

Editorial

Thank You!

Rebecca Wilder, RDH, BS, MS

A large number of individuals have contributed to making this past year a recording breaking one for the *Journal of Dental Hygiene*. We had more submissions this year than any year previously! In addition, we were able to provide our members with the Proceedings of the North American Dental Hygiene Research Conference. None of this would be possible without the energy, diligence, commitment and enthusiasm from a huge number of ADHA members and other professionals who make the publication possible.

I wish to gratefully acknowledge the support and valuable contributions of the *Journal* staff editor, Josh Snyder. Also, many thanks to Jeff Mitchell, Director of Communications, and Jean Majeski, Man-



aging Editor of *Access Magazine*, who has assisted us with the print *Journal*. I also want to publically

acknowledge the support from Ann Battrell, Executive Director of ADHA for recognizing the importance of research and scientific inquiry to the forward progression of our profession.

We are proud of the peer review process and the quality publications that culminate from the efforts of the editorial review board. These volunteers make our publication one that all of us can be proud of as we strive to continuously grow our body of knowledge.

Thank You!

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

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Book Reviews

Review of: Dental Instruments: A Pocket Guide, Third Edition

Bartolomucci Boyd LR
Saunders Elsevier, 2009
St. Louis, Missouri
688 pages, illustrated, soft cover
ISBN: 978-1-4160-4619-6
Price: \$39.95

Review by Lynne C. Hunt, RDH, MS, clinical instructor

Dental Instruments: A Pocket Guide, Third Edition is designed for student learning via a flashcard method or for quick reference for the dental professional in a clinical setting. Its portable size and flip style pages are ideal for the student on the go or for storage in the operatory for future reference. The third edition includes 3 new chapters: Chapter 13, Preventive and Sealant Instruments and Bleaching Trays; Chapter 19, Dental Materials Equipment; and Chapter 20, Dental Radiography Equipment. In addition, Boyd has added more instruments, equipment, and new tray setups to the following chapters: Chapter 12, Hygiene Instruments; Chapter 14, Orthodontic Instruments; and Chapter 17, Oral Surgery Extraction Instruments.

Included in the guide is access to an EVOLVE website. To enhance learning, students can take quizzes, participate in drag-and-drop tray setup exercises, and view photos of instruments and equipment being used in a clinical environment. Instructors have access to instrument and equipment photos, teaching ideas, a 200-question test bank, and tray setup quizzes.

This well-organized guide begins with basic dental instruments used in general dental practice (including dental hygiene instruments), moves through the instruments used in dental specialty practices (endodontics, orthodontics, oral surgery, periodon-

tics) and ends with sterilization, dental materials, and dental radiography equipment. Each instrument or type of equipment is introduced with clear photographs or drawings followed by bulleted text describing function, characteristics, and practice notes. Included in the practice note section is information on how to dispose of or sterilize the equipment or dental material in question. In most chapters a photo and description of a tray setup follows the introduction of the separate instruments. A tray setup of topical anesthetic (Oraqix) would be helpful in the chapter on anesthesia.

While this guide is not meant to be a catalogue of products, it is very thorough in its scope. At first glance, the guide appears to be more applicable to dental assistants and dental students than dental hygienists. Boyd, however, stresses the fact that it is very important for all members of the dental team to have a thorough knowledge of the instruments used in the office. Often, dental hygienists are less knowledgeable about the instruments and tray setups of procedures other than those they perform every day. The dental instrument diagrams, descriptions, photos, and clear, concise text of this guide would be a remarkable resource for the practicing dental hygienist.

Review of: Ten Cate's Oral Histology: Development, Structure, and Function

Antonio Nanci
Mosby/Elsevier, 2008
St. Louis, Missouri
413 pages, illustrated, indexed
ISBN: 978-0-3230-4557-5
Price: \$81.56

Review by Stacy McCauley, RDH, MS

This textbook, divided into 14 chapters with 395 pages of content, is an excellent overview of oral histol-

ogy authored by Dr. Antonio Nanci. The content is supported frequently throughout the book with excellent, easy to understand diagrams and photos. The book begins with a brief overview of the structures of the oral tissues. The next 2 chapters contain well written and illustrated explanations of the embryologic growth process. The next 5 chapters move the student through the various aspects of the development and physiology of the teeth, supporting structures and alveolar bone. The latter chapters highlight the tooth eruption and shedding process, salivary glands, the oral mucosa, the temporomandibular joint, and the regenerative process associated with oral tissues. Dental hygiene educators will find this book to be well organized, sequenced appropriately, and extremely comprehensive in explaining the oral histological process.

This book will also be found useful in supporting the didactic content presented in the dental hygiene curriculum. The "Topics for Consideration" sections were an excellent addition to the conclusions of most of the chapters. These sections seemed to bring in the clinical application and/or clinical relevance of the content discussed in a particular chapter. Although an excellent addition to the textbook, more clinical applications added to the "Topics for Consideration" related to cleft lip and palate would have benefited the book. The author could have briefly explained both cleft palate obturators and the surgical techniques used to correct both cleft lip and palate. This could have also been supported by pictures of the prosthetics and before and after photos of surgical cases. In chapter 4, the author could have elaborated a bit more in the content area related to MMP's and Collagenase. These are fundamental concepts in the inflammatory process, the healing process,

and the disease process. Dental hygiene students would benefit from further explanation of MMP's and Collagenase. The author could have added a "Topics for Consideration" related to how low dose Doxycycline in periodontal therapy affects the Collagenase enzyme. Additionally, more clinical relevance could have been discussed in a "Topics for Consideration" section in chapter 6, related to bisphosphonates and the im-

pact on bone. Finally, the textbook sufficiently explains the dentin hypersensitivity phenomena. It might have been helpful to have the author include how various anti-sensitivity products work to reduce dentin hypersensitivity (i.e. Potassium Nitrate versus Sodium Fluoride).

For the entry level dental hygiene student, this textbook fully meets the expectations of a comprehensive oral histology textbook. The

content is written in an easy to follow manner and is fully supported by well diagramed pictures, charts, and diagrams. The "Topics for Consideration" sections are an excellent addition to the conclusion of the chapters. In conclusion, in concert with their clinical dental hygiene textbooks, dental hygiene educators will find this textbook valuable to include in the curriculum.

Motivational Interviewing: Application to Oral Health Behaviors

Karen Williams, RDH, PhD

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.

Almomani, F. Williams, K. Catley, D. Brown, C. Effects of an oral health promotion program in people with mental illness. *J Dent Res.* 2009;88(7):648–52.

Objectives: More knowledge is needed regarding efficient methods of oral health prevention and reducing disparities in oral health. Motivational interviewing (MI) has demonstrated utility for improving health behavior, including among those with serious mental illness (SMI). This study tests whether MI enhances the efficacy of an oral health education intervention in individuals with SMI.

Material and Methods: Sixty individuals were randomly assigned to MI plus oral health education or oral health education alone. Plaque scores, oral health knowledge and self-regulation were assessed at baseline and at 4 and 8 weeks.

Results: Repeated-measures of ANOVA showed improvement ($p < 0.05$) in plaque, autonomous regulation and oral health knowledge across time for both groups. However, individuals receiving MI improved significantly more when

compared with those receiving only oral health education.

Conclusion: Results suggest that MI is effective for enhancing short-term oral health behavior change for people with SMI and may be useful for the general population.

Commentary

A primary role of the dental hygienist is to assist individuals in achieving optimal oral health. Beyond professionally delivered care, dental hygienists encourage their patients to practice effective dental plaque removal, attend to healthy dietary and lifestyle habits and adhere to regular professional dental maintenance visits. This requires a thorough knowledge of oral disease processes coupled with an understanding of human behavior and motivation. It is not uncommon for dental hygienists to encounter patients who are poorly adherent or patently resistant to their professional recommendations. Yet clinicians are taught to provide oral health education to all patients, irrespective of their intrinsic motivation, with the hope that knowledge will somehow magically increase motivation and change behavior. Unfortunately, the provision of education and expert advice is rarely sufficient to bring about the desired patient behavior change. All too often, a dynamic develops in which the dental hygienist takes on the role of “the persuader,” arguing for change, while the patient takes on the role of “the resistor,” shooting down all suggestions and providing a long list of reasons why they cannot follow the recommendations.

Patients may also resist passively by ignoring advice and failing to return for care. The end result is that dental hygienists become frustrated, which makes them less effective as a change agent.

This scenario can be even more complicated when providing care to individuals with serious mental illness (SMI). The illness can increase the individual’s risk for tooth decay and periodontal diseases, as well as medication-induced xerostomia. Apathy may also impact their ability and/or desire to effectively manage their oral health. As a result, preventive dental education is particularly important for people with SMI. The current study explored the effectiveness of MI as an adjunct to oral health education in a population of individuals with SMI.

Previous studies have shown that MI can be effective in enhancing motivation for changing a wide variety of health behaviors in populations with and without SMI. MI uses tried and true methods to elicit the patient’s internal motivation towards the desired behavior. In contrast to traditional oral health education, this method does not rely on persuasion or unrequested advice to stimulate external reasons for change.

The study subjects consisted of 60 adults with confirmed diagnoses of schizophrenia, bipolar disorder or depression. Subjects were recruited from a community program that provides support services to individuals with SMI. In order to qualify for participation, subjects had to have at least 1 gradable tooth in each sextant and be capable of providing informed consent. Subjects were excluded if

they had obvious periodontal disease, orthodontic appliances, severe physical or cognitive disabilities or were currently using a mechanical tooth brush. At the baseline visit, subjects' oral hygiene was assessed using the Turesky Modification of the Quigley Hein Plaque Index. Additionally, their knowledge about oral health/mental illnesses and their motivation for engaging in daily plaque removal were evaluated. Following baseline, subjects were randomly assigned to receive either traditional oral health education or a brief motivational interviewing intervention prior to oral health education.

The traditional oral health education intervention consisted of information about the oral health effects of SMI, the advantages of good oral hygiene and the disadvantages of bad oral hygiene. The MI intervention, which was conducted prior to the education session, focused on exploring pros and cons, motivation and confidence and personal values related to daily tooth brushing and oral health. All subjects received printed material summarizing the educational information, a battery powered toothbrush (Crest® Spin-Brush Pro), a reminder system and weekly telephone calls for 4 weeks.

Data on oral hygiene (plaque score), knowledge scores and motivation scores (internal, external and introjected motivation) were compared between the 2 groups over the 2 month study using a 2-factor repeated measure ANOVA. The results showed that both groups mean plaque scores decreased between the baseline and 1 month observations (3.6 to 2.3 and 3.3 to 2.6 for MI and traditional oral hygiene, respectively). However, only the MI group's plaque score continued to decrease between 1 and 2 month observations (from 2.3 to 1.9). This clinically meaningful decrease in plaque score over time was statistically significant ($p < .05$).

Oral health knowledge scores increased significantly between base-

line and 1 month for both groups, and remained constant until the end of the study. The MI group had a slightly greater improvement in knowledge (32.9 versus 27.5 at the 2 month observation period). This, coupled with the decreasing plaque scores, may suggest that the MI subjects were more attentive to the education session than subjects who received only education.

Of particular interest was the change in motivation scores for the 2 groups. While neither group showed significant increase in internal or external motivation, the MI group had an increase in introjected motivation over time (increase from 4.5 to 6.1 for MI compared to 4.1 to 5.0 for only oral hygiene). According to self-determination theory, introjected motivation is based on guilt and falls somewhere between internal and external motivation. The authors hypothesized that an increase in guilt-related motivation for subjects in the MI group may be unique to this population, as the nature of SMI and/or psychotropic medications may diminish overall motivation and make it more difficult for subjects to internalize motivation. They also suggested that greater introjected motivation may actually be preferable to external motivation for this population.

Although the study was brief, conducted over only a 2 month period, the results have important implications for dental hygienists. This study provides some of the first short-term evidence suggesting that including a brief MI session before oral health education may improve motivation, knowledge and oral hygiene better than education alone in individuals with SMI. Individuals with SMI have an unusually high oral health disease burden, yet are often considered a poor investment of the clinician's time. Applying principals from cognitive behavior theory to patient engagement in the clinical environment shows promise for improving oral health behaviors

necessary for better oral health. The authors conclude that these results support use of MI as a strategy for improving oral health in poorly motivated individuals while also suggesting that future studies need to explore effectiveness of MI for improving oral health in other patient populations.

Jönsson B, Ohrn K, Oscarson N, Lindberg P. An individually tailored treatment program for improved oral hygiene: introduction of a new course of action in health education for patients with periodontitis. *Int J Dent Hyg.* 2009;7(3):166–75.

Objective: To describe and evaluate an individually tailored treatment program based on a behavioral medicine approach to oral hygiene self-care for patients with chronic periodontitis.

Material and Methods: Two experimental single-case studies with multiple-baseline designs across different self-administered oral hygiene behaviors were conducted. Cognitive behavioral techniques were used to organize the strategies for the intervention and the approach to counseling was inspired by and structured in accordance with Motivational Interviewing (MI). The central features in the program were the individual analysis of knowledge and oral hygiene habits, individually set goals for oral hygiene behavior, practice of manual dexterity for oral hygiene aids, continuous self-monitoring of the behavior and prevention of relapse.

Results: Both participants reached the pre-decided criteria for clinical significance in reducing plaque and bleeding on probing. Reductions of periodontal probing depth were achieved as well. The positive results remained stable throughout the 2 year study period.

Conclusion: The successful application of this educational model suggests that it could be used as a

method for tailoring interventions targeted to oral hygiene for patients with periodontal conditions. The program will now be tested in a larger randomized controlled trial.

Commentary

Improving the overall health of patients with chronic periodontitis continues to be an important role for dental hygienists. Despite the short-term success of scaling and root planing, achieving long-term periodontal health is predicated on patients' willingness and ability to engage in the effective oral hygiene behaviors at home. To date, few studies have applied health theories and employed strategies that are known for promoting good health-related behaviors. The theoretical foundation used in this study was the Social Cognitive Theory, a well-known theory used for understanding factors related to health behaviors. This theory frames behavior as a complex interrelationship between several important factors: self-efficacy, knowledge, expectations and individual values/health goals. Because a wealth of literature in other health fields has shown consistently better outcomes when interventions are theoretically based, these authors hypothesized that an oral health program based on these tenets would be successful in achieving good health outcomes in individuals with chronic disease. Therefore, this study describes implementation of a novel treatment program for self-care and evaluates the long-term success of such a program.

As a proof of concept study, the study reports on 2 experimental single-case studies of patients with persistently poor periodontal disease control. A 50-year-old female non-smoker and a 60-year-old male smoker comprised the subjects for this study. Both were followed initially at weekly intervals to establish multiple baselines against which change over time could be com-

pared. The intervention consisted of 4 distinct phases. The baseline phase consisted of collecting periodontal probing depths, bleeding on probing, plaque index and gingival index at 3 sessions over a 3 week period, as well as assessing information on self-reported oral hygiene care at home. The second phase consisted of a MI-based intervention phase where patients attended 45 to 75 minute sessions each week for a 3 week period. Initially, an interview was conducted to understand the patient's perspectives and knowledge of oral health, previous experiences and expected outcomes. Patients identified 3 to 5 personal goals related to oral health that were important to them but were not directly related to their periodontal status. Some goals were related to behavior (achieving better cleaning) or psychological (avoiding bad breath) but all reflected the individuals desire for future oral health and treatment. Based on these goals, the dental hygienist made recommendations for self-care aids and then explored the patient's motivation and ability to use these aids. Plaque was disclosed prior to the discussion to initiate the conversation and engage the patient in discovery about their current status. The third phase (which occurred over a 6 week period) included professional scaling and root planing, along with supportive integration of the home care aids into routine home care. The clinician allowed patients to develop their self-care routines at their own pace. From month 3 through 24, patients returned for 3 follow-up examinations and 2 maintenance care sessions. This comprised the follow-up and final phase of the study. At all visits during the final phase, plaque and gingival health measures were collected.

Results for plaque scores and gingival index scores were plotted for each phase over the 24 month study period for the 2 individuals. For both patients, there were similar trends in oral health measures across time.

During the baseline phase, there was very little change in either plaque or gingival scores. However, once the MI phase was implemented, there was a clear trend for decreasing plaque and gingival inflammation during the 3 week phase. For the female patient, plaque and gingivitis scores bottomed out at the end of phase 2 and remained low for the remaining 24 weeks of the study. For the male patient, scores continued to decrease during phase 3 and bottomed out at the end of that phase. At that point, his plaque and gingival index score remained very low for the remainder of the 2 year period. It is notable that the change in bleeding on probing for the female patient decreased from 68% during the baseline phase to 6% at the 2 year follow-up. Similar decreases were noted for the male patient with a decrease from 83% to 10% over the study period.

These results demonstrate that an individually tailored oral health intervention that engages the patient in problem solving and setting goals can be highly effective at achieving periodontal stability over a sustained period of time. As a longitudinal proof of concept study, it provides important information regarding the role patient engagement can play in controlling periodontal disease over a sustained period of time. Assisting patients in identifying internally valued cognitive and behavioral strategies using MI, coupled with professional care, gave the dental hygienist a real opportunity to support behavior change in these 2 individuals. While it may be argued that the amount of time required for the initial 3 phases is not practical in terms of appointment time or financial expenditures in the private dental office, the sustained positive effect on periodontal health over 2 years time may suggest that this front-loaded approach to patient education may be worth the initial time and effort if it results in life-long oral health behavior changes.

Clearly, results from a single-

case study on 2 patients cannot be generalized to a larger population of periodontal patients. The authors acknowledge this limitation and argue effectively that these results give support for advancing knowledge in this area in a larger randomized clinical trial. Future studies might also want to explore how much “intervention dose” is needed to engage patients and elicit motivation to improve oral health care at home. This study provided the same “intervention dose” to the 2 individuals and achieved excellent outcomes. Whether that amount of contact time is needed remains unknown.

The Bottom Line

Engaging patients and facilitating oral health related behavior change is one of the most rewarding and concomitantly challenging roles for dental hygiene clinicians. As with most chronic conditions, periodontal disease is largely preventable but requires good oral health behaviors at home and adherence to periodic maintenance visits. Evidence suggests that adherence to health recommendations made by clinicians is as important as professionally delivered care for controlling disease and maintaining periodontal stability. For this reason, professional treatment of periodontal patients requires multiple skills, including but not limited to knowledge of the periodontal disease process and associated risk factors, advanced instrumentation skills, knowledge about health behaviors in humans and understanding the dynamic process of motivation.

Patient education is primarily based on providing information about periodontal disease along with persuasion to improve oral hygiene or adhere to recommendations. A large body of literature increasingly suggests that providing education and expert advice is rarely sufficient to induce patient behavior change. When patients are not ready for change, they may actively resist suggestions by finding excuses for their

behaviors or passively resist by ignoring advice.

An emerging body of science in cognitive psychology is supporting that educational and therapeutic interventions consistent with theories of behavior change are more likely to succeed. MI is one such strategy that targets health-related behavior change by encouraging patients to express their own reasons for and against change, and to think about how their current behaviors and associated health status affect their core values and life preferences. MI has shown utility in improving health related behaviors in smoking, drug addiction, exercise, weight reduction, diabetes management, medication adherence and condom use, and these 2 studies extend our knowledge about the potential role MI can play in improving oral health. MI is a client-centered, clinician directed counseling style for encouraging behavior change by helping patients explore and resolve ambivalence they might have related to health behaviors. It requires the dental hygienist to assume the role of a sensitive and supportive advocate rather than persuasive expert. It is based on recognizing that there are well-established factors associated with change — individual autonomy, intrinsic motivation, feelings of self-efficacy, connecting the change with personal values, having a sense of perceived control and being at a point of readiness for change.

These 2 studies suggest that MI, whether brief (15 to 20 minute sessions) or extended (multiple 45 minute sessions) can produce short and long-term oral health behavior changes, respectively. Although the science on MI for use in managing oral diseases is still fairly young, there is increasing interest in this approach for improving oral health in the dental clinical environment. Currently, there are multiple randomized clinical trials being conducted that will enhance our understanding of dental patient engagement. Until

then, the following conclusions can be supported:

- A brief MI intervention for individuals with mental illnesses is more effective at reducing plaque scores, in the short run, than traditional oral hygiene education
- An intensive, individually tailored treatment program can reduce plaque and gingivitis, and this effect can extend 21 months beyond the completion of the intervention
- MI may improve our understanding of motivation and provide dental hygienists with a new strategy for affecting the oral health of our patients

Summary

The practice of dental hygiene can be frustrating when patients fail to heed our professional recommendations and experience disease progression. We can all relate to situations where, despite our best efforts, patients with progressive disease fail to change behaviors and end up losing teeth unnecessarily. It is critical to understand that all behavior change (whether related to weight loss, increased exercise, tobacco cessation, adherence to medications or improved oral hygiene) involves some level of ambivalence. In MI, the role of the dental hygienist is to engage the patient in meaningful interaction where the patient has the opportunity to explore their values and beliefs about oral/dental health, examine pros and cons related to changing oral health behaviors and articulate and resolve ambivalence to change in a non-judgmental environment. Ultimately, this strategy elicits the patient’s own motivation towards behavior change and allows them to become invested in the change process. It is only when patients are invested in their own behavior that optimal oral health can be achieved.

Keeping an eye on the evolution of scientific evidence is critical for

dental hygienists to be maximally effective in supporting health-related behavior change for individuals. Exciting advances in cognitive psychology are informing the process of care in applied health sciences such as dental hygiene. MI is one such advanced strategy that can be incorporated into regular patient care in the dental office. Educational pro-

grams are increasingly modifying patient education curricula to teach the listening and communication skills necessary for MI. Numerous training programs exist around the United States and internationally. A one day MI training program can be beneficial for clinicians who are interested in advancing skills in patient engagement. Several corporate

sponsors are developing materials and programs to facilitate dental hygienists' understanding of MI. As evidence increases in this area, it may change the manner in which we engage our patients and effectively communicate. These studies offer some insight into early effectiveness of MI for oral health behavior change.

Critical Issues in Dental Hygiene

Building a Research Infrastructure

Jane L. Forrest, RDH, EdD; Ann Eshenaur Spolarich, RDH, PhD

It is widely recognized that dental hygiene practice must be based on sound research and scientific information. To promote research and advance the scientific base of dental hygiene practice, a research infrastructure is required. Such an infrastructure will support research efforts and enable the systematic and purposeful building of a rigorous body of knowledge.

What is research infrastructure? Research infrastructure fosters the development and advancement of long-term research programs, enables discussion and dissemination of research findings and supports the systematic building of a scientific knowledge base that informs practice. There are 5 essential and inter-related elements of research infrastructure that are common to other professions.¹ These elements are:

- A critical mass of researchers/scientists
- Research priorities that produce clinically relevant knowledge
- Communication systems that promote linkages among researchers and increase access to research findings
- Funding mechanisms to support research
- Demonstrated value for research and its relationship to practice

There are many approaches by which each one of these elements can be developed and advanced in dental hygiene. Highlighted are some of the critical considerations related to each element.

Critical mass of researchers/scientists: An important component of an infrastructure is the presence of a sizable number of professionals trained and actively participating in

research. Although there has been an increase in the number of doctoral-prepared dental hygienists, there are 18 programs that award a master's degree in dental hygiene, dental hygiene education or oral biology, and none that award a doctoral degree. Ideally, researchers in the profession should be prepared through doctoral education in dental hygiene. Recently, leaders in dental hygiene education proposed a curriculum model for the doctorate in dental hygiene.^{2,3} Proponents of the doctoral degree in dental hygiene strive to achieve what is considered among the hallmarks of any true profession – the terminal degree in the field. These programs emphasize leadership and scholarship – skills that are essential in the workplace and for successful interdisciplinary, collaborative efforts. However, until such programs exist, dental hygienists must receive their doctoral education in other disciplines. This is not to diminish the importance of the pursuit of doctoral studies in other fields. Arguably, the profession gains diversity in its perspective and direction from those hygienists who share new ideas and knowledge obtained from their scholarly work in other disciplines. Diversity of education among our scholars allows the profession to not just aim higher towards the terminal degree, but also expands the breadth and depth of the knowledge base of the profession.

To increase the number of researchers in dental hygiene, graduate education and research as a career path must be actively promoted. Faculty and students need to be socialized to the importance and benefits of research and doctoral education. Mechanisms for supporting advanced education and systems

for mentoring are required to enable novice researchers and those in the profession who are not doctoral-prepared to engage in the research process effectively.

Identifying research priorities: Identifying specific areas of inquiry and obtaining consensus on priorities for investigation is another element of a research infrastructure that enables systematic knowledge building. Research priorities in a profession are commonly established by assessing current activities, generating state-of-the-art papers on key areas, systematically obtaining input from the research community and disseminating, discussing and then refining priorities. Research priorities must be based on scientific merit, match with funding opportunities and lead to the building of a knowledge base that is specific to the practice of dental hygiene. A shared vision of the research priorities for dental hygiene provides a basis for establishing partnerships with other organizations and agencies that have areas of interest in common with dental hygiene. An initial step in this area was taken by the National Center for Dental Hygiene Research (NCDHR) by sponsoring the North American Dental Hygiene Research Conference, held in June 2009 in Bethesda, Maryland. The first day of the conference was hosted at the National Institute of Dental and Craniofacial Research (NIDCR) and the National Institutes of Health (NIH), with the specific goals of sharing strategic plans for conducting oral health research from the perspectives of the NIDCR, the Canadian Institutes of Health Research, the ADHA and the Canadian Dental Hygienists Association.

As priorities are identified, difficult choices will have to be made as to the areas of inquiry that can be initially supported by the profession. All topics of potential importance cannot be immediately supported given the limited opportunities for funding and scarce professional resources (e.g., limited numbers of doctoral-prepared researchers).

Communication systems to promote linkages: The need for effective communication systems as part of a research infrastructure become increasingly important as the research efforts of a profession expand and mature. Strategies that support linkages and dissemination of research include traditional mechanisms such as annual research meetings and conferences, published papers and proceedings and research journals. Electronic communication, such as the Internet and web, offers an exciting approach to promote scholarly exchange and to disseminate and access research information. This technology can also be used to establish linkages among researchers at the local, national and international levels without regard to geographic location. Dental hygiene has developed some of these communication strategies. However, greater emphasis must be placed on creating opportunities for presentation and discussion of research, the basis and foundation of scientific work. Conferences, webinars, podcasts and targeted publications, such as special journal supplements, can be used to increase the dissemination of timely information and can reach large numbers of dental hygienists.

Funding for research: It is essential for a profession to devote a portion of its assets for funding research activities, and we must continue to develop mechanisms to secure and dispense monies and other critical resources needed to achieve our research goals. The ADHA Institute for Oral Health offers support for

research studies that are primarily at the pilot stage of development. This level of support assists students and novice investigators to explore new ideas, as well as provide an opportunity for an established researcher to enter a different area of inquiry. In addition, many academic and health institutions provide intramural funding for pilot research that may be available to dental hygienists. Other professional associations offer scholarships to graduate students for thesis and dissertation study. This is a viable strategy to promote in dental hygiene as well. Obtaining funding for large-scale and multi-site studies requires having pilot data and establishing an area of expertise or track record that is compatible with the research priorities of the agency or foundation from which funding is being sought. This takes time and requires enabling dental hygienists to build a research career path in order to become competitive for funding.

Valuing research: Underlying each component discussed above is the fundamental value that a profession must place on the work of research. For example, nursing is a profession that has deliberately focused its efforts on valuing and building an effective research infrastructure. As a result of these efforts, nurses have joined the mainstream scientific community and have received the highest level of federal recognition, the establishment of the National Institute of Nursing Research at the NIH. An important strategy for increasing the value of research is to increase its visibility in all aspects of professional activities. As discussed in a previous edition of this column, the National Dental Hygiene Research Agenda should be used to drive the efforts of the association, including establishing priorities for funding and directives for targeted research efforts.⁴

Does dental hygiene have a research infrastructure? Dental hy-

giene has an emerging infrastructure that must be purposely advanced and supported. Components of this infrastructure include an increasing number of dental hygienists who are doctoral-prepared, a national research agenda from which priorities can be identified and professional association support of small pilot research efforts. In 1994, the NCDHR systematically began developing the infrastructure by training collaborative teams of dental hygiene researchers. At the end of a 3 year funding cycle, 14 teams (65 individuals) initiated pilot research that addressed an area of the National Dental Hygiene Research Agenda. It was hoped that their efforts would build a program of research that would serve as a basis for additional centers of excellence. Through 2 additional cycles of funding, the National Center received support to establish an electronic communication system, the DHNet, to enhance dissemination and communication among researchers, and to advance training in evidence-based decision making. As a result of the North American Dental Hygiene Research Conference, the NCDHR will be enhancing an electronic network of dental hygiene researchers and providing a mechanism for sharing research investigations and fostering collaboration to strengthen the research infrastructure.

These activities are promising and suggest the viability of a center-approach to advance research in dental hygiene. Nevertheless, a research infrastructure suggests a level of coordination and integration of activities that goes beyond any one institution, organization or center. Building an infrastructure for dental hygiene will require considerable commitment, communication, time and energy on the part of the professional associations, educational programs and the dental hygiene scientific community at large. Gaining support from university administration, government, private industry and foundations also will be critical.

To expedite the development of a research infrastructure, a nationally coordinated effort is required. We believe that the initial focus and funding of this effort should be on the priorities identified from the National Dental Hygiene Research Agenda. Although these recommendations were made 15 years ago in 1994, they are still current today.¹

Building an infrastructure is particularly critical for dental hygiene in today's health care environment. Limited availability of research support necessitates careful examina-

tion and consensus as to the next steps for advancing professionalization. However, achieving excellence in practice, the cornerstone of professionalization, is intricately tied to and dependent upon putting into place a viable structure for the conduct of research.¹

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Oral Health: Dental Hygienists are Key

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In 2000, the Department of Health and Human Services, the United States Public Health Service, published "Oral Health in America: A Report of the Surgeon General."¹ This report documented the extent of oral disease in our country, the disparities in access to oral health care and the scientific evidence that demonstrated connections between oral health and systemic health. Examples of the burden of oral diseases and disorders reported included the following:¹

- Dental caries is the single most common chronic childhood disease – 5 times more common than asthma and 7 times more common than hay fever
- Over 50% of 5 to 9 year old children have at least 1 cavity or filling, and that proportion increases to 78% among 17 year olds
- Tobacco-related oral lesions are prevalent in adolescents who currently use smokeless (spit) tobacco
- Most adults show signs of periodontal or gingival diseases. Severe periodontal disease affects about 14% of adults aged 45 to 54
- About 30% of adults 65 years and older are edentulous, compared to 46% 20 years ago
- Oral and pharyngeal cancers are diagnosed in about 30,000 Americans annually – 8,000 die from these disease each year
- At any given time, 5% of Americans aged 65 and older are living in a long-term care facility where dental care is problematic

This situation becomes more pronounced when considering that many of the individuals in America either do not have access to dental care or

do not have dental insurance.

Worldwide, oral health presents a significant challenge as well. Dental caries and subsequent tooth decay and periodontal diseases are the most common oral diseases globally. Sixty to 90% of school children worldwide have dental caries. Severe periodontal disease is found in 5 to 20% of middle-aged adults. Further, the incidence of oral cancer ranges from 1 to 10 cases per 100,000 in most countries.² This situation is exacerbated by the fact that dentists are in short supply in nations that have low-to-middle income.

The challenges we face in America and worldwide are to improve oral health by reducing the burden of oral disease and creating strategies for preventing and controlling chronic disease. Recently, an editorial appeared in *Lancet* magazine discussing how oral health is a neglected area of global health, something that has traditionally registered low on the radar of national policy makers. The author cited the importance of prevention as being central to resolving this problem: "Evidence-based, simple and cost effective preventive approaches exist, but they need to be rigorously promoted and implemented. Professionally, health workers, including physicians, nurses, pediatricians and pharmacists can all deliver prevention messages about the use of fluoride and the risk factors for oral disease."³

While laudable that other health care professionals are mentioned as being an important component of prevention of oral diseases, there is no mention throughout the editorial of the role of dental hygienists in oral health disease prevention and control.

Both the World Health Organiza-

tion and the Surgeon General's Report on Oral Health stress the need to reduce risk factors associated with oral disease. Limiting intake of sugars and maintaining a well-balanced nutrition plan, promoting tobacco cessation and decreased alcohol consumption, use of optimal levels of fluoride and placement of sealants and use of protective sports and motor vehicle equipment are approaches that can effectively decrease caries, periodontal disease, oral cancer and facial injuries. Integrating oral health care into national and community health programs is a recommended strategy to reach targeted populations that are underserved.^{2,4}

These recommendations can all be accomplished by using the services of dental hygienists. The health care community at large is unaware of the value provided by dental hygienists to oral and general health. Dental hygienists must be integrated more fully into the health care system to provide a broad array of services identified to meet the needs of the public.

Dental hygienists as a group appreciate their role in prevention and control. Yet, for the rest of the health care community to value and utilize this resource, there must be greater effort expended to educate the public, other health care professionals and policy makers about the contribution dental hygienists can and do make to public health. While publishing in dental hygiene journals and magazines is important, dental hygienists should publish research related to their contributions to health delivery systems as well as the utilization and outcomes of their alternative practice models in journals and publications outside the discipline of dental hygiene. Dental hygiene profession-

al associations need to promote that dental hygienists function in a variety of settings beyond private dental offices, including school based dental clinics, hospitals, managed care organizations, community health centers, correctional institutions and nursing homes. They may work in government, sales or marketing positions, or as educators, researchers,

administrators, health policy makers, managers, consumer advocates or as consultants. Further, dental hygienists must actively seek opportunities to influence national policy makers to promote dental hygienists as the key to oral health prevention practices.

As the Lancet author notes: "Politically, commitment is needed to

integrate oral disease prevention into programmes to prevent chronic diseases and into public-health systems. Good oral health should be everybody's business."³ As dental hygienists, we need to be sure that the public, health care communities and public policy representatives know that oral disease prevention is our business.

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Research

Insurance as a Predictor of Dental Treatment: A Pilot Study in the Savannah, Chatham County Area

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Introduction

Countries offering government funded dental insurance utilize universal databases to research public health dentistry. Studies utilizing detailed statistics on treatments and procedures administered to citizens provide insightful information in the field of dentistry. However, limited research was found that investigated insurance status as a contributing factor for treatment compliance. By using the diversity of insurance coverage in the United States, research was conducted to evaluate the influence of insurance status on a citizen's behavior to accept or reject dental treatment. Prior to conducting such a study on a national basis, this pilot study was conducted to determine if a correlation exists between one's insurance coverage and treatment compliance, and to define its limitations. The study investigated insurance status as a predictor of dental/dental hygiene treatment. The researcher utilized existing data from a 2 year time frame that was provided by a private dental practice located in Savannah, Georgia. Comparisons were made as to whether the patient elected to receive or reject the recommended dental treatment. The research question for this study was: Do insured individuals obtain dental treatment to a greater degree than the uninsured? The independent variable was insurance status, which included

Abstract

Purpose: To assess patient compliance with the treatment prescribed by the dentist.

Methods: Data, which included age, gender, insurance status and a tally of accepted and rejected procedures by use of CDT (current dental terminology) codes, was extracted from a private dental office database. All patient identifiers were removed to insure internal reliability. Thirty procedure codes were investigated for each patient to determine compliance by individual code and categories which included preventative, radiographic and restorative procedures.

Results: Results indicated that the acceptance rate of dental exams by the insured and uninsured was greater than 80%. The comprehensive oral exam was most commonly rejected. The insured population had a 90% acceptance rate for, where the uninsured population had a 74.6% acceptance rate for the oral prophylaxis procedure. Radiographic procedures had an acceptance rate of 8.3% higher by insured patients than those uninsured. Crowns, bridges and dentures showed less difference in acceptance rates.

Conclusions: A positive correlation exists between insurance status and patient acceptance of prescribed treatment.

Key Words: dental insurance, dental treatment, dental treatment and insurance

This study supports the NDHRA priority area, Health Services Research: Assessing how third parties influence access to and utilization of dental hygiene services.

insured versus uninsured patients. The dependent variable was the dental treatment obtained.

Review of the Literature

Insurance coverage and/or benefits have become a growing consideration in the clinical practices of dentistry.¹ The question of whether

or not insurance will provide a financial benefit appears to play an important role in the decision-making process for many patients. Different types of insurance, such as private, public and military, vary in the types of coverage that are available. While various types are discussed in each study, the basic principle of providing financial assistance for dental

care is shared by all.

Most available research regarding dental insurance examines who is insured and what factors influence a person's insurance coverage status. Most frequently, these factors included issues of racial, ethnic, socioeconomic and demographic characteristics. The studies were divided into groups according to age: children, adult and older adult. The purpose of this literature review was to determine the relation of dental insurance with the intention of considering the methods of data collection, trends in interest for this topic and the findings of the related studies.

Several of the studies conducted in the United States utilized data collected from previous nationally administered studies. This data allowed for better external validity with large sample populations. One frequently cited study was the NHANES, conducted by the National Center for Health Statistics.² The NHANES III used both a survey and a clinical exam. In 1995, the National Health Interview Survey (NHIS) study population involved 39,239 American households.³ Stancil et al utilized this nationally representative cross-sectional survey of the United State's non-institutionalized population, as well as survey data from the Centers for Disease Control (CDC) and the NHIS. Manski et al found that the Medical Expenditure Panel Survey (MEPS) was another nationally representative source which was conducted by the Agency for Healthcare Research and Quality.⁴ It used an overlapping panel design, enabling both cross-sectional and longitudinal studies to be conducted using this data.³ Population samples used in these studies excluded the institutionalized population.²⁻⁴

Many people have private insurance and their records are kept as property of individual dental practices across the nation. Therefore, collecting data relating to one's dental health status and insurance status is somewhat restrictive in the United

States, and findings often pose limited validity.⁵ Further, the Health Insurance Portability and Accountability Act, of 1996 (HIPAA) regulations limit access to individual's records for the purpose of collecting insurance coverage data. In those countries utilizing federally funded dental insurance, a greater amount of information is available via a single database. Using databases as means of data collection was explored in one Canadian study.⁶ In Canada, dental services are provided by the government. This study focused on a native population referred to as the First Nations. A First Nations dataset of 12.8 million records from 538,034 clients were examined, all from a single database.⁶ The study sought to analyze expenditures (dependent variable) and identify factors influencing cost (independent variable). This research indicated that from 1994 to 2001, of those individuals receiving dental services, 36% were restorative treatments, 12.7% were diagnostic, 12.2% preventative and 8.9% orthodontics.⁴

Children: Much of the research focused on children. Chen found that results from the 2000 MEPS study revealed that 68.5% of children had private health insurance and, of these, only 56.9% had dental insurance.⁷ There was a greater likelihood of African American children being provided dental insurance than Caucasian, non-Hispanic children. Moreover, it was suggested that near-poor families may be at a greater risk of being uninsured than poor-families, because the near-poor are less likely to qualify for public assistance insurance in the United States.⁷ Chen cited that similar percentages existed for children who had public government funded medical insurance (18.4%) as for those children who had public assistance dental insurance (16.9%). However, there were higher percentages of children with private medical insurance (65.3%) than those with private dental insurance (44.6%).⁷ The NHIS study also

found that the near-poor population had the highest percentage of uninsured children, and African American children were more likely to be insured than Caucasian children.³ A comparatively small study in Detroit of low income persons of African Americans descent found that a child's number of dental visits was significantly influenced by insurance status and also by the caregivers perception of the child's oral health.⁸ Sohn et al reported that, if the caregiver perceived the child as having "fair" or "poor" oral health, the child was more likely to be taken to dental visits.⁸ Further, it was indicated that caregiver education level and gender influenced whether or not children were taken to the dentist.⁸ An additional study conducted a national survey of parents whose children possessed special needs to assess unmet health care needs of this population.⁹ Ranking first in health services not received by this population was dentistry, with more than 3/4 of children needing dental care within the past year – nearly 1/2 of the uninsured reported needing dental services. Of those with private insurance, 5% expressed a need for services which were not obtained.⁹

Further, a cross-sectional study was conducted in Brazil which examined the associations between socioeconomic circumstances (independent variable) and oral health status (dependent variable) at 2 stages of life – birth and adolescence.¹⁰ The findings indicated that Brazilian adolescents with high levels of material deprivation between birth and age 13 had a higher likelihood of having oral disease.¹⁰

Adults: A study using data collected in the NHANES III from 1988 to 1994 indicated that nearly 54% of adults over age 20 possessed private dental insurance.² Several studies also found that Non-Hispanic African Americans were more likely to have private dental insurance than non-Hispanic Caucasians or Mexican-Americans.^{2,12,13} Further studies

indicated that the higher the education level, at least through the twelfth grade, the percentage with private insurance increased. The clinical findings also suggested that individuals with private dental insurance have better oral health status.^{2,14,15} It was also revealed that privately insured people were significantly less likely than their respective counterparts to have untreated dental caries, periodontal conditions of 4 mm or more of attachment loss and missing 12 to 27 teeth.² The results of this study were found using a propensity score methodology that assigns a single summary score according to naturally occurring groups from background characteristics.²

Older Adults: Differing from the general adult population, older adults experience many changes financially with consideration for retirement and the often decreased income or loss of benefits from no longer being employed. One study explored this phenomenon using data from the 1996 MEPS by evaluating 4,272 non-institutionalized adults over the age of 55.⁴ Researchers predicted that, as age increases and income decreases, dental insurance coverage will decrease. Moreover, factors such as age, income and dental insurance status are directly related to dental service usage. Results from this study showed that as adults get older, dental visits and having dental coverage decreases. It should be noted that, although the presence of teeth had a profound effect on the likelihood of a visit, it did not appear to have an effect ($p > .05$) on the mean number of visits or mean expenditures. Income also effected likelihood of a dental visit, but only insurance coverage appeared to have an effect ($p < .05$) on the mean number of visits or mean expenditures.^{4,12}

A Canadian study of 788 older adults living in institutions for the aged contradicted results utilized in this review. This particular study considered the effects of dental insurance on the ranking of dental

treatment needs in the elderly population.¹¹ It found that the rankings of the participants were not related to insurance status and claimed that none of the factors relating to gender, dental status and ability to perform daily activities confounded the effects of dental insurance on dental needs.¹¹ However, results indicated that insured participants were twice as likely to need new dentures as the uninsured.¹¹

Referenced in many of these studies was the RAND Health Insurance Experiment, which provided a significant evolution in the study of insurance.² While not discussed in detail in this review, results are in the study of insurance and considered historic in nature. The RAND study assigned families at random to different levels of insurance coverage for a period of years and found that “dental insurance effects on clinical outcomes in the Rand Health Insurance Study suggest dental insurance, by reducing out-of-pocket expense, increases willingness to seek oral health care, which in turn improves oral health. These results are more pronounced in children and adolescents than adults.”²²

At any age, socioeconomic and demographic factors play a significant role in whether or not someone is insured or uninsured. The research suggests that having insurance is linked to better oral health status. These relationships are of global interest. However, in the United States, a significant limitation exists when attempting to compare insured and uninsured individuals, where results cannot yield exact datasets detailing services provided to its citizens.

Methodology

Using a longitudinal study methodology, patient behavior to accept or reject dentist recommended treatment was compiled via an existing computerized database as the research instrument. Data was extracted and entered into an Excel spread

sheet. Inferential statistics were computed using the dataset. Correlations regarding insurance status, age, gender and treatment plans were considered. A single treatment plan consisted of both the accepted and rejected procedures, whereas both were prescribed based on the individual need of the patient. The Pearson’s test was utilized for some of the calculations in this study, where other correlations were found using a modified Pearson’s test and are considered point-biserial. The Modified Pearson’s test was utilized because the correlation involved dichotomous variables, such as insurance and a continuous variable of accepted procedures. The pilot test represented a small sample which was sensitive to outliers and a level of skepticism should be observed when considering the results of this study.

Data Collection: This pilot study conducted in Savannah, Georgia utilized an existing database provided by a private dental practice that spanned over a 2 year period, from January 1, 2005 to December 31, 2007. This single blind descriptive study assessed compliance with prescribed treatment. The data set was manually extracted from the database by the office manager. All patient identifiers were removed to insure internal reliability. The dataset included: age, gender, insurance status (insured or uninsured) and a tally of accepted and rejected procedures by use of CDT (current dental terminology) codes. Thirty procedure codes were investigated for each patient. Compliance was examined by individual code and by categories: preventative, radiographic and restorative procedures.

IRB & Legal Review: Prior to beginning this research, approval was granted by the Institutional Review Board (IRB) at Armstrong Atlantic State University. Approval was issued from the board on February 15, 2008. The IRB approved the project under the provisions of Federal Regulations 45 CFR 46. All

of the patients included in this study signed a HIPAA Release Form, thereby granting informed consent. Those who refused were excluded from the sample. Patients were given the opportunity to sign the HIPAA Release Forms when filling out the initial paperwork to become involved as a new patient. The privacy policy of the office is set forth according to those guidelines established by the United States Department of Health and Human Services, Office for Civil Rights. This research abides by these terms and falls under the heading “uses and disclosures for other reasons without permission,” which states: “uses or disclosures for health related research,” “disclosure of de-identified information” and “disclosure of a ‘limited dataset’ for research, public health or health care operations.” Compliance of HIPAA Laws and Regulations of this research was legally reviewed on January 29, 2008 by a licensed attorney in the state of Georgia and found in compliance with the law. Documentation of informed consent was obtained from the dental practice providing the dataset. The documentation contains the signatures from both the dentist and office manager. The office manager agreed to serve as a mediator between the existing dataset and the researcher and to exclude identifiers from the data provided. The researcher had no access to the patient’s personal identifying information.

Population: Sample selection for this study began with oversampling of the uninsured adult patients. An equal sample size was selected at random from the remaining insured adult population. This study found a difference of less than 1% in the male to female ratio of citizens seeking dental care between those insured and uninsured. The sample population consisted of 94 adult patients (30 females and 17 males, from both insured and uninsured statuses). The total population of this office consisted of 1,036 patients. With 231

uninsured patients (22.3% of the total population) and 805 insured patients (77.7%), the calculated sample size for this pilot study would include approximately 400 patients. This private practice, however, served many families. Adults over 18 years old accounted for 30.2% of the total practice population. The age of each subject was calculated as of December 31, 2007. To insure the patients were over 18 for the duration of the study, those under the age of 20 were excluded from the sample. Child populations are commonly used as a trend in insurance status studies.⁶⁻⁸ IRB approval was indicated for this study, and it was advised to exclude children and to include only adults. A chart of the adult practice population can be viewed in figure 1. After the children were excluded, the insured adult populations included 266 patients (168 females, 98 males) and the uninsured adult population included 47 patients (30 females, 17 males). For this comparative study, equal sample sizes were taken from each group.

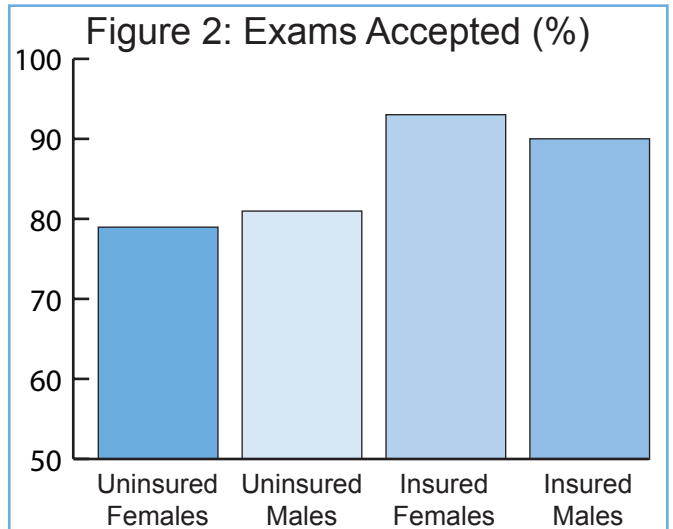
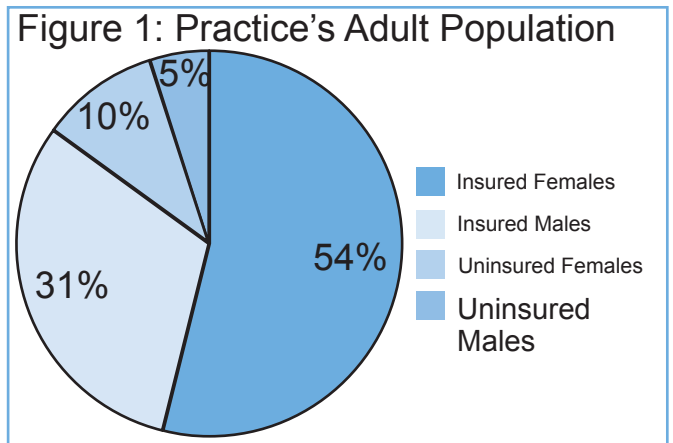
Age: Once the sample of 94 patients was selected, age groups were investigated in keeping a common trend in insurance study. In ascending order, based on percentage of the whole, the sample was as follows: 50–59 year olds (13%), 40–49 year

olds (16%), 20–29 year olds (18%), 30–39 year olds (21%) and 60 years and older (32%), creating the largest percentage of the study population.

Results

Preventative Examinations: The study reviewed 3 specific dental examination codes commonly used in dental practice. They were: D0120, a periodic oral evaluation for established patients; D0140, a limited oral evaluation that is problem focused and D0150, a comprehensive oral evaluation for new or established patients. Cumulatively, patient acceptance was above 80% regardless of insurance status (figure 2). The most frequently rejected exam was the comprehensive examination (D0150).

Oral Prophylaxis: D1110, preventative dental cleanings, account-



ed for 145 performed procedures in this sample. The insured population had an acceptance rate of 90% for prophylaxis procedures, whereas the uninsured population acceptance was 74.6%. The correlation coefficient between insurance status and the percentage of accepted prophylaxis was $r=0.28$.

Advanced Hygiene Procedures: D4341, periodontal scaling and root planing per quadrant, was applicable to only 5 individuals, even though it included 11 prescribed treatments due to multiple quadrants prescribed per patient. The uninsured sample accounted for 4 accepted quadrant treatments while the insured sample included 3 rejected and 4 accepted D4341 treatments. Overall, 2 of the 5 patients rejected this treatment.

Radiographs: Of this sample, there were 8.3% more patients with insurance accepted radiographic procedures than those without insurance. A significant correlation ($r=0.21$) was found between insurance status and the percentage of accepted radiographic procedures. The radiographic procedures rejected by both the insured and the uninsured were the bitewing and full mouth series radiographs.

Types of Radiographs and Compliance: Full Mouth Series (FMX), D0210: The total prescribed full mouth series of radiographs accounted for 50 procedures. A total of 68% were accepted. Insured patients accepted 77.4% of the recommended FMX. Uninsured acceptance was 24.8% less than the insured.

Bitewing radiographs, D0272 (2 films) and D074 (4 films): The insured population accepted 94% of the advised bitewings. The uninsured population accepted 75% of this procedure.

Panoramic, D1330: Panoramic radiographs only accounted for 3 procedures received by the entire adult population with 100% acceptance.

Periapicals, D0220 & D0230: Similar to the panoramic, no PAs radiographs were rejected.

Restorative Treatment: Individual dentist preference affected the type of restorative procedures provided in the practice, and is considered a limitation in data collection and affected the results of this study. Amalgam type restorations were rarely placed.

Anterior Restorations: Anterior restorations included all resin based composite restorations and are collective of D2330 (1 surface), D2331 (2 surfaces), D2332 (3 surfaces) and D2335 (4 or more surfaces). The insured population accepted at a rate of 22% more often than the uninsured population. The highest compliance rate was the insured males at 79.2% of the recommended treatment. Overall, 57.3% of the total 103 anterior restorations were completed (figure 3).

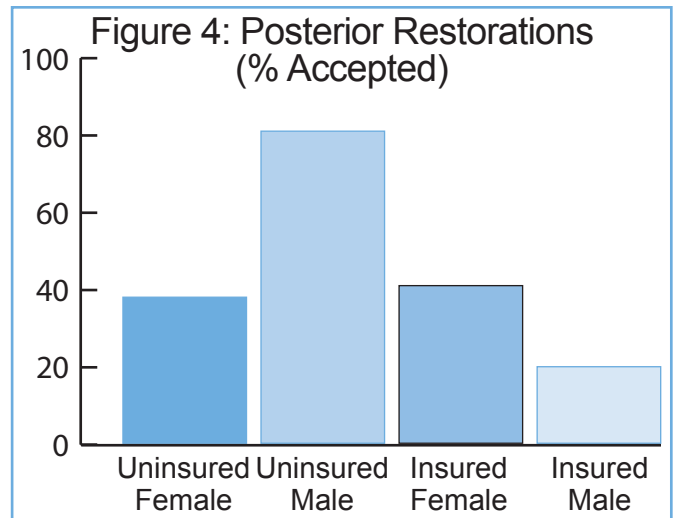
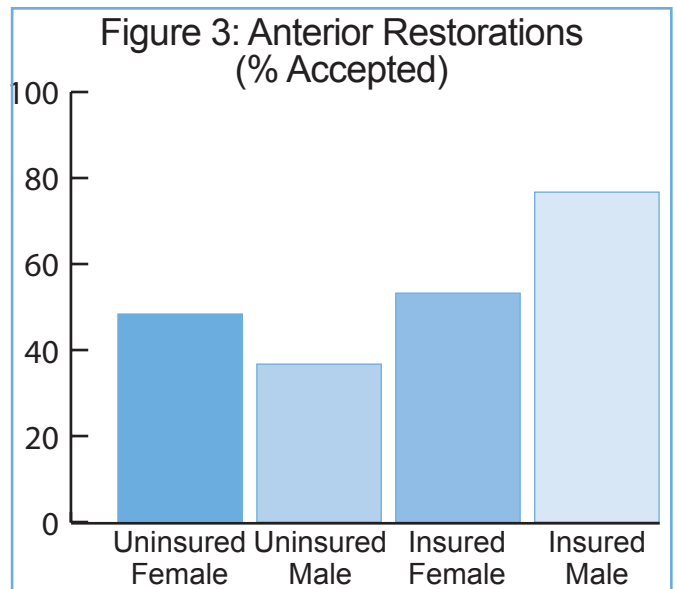
Posterior Restorations: Posterior resin based composite restorations included D2391 (1 surface), D2392 (2 surfaces), D2393 (3 surfaces) and D2394 (4 or more surfaces). Unlike with the anterior restorations, acceptance for posterior restorations was higher among the uninsured population (figure 4).

Crowns: Due to the dentist's specific preference, only porcelain fused to high noble metal, D2750, were tal-

lied. The rejection rate for procedure D2750 was over 65% for both the insured and uninsured population. It should be noted that, while it appears uninsured males held a 50% acceptance rate, the data is skewed since only 2 out of the 29 crowns were prescribed for this group. Uninsured females had the most crowns prescribed.

Bridges/ fixed tooth replacement: Due to the limited number of these procedures in this sample, result data in this category was not included.

Dentures/removable tooth placement: This data included complete dentures D5110 (maxillary) and D5120 (mandibular) and partial resin



based dentures D5211 (maxillary) and D5212 (mandibular). Insured patients accepted 7.1% more removable dentures than the uninsured patients. Since these procedures were not applicable to the treatment plans of any of the insured male population the genders were combined within the same insurance status.

Overall Results: In total, 72% of all prescribed treatments were accepted. Insured patients accepted 75% of their treatment, while uninsured patients accepted 68% of their treatment. The correlation of insurance status to the number of accepted procedure was $r=0.27$. Figure 5 displays the average number of procedures per patient divided by those prescribed, accepted and rejected. The first column shows the average number of prescribed treatments per patient. Ideally, there should have been 376 prophylaxis performed since it is recommended every 6 months, and over the 2 year period each patient would have at least 4 cleanings. Also in conjunction with cleanings, the patient must have an oral examination by a dentist, which is required by the rules and regulations for dentistry in the state of Georgia. Therefore, each patient had at least 8 prescribed procedures, which is comparable to the average number of prescribed procedures per patient (7.98). In the uninsured population, only an average of 6.87 procedures per patient was prescribed. The second column reveals the average number of accepted procedures. A significant correlation ($r=0.27$) of insurance status to the number of accepted procedures was revealed. However, this is not a strong correlation which indicates that, even though more insured individuals seek dental treatment, there is little difference between those insured and uninsured receiving the recommended treatment.

Discussion and Limitations

A limiting factor influencing the acceptance rate is the communication among the dental staff about the

treatment. Additionally, the efforts of the office administrator, with regard to accommodating schedules and financing, could have been a factor (Vaccari, personal communication, April 2008). The result regarding completed procedures is most likely due to improved recording of treatment recommendations in the patient's record. Another factor affecting why the uninsured had less prescribed treatment may be attributed to a higher dropout rate of these patients when compared to those insured patients (Vaccari, personal communication, April 2008). It is therefore recommended that in a future study a record of patient dropout rate would be beneficial.

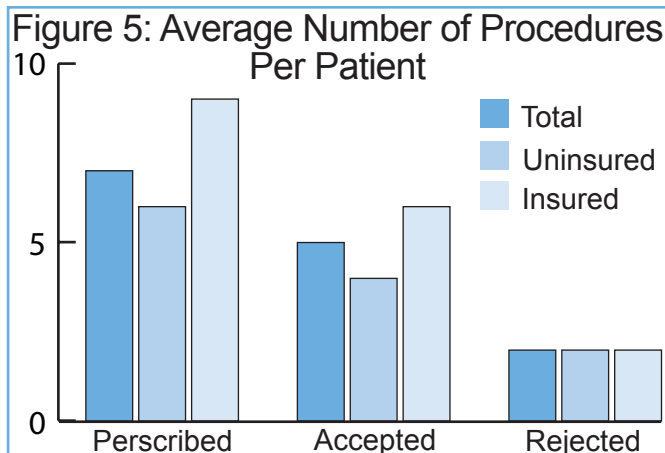
A primary limitation for this study was the participation of only 1 dental practice for this investigation. The office was a newly established practice with 1 dentist and 1 hygienist. The use of multiple offices would have allowed for greater external validity. The data is reflective of the phenomena preferences and operations of this single practice only. It presented restrictions on the dataset procedure selection and the population size. The general age of the patients in this specific dental office also created a limitation in the sample size for this study. Families accounted for much of the office's population. Patients under the age of 18 years comprised 2/3 of all registered patients. The inclusion of children in this study would have been preferred. It would have not only provided a larger sample but would have allowed more age comparisons and investigation into additional procedures such as sealants. The IRB approval for using minors in this research would have

been more difficult.

A major limitation was the small number of uninsured people seeking dental treatment. Since this was a comparative study, the population was directly affected by the limited number of uninsured adults registered within this private practice. Other factors about the practice, such as their fees, could contribute to why the office attracts so few uninsured patients. It may be conjectured that uninsured patients seek treatment in offices with comparatively lower prices since the patient is accepting full responsibility for any cost incurred. A study investigating ratios of insured and uninsured populations among several offices with variations in fee schedules may help determine this possibility.

To explain why a stronger correlation between insurance status and patient acceptance of procedures was not found may be due to the fact that significantly fewer uninsured patients are seeking dental care. Those who express enough of a concern to schedule and arrive for a dental appointment may account for the population who has a greater value assigned to dental health than those without insurance not seeking treatment. It can be assumed that if the person is concerned enough to seek treatment, they will be increasingly likely to accept prescribed treatment.

A consideration for future research should be the variations



among insurance providers and plans to establish if a correlation exists between the two. Incorporation of a survey that would provide patients the opportunity to express why they chose to reject or accept the treatment may be beneficial. The NHANES, as discussed previously, used both clinical evidence and a survey to find results. This information further explains why the rejection rate of certain procedures is present within the insured population, especially those where insurance covers only a portion of the cost. Considering that only 1 office was used in this study, the results for the insured populations were likely influenced by the specific HMO/DHMO or EPO accepted at this office.

As with many studies investigating insurance, the socioeconomic status of the person should also be considered. Another consideration is that cost and financial aid may not be the only reasons a person rejects treatment. It should be considered that some individuals may have dental insurance made available to them, but elected not to have insurance. Instead, they prefer to pay directly for their dental care. Another influencing factor could be a scheduling conflict on the part of the individual or the office, or it could also have to do with anxiety and a fear of the dental treatment.

A challenge in the statistical analysis of the dataset was that not all procedures were indicated for every patient, especially when considering restorative procedures. Using a small sample resulted in some procedures being applicable to as few as 1 person. Such cases would result in skewed data whereby any finding would be inconclusive. The researchers were sensitive to this situation and any findings deemed to be not reflective of the entire sample were excluded from the results.

Since this study only examined 1 dental practice, the limitation arose in the types of procedures that could be investigated. The ADA CDT codes

that were the most often applied in this office were used. Due to dentist preference, certain procedures would have been skewed. The dentist at this practice preferred composite restorations over amalgam as discussed previously regarding restorations.

Procedures that were referred to dental specialists for specific treatments were eliminated from this study. The dental practice used for this study refers out all endodontic, orthodontic and oral surgery (including extractions) to specialized practices. Since these procedures were referred outside the private practice, they were unable to be used in this study. The office does keep track of the correspondence with the specialized practices regarding the referrals, but this information would be from a secondary source. The possibility exists that not all correspondence were maintained, and it was decided to exclude these procedures from the dataset.

There is also the chance that patients chose an alternative treatment than the one presented by the dentist. For example, if a patient were advised to have a root canal and crown to save a tooth, the patient may have elected to have the tooth extracted. Gilmore et al found contrary results, in that most patients choose the treatment recommended by the dentist.¹⁶ However, in the dataset utilized for this investigation, it appeared that the patient did not comply with restorative recommendations. Moreover, if initial treatment for the removal of tooth decay was not received, the decay continued to spread, thereby resulting in a larger restoration. In this case, the dataset might show a rejected 2 surface restoration but acceptance of a 3 surface restoration. Consideration for this phenomenon would need to be addressed in software preparation for a larger study. Perhaps the software can check the individual tooth number and cancel a rejected procedure should an accepted treatment occur on the given tooth.

There were limitations encountered in extracting the dataset because of the restrictions of the software. The office used EagleSoft 11.0 software designed for dental practices. The software was not capable of removing identifying information so that this would be a blinded study. Instead, the office manager undertook the time consuming task of manually extracting the data. As with any research where humans are entering data, a chance of error exists. Since the data had to be manually extracted and then reentered manually into Excel, the likelihood of human error was increased. This was a limitation with the particular software program at this office, but the office manager, who is familiar with many other dental practice software programs, stated other programs are capable of producing the data set automatically.

A major limitation for this study was time constraints and a lack of funding for data collection, analysis and written review of the findings. This created many restrictions in research modifications. More conclusive results would be possible if given proper funding, corporation from multiple dental practices, a larger sample and an extended period of time for research (Beiter, personal communication, April 2008).

In review, the limiting factors applicable to a larger modification of this study include: the limited uninsured population seeking dental care, not all patients are candidates for every procedure, dentist's preference, referred procedures, patient scheduling, the fee schedule of the dental practice, variations in coverage amounts among insurance plans and providers and extraneous factors influencing patients' decisions.

Conclusion

In accord with previous research, this study found that significantly more insured patients sought dental treatment than those uninsured. Of this sample, 85% of adults seeking

dental care were insured. Using a modified Pearson's test, a significant correlation was found between insurance status and the percentage of accepted procedures for examinations ($r=0.27$), oral prophylaxis ($r=0.28$) and radiographs ($r=0.21$). Correlations with restorative procedures were either inconclusive or had a correlation coefficient of less than 0.20. In total, 72% of all prescribed treatments were accepted. Insured patients accepted 75% of

their treatment, while uninsured patients accepted 68% of their treatment. The resulting correlations merit further investigation into insurance status as a predictor of dental treatment.

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Predictors of Success in Dental Hygiene Education: A Follow-Up Study

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Introduction

Selecting the most qualified applicants remains a significant challenge for dental hygiene program admissions committees. Qualified applicants are those who will successfully complete program requirements and licensing examinations to become competent health care providers ready for entry into the profession.¹

When predictors of success were first studied at the Medical College of Georgia, there was a scarcity of literature related specifically to dental hygiene. Most studies assessed success of dental students²⁻⁶ and other health professionals⁷⁻¹⁷ including occupational therapy, physical therapy, respiratory therapy and nursing. The only study that was specific to dental hygiene was published by Syme and DeVore.¹⁸ They researched admissions committee members' opinions regarding dental hygiene applicant interviews.

Review of the Literature

Since 2002, there has been an increase in publications related to predictors of success specific to dental hygiene. Numerous dental hygiene programs have used a variety of data (cognitive and non-cognitive) to predict success of students in dental hygiene school. Edenfield and Tanenbaum studied the Admission Point Index as a predictor of success for retention, successful completion of the National

Abstract

Purpose: In 2002, a 6 year review of dental hygiene graduates from the Medical College of Georgia (1996 through 2001) was conducted to determine which criteria were the best predictors of success. Success was defined in terms of National Board Dental Hygiene Examination (NBDHE) score and dental hygiene GPA at graduation. The purpose of this follow-up study was to determine if a relationship exists between predicted success (using 2002 models) and actual success of entry-level baccalaureate degree students who graduated from 2002 through 2007.

Methods: Two probability models of success were developed from a previous study of MCG dental hygiene graduates (1996 to 2001). Academic information from students (n=156) in the 2002 to 2007 classes was inserted into the two 2002 models to determine if there was a correlation between their actual and predicted success.

Results: Moderate correlation ($r=.581$, $p=.01$) was found when using the established MODEL 1 to predict dental hygiene GPA at graduation and moderate correlation ($r=.465$, $p=.01$) was found when using the established MODEL 2 to predict NBDHE scores.

Conclusions: The authors concluded incoming GPA and total SAT® Program score remain useful in predicting the success of students. However, when substituting incoming GPA with dental hygiene GPA at the end of the first year, even stronger correlations resulted in MODEL 1 ($r=.957$, $p=.01$) and in MODEL 2 ($r=.694$, $p=.01$). Based on these results, recommendations were made to keep current admissions criteria and to implement formal remediation for academically weaker students after completing the first year of the dental hygiene program.

Key Words: dental education, National Board Dental Hygiene Examination, College Admission Test (SAT® Program)

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

Board Dental Hygiene Examination (NBDHE) and graduation of dental hygiene students.¹⁹ Their descriptive study employed the ex post facto design, utilizing the Admission Point Index scores, NBDHE scores, retention rates and graduation rates

of dental hygiene applicants (n=80) accepted for the years of 1995–1997. The authors concluded the Admission Point Index can be used as a predictor of success for entry into the profession.¹⁹

DeAngelis compared use of an

atypical, non-cognitive predictor of academic achievement, the Problem Solving Inventory, with the traditional cognitive measures of the American College Testing® Program (ACT®) score and GPA of 28 dental hygiene students.²⁰ The preliminary findings of this study indicated the Problem Solving Inventory moderately enhanced the predictive capacity of the traditional cognitive measures of entering GPA and ACT score.²⁰

Williams et al examined the degree to which 207 dental hygiene students' pre-existing critical thinking skills and critical thinking disposition uniquely predicted early clinical reasoning ability.²¹ The results of their investigation suggested critical thinking skills, as measured by the California Critical Thinking Skills Test (CCTST), explained a statistically significant proportion of variance in initial clinical performance as measured by the 3 outcome measures. Additionally, the degree to which the CCTST explained variance in the outcomes exceeded that predicted by entering GPA, number of college hours and students' age. The CCTST was especially effective as a predictor of acquired knowledge. Critical thinking disposition did not play a comparable role in predicting initial student outcomes.²¹

DeWald et al examined data from 168 students such as entering GPA, exiting GPA and taking a board review course to predict performance on the NBDHE.²² Results of their study did not find entering GPA to be a predictor of NBDHE performance. A strong correlation was found, however, between exiting dental hygiene GPA and performance on the NBDHE. The authors also noted students who took the review course did not perform any better than those who did not take the course.²²

In another study of 132 graduates, Bauchmoyer et al found overall entering GPA had the strongest correlation with cumulative dental hygiene GPA, followed by GPAs in biology, chemistry I and chemistry II

courses. The strongest correlation for NBDHE success was the cumulative dental hygiene GPA.²³

In 2006, Williams et al studied whether preexisting critical thinking skills and critical thinking disposition predicted student (n=76) performance on the NBDHE.²⁴ The predictive value of critical thinking skills scores and disposition (habits of mind, attitudes and character attributes) scores were examined in addition to that provided by traditional predictors such as entering GPA, age and total number of college hours at entry into the dental hygiene program. Preexisting general critical thinking skills and disposition were assessed using the CCTST and California Critical Thinking Disposition Inventory (CCTDI). These tests were administered the first week of classes and again at the completion of the 2 year educational program. The authors concluded critical thinking skills, as measured by the CCTST, explained a statistically significant proportion of variance in the multiple-choice and case-based component scores of the NBDHE. Additionally, the degree to which the CCTST explained a variance in the outcomes exceeded that predicted by entering GPA, number of college credit hours and students' age. The CCTST was significant as a predictor of the case-based portion of the NBDHE. The CCTDI was not significant as a predictor of board examination scores.²⁴

In 2007, Alzahrani et al examined a variety of factors to assess students (n=235) who were most likely to graduate and be successful in passing the NBDHE.²⁵ Based on the results, the authors concluded the final course grade in oral pathology was a significant predictor of successful graduation. The final course grade in oral pathology, final course grade in oral anatomy and histology and the admissions criteria points rating predicted NBDHE. However, while the admissions criteria points score was determined to be a significant predictor of NBDHE success, it was not

found to be a predictor of successful graduation from the program. No statistically significant relationship was found between incoming college GPA (I-GPA) and GPA in prerequisite college science courses (S-GPA) and graduation and NBDHE success.²⁵

Probability models generated from results are specific to the program and cannot be generalized to other programs. This is a limitation with predictor studies, primarily due to differences in admissions criteria, prerequisite courses, teaching methodology and dental hygiene curriculum sequence and length. Predictor studies are an example of action research which can be useful for historical perspective and for comparison of research methodologies. However, caution must be used when comparing results across programs.

In 2002, a 6 year review of the Medical College of Georgia's (MCG) dental hygiene program graduates (classes of 1996 to 2001, n=134) was completed to determine predictors of academic success.¹ Predictors of success were defined as the student's ability to complete program requirements and pass the NBDHE. Using multiple regression analysis, 2 predictor models were established. The authors concluded knowledge of incoming GPA (I-GPA) and total SAT® Program (T-SAT) score was most helpful in developing models to predict success of students in MCG's dental hygiene program.¹

The purpose of this follow-up study was to determine if a relationship existed between the predicted success and the actual success of entry-level baccalaureate degree students who graduated in the classes of 2002 through 2007 by using models established in the 2002 study.¹

Methodology

Approval to conduct this study was obtained from the institution's Human Assurance Committee. In this retrospective investigation, aca-

demographic transcripts and admissions documents of dental hygiene graduates (n=156) from 2002 to 2007 were reviewed.

Demographic information such as age, gender, race and prior degrees were recorded. Academic information was also collected and included the following:

- Incoming college GPA (I-GPA) of all previous college coursework. Minimal preparation included 60 semester hours of college courses required for program admissions. These prerequisite hours were established by the University System of Georgia and included classes in 6 subject areas
- Total SAT® Program score, verbal and math sections (T-SAT)
- GPA including courses completed during the first 3 semesters of the dental hygiene curriculum (DH1-GPA)
- Final dental hygiene GPA at graduation, after completing all 5 semesters of the dental hygiene curriculum (DH2-GPA)
- National Board Dental Hygiene Examination score (NBDHE)

All information collected from academic records was documented by 2 investigators on a spreadsheet using non-traceable identifiers. Success in dental hygiene education was defined by 2 variables, NBDHE and dental hygiene GPA at graduation (DH2 - GPA).

Two probability models of success were determined from a previous study of MCG dental hygiene graduates (1996 to 2001), in which authors defined program success or success in dental hygiene education by 2 variables: NBDHE score and Dental Hygiene GPA at the end of second year (DH-GPA).¹ Five cognitive admissions criteria variables were identified as potential predictors of dental hygiene success: incoming college grade point average (I-GPA), incoming math/science college grade point average (MS-GPA), total SAT® Program score (T-

SAT), verbal SAT® score (V-SAT) and math SAT® score (M-SAT).

A forward, step-wise, multiple linear regression was used to analyze the data. In predicting DH-GPA, the most efficient model included I-GPA (p<.001) and T-SAT (p< .004). The 2002 model justified the following observations:

- Knowledge of T-SAT in addition to the I-GPA added significantly to the ability to predict the DH-GPA
- Knowledge of non-math/science GPA in addition to the math/science GPA added significantly to the ability to predict the DH-GPA
- Knowledge of V-SAT in addition to the M-SAT added significantly to the ability to predict the DH-GPA

The most efficient model to predict Dental Hygiene National Board performance at this institution included only the I-GPA. T-SAT did not add significantly to the ability to predict performance on the National Board. The 2002 study justified the following observation:

- Knowledge of non-math/science GPA in addition to the math/science GPA added significantly to the ability to predict performance on the Dental Hygiene National Board Examination

The 2002 study concluded the dependent variables, DH-GPA and NBDHE, could be predicted using 2 models. In this follow-up study, academic information from dental hygiene students in the 2002 to 2007 classes was inserted into the two 2002 models to determine if there was a correlation between their actual and predicted success:

- Dental Hygiene GPA at Graduation (DH2-GPA) = 1.689 + (incoming college GPA X 0.375) + (total SAT score X .000603)
- National Board Dental Hygiene Examination Score (NBDHE) = 65.545 + (incoming college GPA X 5.984)

Data were analyzed using SPSS®

14.0 statistical software. Actual and predicted variables were paired for each member of the 2002 to 2007 dental hygiene classes and then correlated. The resulting correlation coefficient (r) indicated the degree of relationship between the actual and predicted variables. The magnitude of the correlation was defined according to the coefficient value as low (r<0.35), moderate (r=0.35-0.65), or high (r>0.65).²⁶

Results

The population consisted of dental hygiene graduates (n=156) at the Medical College of Georgia. Subjects ranged from 19 to 47 years of age, with a mean age of 23. One hundred fifty-three (98%) were female and 3 (1.9%) were male. One hundred twenty-two (78%) were Caucasian, 22 (14.1%) were African American, 6 (3.8%) were Hispanic and 6 (3.8%) were Asian/Pacific Islander.

A total of 46 (29.5%) had earned a certificate or degree in another area at the time of matriculation in the dental hygiene program. Twenty-three (14.7%) had previously earned an associate degree, 16 (10.3%) had previously earned a baccalaureate degree and 7 (4.5%) had previously earned a dental assistant certificate. A composite academic profile revealed that the dental hygiene students enrolled from 2002 through 2007 had an average incoming college GPA of 3.20 (n=155), an average incoming college math/science GPA of 2.85 (n=155) and an average T-SAT score of 930 (n=59).

Correlations between actual and predicted GPA at the end of the dental hygiene program are shown in Table 1. When using MODEL 1, moderate correlation (r=.581) was found between actual DH2-GPA and predicted DH2-GPA, significant at p=.01. When substituting DH1-GPA for I-GPA in MODEL 1, high correlation (r=.957) was found with similar significance (p=.01).

Correlations between actual and predicted NBDHE scores are shown

in Table 2. When using MODEL 2, moderate correlation ($r=.465$) was found between actual NBDHE and predicted NBDHE, significant at $p=.01$. When substituting DH1-GPA for I-GPA in MODEL 2, high correlation ($r=.694$) was found with similar significance ($p=.01$).

Discussion

In the 1996 to 2001 and 2002 to 2007 cohorts, the average age was 23 and the minimum age was 19. Maximum age in the current and previous studies only differed by 2 years, 47 and 45 respectively. Fewer males were represented in the current study when compared to the 2002 study, 1.9% and 5% respectively. Enrollment of African American students increased from 6% to 14.1% and enrollment of Hispanics increased slightly from 3% to 3.8%. Enrollment of Asian/Pacific Islanders decreased from 6% to 3.8%. In both studies, approximately 30% of students enrolled with a certificate or prior degree. Overall, the demographics of both cohorts have strong similarities and demonstrate that student characteristics have not changed drastically over the past 12 years.

Models established using the classes of 1996 to 2001 were useful in showing moderate correlations between actual and predicted dental hygiene GPA at the end of the curriculum and NBDHE scores. However, when substituting dental hygiene GPA at the end of the first year (DH1-GPA) with incoming GPA (I-GPA) in both models, the correlations were higher. Implications of this finding include the need to focus remediation efforts at the end of the first year for students who are not performing well academically.

In the current and previously published studies, entering dental hygiene GPA provided lower correlation with NBDHE performance than exiting dental hygiene GPA.^{22,23,25} Higher correlation was found with NBDHE performance when using dental hygiene GPA at the end of the

Table 1. Correlations Between Actual and Predicted GPA at End of DH Program

DH2-GPA Actual (n=155)		DH2-GPA Predicted (n=59)	
MODEL 1: $DH2-GPA = 1.689 + (I-GPA \times 0.375) + (T-SAT \times .000603)$			
DH2-GPA Actual	_____		.581**
DH2-GPA Predicted	.581**	_____	
MODEL 1: $DH2-GPA = 1.689 + (DH1-GPA \times 0.375) + (T-SAT \times .000603)$			
DH2-GPA Actual	_____		.957**
DH2-GPA Predicted	.957**	_____	
**Pearson correlation is significant at the 0.01 level (2-tailed)			

Table 2. Correlations Between Actual and Predicted NBDHE Score

NBDHE Actual (n=154)		NBDHE Predicted (n=154)	
MODEL 2: $NBDHE = 65.545 + (I-GPA \times 5.984)$			
NBDHE Actual	_____		.465**
NBDHE Predicted	.465**	_____	
MODEL 2: $NBDHE = 65.545 + (DH1-GPA \times 5.984)$			
NBDHE Actual	_____		.694**
NBDHE Predicted	.694**	_____	
**Pearson correlation is significant at the 0.01 level (2-tailed)			

first year. Implication of these similar findings increases the reliability and validity regarding the importance of dental hygiene GPA at the end of the first year.

Probability models generated from results of this study are limited to the MCG dental hygiene program and cannot be generalized to other programs. Based on the results of this study, the authors made the following recommendations for the entry-level baccalaureate dental hygiene program at the Medical College of Georgia:

- Keep the current admissions criteria since failures on national boards have been consistent with students who were academically weaker in the dental hygiene curriculum
- Implement a formal remediation program after completion of the first-year curriculum for those students with DH1-GPA less than 3.0. The DH1-GPA of all students in the classes of 2002 to 2007 who were not successful

on the NBDHE ($n=7$) was less than 3.0

Further investigation of remedial options for dental hygiene students is needed. Continuous evaluation of admissions criteria, both cognitive and non-cognitive, is also needed to capture impending changes among future generations of students which may impact their success in dental hygiene education.

Conclusion

Results of the current study show that the 2 models established using student data from the classes of 1996 to 2001 were useful for predicting the success of subsequent classes of 2002 to 2007. Incoming GPA and Total SAT® Program scores remain helpful in predicting the success of students in the entry-level baccalaureate degree program at the Medical College of Georgia. Alternatively, when using GPA at the end of the first year of dental hygiene curriculum instead of incoming college GPA, a stronger correlation of success resulted. Finding

strong correlates of success at the end of the first year of the dental hygiene curriculum, rather than at the end of the exiting year, is more useful and timely for implementing remediation.

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Motivational Interviewing to Decrease Parental Risk-Related Behaviors for Early Childhood Caries

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Introduction

The Surgeon General's Report on Oral Health in America identified dental caries as the single most common chronic childhood disease.¹ In part, caries is rampant because early childhood caries (ECC) is a transmissible, infectious disease affecting the teeth of infants and toddlers. Transmissibility is routed in the behavior of mothers or primary caregivers who expose children to cariogenic microorganisms through intimate contact, sharing and tasting foods on a spoon or pacifier.² Progression or reversal of the decay process is based on a balance of protective and pathologic factors, and risk assessment is important to management of the caries process.³⁻⁵ Effective caries management strategies for ECC include parent interviews to determine risk-related variables, such as socioeconomic factors, the child's and parent's history of caries and feeding practices.⁶ According to Weinstein and Riedy, "Parenting practices may serve to either protect or place a child at additional risk. Some parents are unaware of the health risks their parenting practices place on their children."⁷

Motivational interviewing (MI) is a patient-centered interaction, a brief counseling technique in which negotiation guides behavior change.⁸ MI has been employed in dental public health to motivate parents to adopt prevention strategies for ECC.⁹⁻¹¹

Abstract

Purpose: This small scale study examined if an individualized motivational interviewing (MI) approach to oral health education promoted positive changes in early childhood caries (ECC) risk-related behaviors of mothers enrolled in a Women, Infants and Children (WIC) Program.

Methods: Seventy-two mothers were recruited to complete pretest and posttest questionnaires 4 weeks apart. Mothers in the treatment group (n=40) experienced a counseling type session (MI) and follow-up telephone calls to promote positive oral health behaviors.

Results: No significant change was found in the 4 constructs measured: valuing dental health, permissiveness, convenience and change difficulty or openness to health information. Statistically significant positive changes were found in the treatment group only in number of times the children's teeth were cleaned or brushed (p=0.001) and the use of shared eating utensils (p=0.035). Other cariogenic feeding practices and use of sweets to reward or modify behavior were not significantly affected (p<0.05).

Conclusions: In this group of WIC mothers, MI appeared to have a modest impact on some high-risk parental behaviors that contribute to ECC. This approach warrants further investigation to assess impact of an extended intervention program, parents from diverse populations and the feasibility of use of peer counselors in the public health setting.

Key Words: dental caries/prevention/control, health education/dental, motivation, primary prevention

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

Review of the Literature

Traditional oral health education consists of advice giving and persuasive approaches.⁹ This approach has a positive effect on knowledge. However, its impact on biofilm removal and oral health are short term. Providing accurate information may help clients make decisions about changing behaviors, but this step alone generally will not motivate behavior change.¹² MI was developed

as an alternative to advice giving or direct persuasion that evolved from research conducted in the 1980s and 1990s to develop patient-centered approaches and brief counseling techniques as alternatives to longer interventions.¹³⁻¹⁵ MI initially was developed as a treatment approach for addictive behaviors and more recently has been used as an intervention for chronic diseases or conditions affected by lifestyle.¹⁶⁻¹⁹ The MI

counseling technique also has been studied in dental public health. A series of articles reported the outcomes of a 2 year clinical study comparing the effectiveness of MI counseling and traditional oral health education in a group of 240 Punjabi-speaking (South Asian) children aged 6 to 18 months in British Columbia.⁹⁻¹¹ The original study found the group of children whose mothers experienced the MI intervention had fewer carious surfaces after 1 year compared to the control group ($p < 0.01$).⁹ Subsequently, the researchers reported fewer new carious lesions, decayed or filled, in the intervention group after 2 years ($p < 0.02$). Positive parental choice to follow recommendations for fluoride varnish was significant in clinical outcomes regardless of no MI follow up in the second year. MI appeared to have a continued impact over time.¹⁰ Further exploratory analysis of the data from this sample showed DMFS rates were higher in children whose mothers had prechewed their food, resided in a rural environment and had a higher income.¹¹

MI is based on the premise of asking questions encouraging individuals to talk about their personal goals prior to offering advice or information, and providing choices for individuals that best suit their situation. MI allows individuals to explore problems in a supportive environment and “resolve ambivalence about behaviour change, rather than present arguments for or against change.”²⁰ An understanding of an individual’s readiness for change allows practitioners to adapt their approach to promote health behaviors. The Transtheoretical Model (TTM) or Stages of Change Model, the conceptual model upon which MI was predicated, allows an understanding of the process of change. Individuals progress through specific stages of readiness toward adopting new behaviors and maintaining behavior changes. The 5 stages include: precontemplative, contemplative, preparation, action and maintenance.²¹ MI focuses on

Table 1: Readiness Assessment of Parents Concerning Infant Dental Decay (RAPIDD) Constructs

Valuing Dental Health	<ul style="list-style-type: none"> • Keeping my baby’s teeth healthy is important to me • My baby benefits a lot when I clean his/her teeth • I like the idea of a health person putting medicine on my baby’s teeth to protect them from getting cavities • I believe, giving my baby fluoride vitamins every day, would help my baby’s teeth
Permissiveness with Oral Health	<ul style="list-style-type: none"> • Foods and drinks that are not sweet, don’t taste good to my baby • I feel like a mean parent if I don’t give my baby sweets • My baby will have no problem when I stop giving him/her the bottle • It makes me feel good when I give my baby something sweet to eat or drink
Convenience and Change Difficulty	<ul style="list-style-type: none"> • Without a bottle, my baby’s crying keeps me and my family up at night • It would be very hard to give my baby less sweets • My baby gives me a hard time when I try to brush his/her teeth • It is very convenient to feed the baby with a bottle • My baby is happier when I give him/her something sweet in the bottle • My baby will have no problem when I stop giving him/her the bottle • It is not easy to give my baby a fluoride vitamin every day • I am able to put my baby to sleep without feeding him/her
Openness to Information	<ul style="list-style-type: none"> • I would take the baby off the bottle if the health center told me to do so. • I get advice on taking care of my baby from radio, TV, magazines, newspaper or books. • I feel comfortable asking someone at the health clinic about ways to take care of my baby. • It is easy for me to get answers about ways to take care of my baby from the health center

Each item is rated on a 5-point likert scale from strongly agree to strongly disagree. Adapted from Weinstein and Riedy.⁷

practitioners’ skills to motivate others to make changes in behavior based on the client’s stage of readiness.^{13,14} Based on TTM, Weinstein and Riedy validated a scale, Readiness Assessment of Parents Concerning Infant Dental Decay (RAPIDD), for assessing parents’ readiness, or stage of change, concerning infant dental decay based on 4 constructs: valuing dental health, permissiveness with oral health, convenience and change difficulty and openness to information. Table 1 summarizes information measured by items included in the RAPIDD instrument and categorized by construct. Findings indicated the

RAPIDD constructs were modestly correlated with child feeding, dietary variables and oral hygiene practices.⁷

The purpose of this small scale study was to determine if an individualized MI approach to oral health education promoted positive changes in ECC risk-related behaviors of mothers enrolled in the Supplemental Nutritional Program for Women, Infants and Children (WIC) in Southeast Idaho, an area without fluoridated water. No other aspect of the WIC program employed MI or provided formal oral health education. Therefore, previous dental knowledge would have come from other sources.

Methodology

Participants spoke English, were enrolled in the WIC Program in Southeast Idaho and had 1 or more children between the ages of 6 and 24 months who were not primarily breast-fed. The WIC coordinator verbally invited mothers to participate in the pilot study as they arrived for scheduled WIC appointments. A sample of the incentive, including complementary oral health products and feeding utensils, was displayed in the WIC coordinator's office. The researcher randomly assigned volunteers to groups using a coin toss prior to the mothers' appointment for enrollment. Each subject subsequently met individually with the researcher as they enrolled, resulting in 40 mothers in the treatment group and 32 in the control group. A predetermined minimum of 30 subjects was established for each group. Random assignment resulted in unequal numbers in the control and experimental groups. At individualized appointments, the researcher obtained informed consent as approved by the Idaho State University Human Subjects Committee and administered the pretests.

Two measuring instruments were used as pre- and posttest instruments. A modified version of the RAPIDD Instrument was used to measure the mothers' beliefs about caring for their child's teeth.⁷ The second instrument, the Parental Care of Child's Teeth (PCCT) questionnaire, was developed for this study to assess demographics and parental oral health behaviors such as child feeding, dietary and oral hygiene practices.

Weinstein and Riedy developed RAPIDD and defined the 4 constructs based on summative subscales of the 20 items.⁷ Each question measured the mothers' readiness for change on a 5-point scale, from strongly agree to strongly disagree. Scores were calculated for each construct as averages. Cronbach's alpha tests were conducted for each of the subscales. The modification to RAPIDD elimi-

nated 1 question about change difficulty regarding breast-feeding. The 20 items were based upon findings from the literature regarding caries risk-related parental behaviors.⁷ Weinstein reported results of his study establishing validity and reliability of the RAPIDD incorporating content of another instrument developed by Evens.²²

The original Evens instrument was the basis for the PCCT used in this study to assess child feeding, dietary variables and oral hygiene practices. Evens had previously found this questionnaire to be valid and reliable. Changes were made to accommodate this study's sample delimitations of age and children not primarily breast-fed. The researcher pilot tested this adapted PCCT questionnaire for content validity using a panel of dental hygiene faculty experts (n=4) to review its content and suggest revisions. This revised instrument was then pilot tested with 5 mothers of young children to determine ease of use and estimated time required for completion.

Following pilot testing, the RAPIDD and the PCCT pretests were administered to both groups by the researcher at the first meeting with each participant. Volunteers were asked to return approximately 4 weeks later to complete posttests. The researcher contacted mothers not returning to complete the posttests. Those unable to return in person were asked to return the posttests in a postage-paid, self-addressed return envelope. Sixty-eight of the 72 mothers completed the posttest.

Intervention: The researcher providing the MI intervention received training from a renowned dental expert through an interactive continuing education workshop and workbook.²³ This workbook provides practical suggestions for dental professionals based on the author's clinical and research experiences and from his study of MI. It describes MI, applies it to various dental situations and provides exercises for its application

to guide understanding and skills.

Subsequent to researcher training, each mother in the treatment group experienced a 20 to 30 minute individualized MI intervention following the pretest. The MI facilitated change in ECC risk-related behaviors based on the desired outcomes for her child's oral health. Rapport building included about 10 minutes of asking open-ended questions such as:

- "Being a first time mother, do you have concerns about taking care of an infant's teeth?"
- "Tell me about your experiences with your own oral health."
- "You seem caring and concerned about your child. Do you have any concerns about her teeth?"

After establishing rapport, open discussion, reflective listening and clarifying each mother's perspective about desired outcomes for her child's options for oral health strategies were offered or not offered based on each mother's readiness for change. If the mother asked or granted permission, information about oral health strategies was shared without advice or opinion in the form of a menu. Strategies autonomously identified by the mother as desirable were reinforced. Following this MI session, the researcher made follow-up telephone calls at 1 and 2 weeks to:

- Inquire whether the mothers had questions
- Offer suggestions with permission
- Provide support
- Affirm efforts

Mothers in the control group received no formal education because the WIC program has no oral health education or MI component. Pamphlets were available for these mothers to take home if desired, and questions were answered if posed. The district health department provides a fluoride varnish program in the public school system twice a year. However, this community has no other formalized public health programs targeting oral health and wellness.

A 0.05 level of significance was set

for all parametric and nonparametric analyses used to analyze pretest and posttest results of both instruments. A repeated-measures analysis of variance (ANOVA) was used to evaluate each of the 4 RAPIDD construct scores. A test of equality of variances was used to test the assumption of homogeneity. After each ANOVA, residuals were analyzed with Kolmogorov–Smirnov test. Violations of normality occurred in 2 of the 4 RAPIDD construct comparisons – therefore, those scores were analyzed within each group using the nonparametric Wilcoxon Signed Ranks Test with a Bonferroni correction to the *p*-value. A similar statistical analysis plan was used to assess results from the PCCT Questionnaire as described for the RAPIDD scores. This instrument assessed feeding practices, frequency of sweets used for reward and behavior modification, sharing of eating utensils and frequency of cleaning the child’s teeth. Non-parametric tests were necessary in all of those comparisons due to violations of normality.

Results

Pretest sample demographics are presented in Table 2. Independent *t*-tests evaluated for differences between the groups in the mothers’ age, age of participating children and ages of oldest and youngest children. No significant difference was found ($p < 0.05$) between the treatment and control groups. No significant difference existed between groups for the children’s gender using a Fisher’s Exact Test or mothers’ level of education using a Mann–Whitney Test. Of the 72 subjects initially enrolled (40 treatment and 32 control), 4 participants were unable to complete the study resulting in 39 in the treatment group and 29 in the control group. Posttests were mailed to participants who were unable to return for completion at WIC (9 of 40 or 23% for the treatment group; 7 of 32 or 22% for the control group). Statistical comparisons were not calculated

Table 2: Demographic variables of participants at pretest: (n=72)

Participant Characteristics				
Maternal Education Level	Some High School	High School Grad	Some College Education	Baccalaureate Degree
Treatment Group	8	13	16	3
Control Group	2	16	11	3
Mothers/Care Providers	Number	Avg. Age	Age Range	Std. Dev.
Treatment Group	40	27.60 yrs.	19 to 39	4.80
Control Group	32	27.68 yrs	20 to 37	5.41
Mothers	71	27 years	19 to 39	
Grandmother	1	39 years		
Children	Number	Avg. Age	Age Range	Std. Dev.
Treatment Group	40	17 months	6 to 24 months	6.53
Control Group	32	15 months	6 to 24 months	5.53
Males	39			
Females	33			

to evaluate differences between subjects completing posttests at WIC or by mail.

No statistically significant difference was found between the control group and treatment group for any of the RAPIDD constructs except valuing dental health. The decline in posttest scores from pretest in the treatment group for valuing dental health was statistically significant ($p = 0.05$), although this difference in scores does not translate into a clinically significant change. Cronbach’s alpha analysis ranged from 0.50 to 0.70 pre- and posttest for each construct. These figures were similar to the original study.⁷

The PCCT Questionnaire assessed frequency of sweets used for reward and behavior modification, cariogenic feeding practices and frequency of cleaning the child’s teeth. No significant change ($p < 0.05$) was found between pretest and posttest scores of either the control or treatment groups in frequency of sweets used for reward or behavior modification, or in most of the cariogenic feeding practices (i.e., bottles given while awake or at bedtime, frequency of snacks or

drinks between meals). Differences were found in use of shared utensils (Table 3). Thirty-three percent of all participants reported sharing utensils with their child. Twenty-five percent of the control group shared utensils at pretest (8 of 32) and 24% at posttest (7 of 29), indicating no difference ($p = 1.00$). Forty percent of the treatment group shared utensils at pretest (16 of 40) and 18% at posttest (7 of 39), demonstrating a significant change in related proportions ($p = 0.035$). Because mothers in the treatment group identified more sharing of utensils at pretest, they had more room to improve – however, the change at posttest appeared to be clinically significant in this group.

Table 3 lists how frequently the mothers cleaned or brushed their child’s teeth. Eleven percent of mothers, 4 from each group ($n = 8$), reported their child did not have teeth at the initial appointment. Therefore, those mothers were excluded from the frequency analysis concerning teeth cleaning. No significant change ($p = 0.796$) in frequency was found in the control group from pretest ($x = 3.20$) to posttest ($x = 3.30$).

A statistically significant change ($p=0.001$) in how often the child's teeth were cleaned or brushed was found for the treatment group from pretest ($x=2.80$) to posttest ($x=3.70$).

Discussion

This MI intervention had no significant impact on any of the 4 RAPIDD constructs. No significant change was found in frequency of sweets used for reward, behavior modification or in most of the cariogenic feeding practices as measured by the PCCT. The short time period between the pretest and posttest (4 weeks) realistically may not have been enough time for mother volunteers to significantly change values, attitudes and behaviors and may require a stronger intervention over a longer period of time. Previous work by Weinstein et al did find significantly fewer carious lesions after 1 year⁹ and 2 years¹⁰ in high risk children whose mothers had been counseled with MI compared to a control group without MI. The initial MI intervention was followed by telephone calls for up to 6 months.

The sample in this study involved volunteer subjects of low socioeconomic status. However, little representation existed from minority or immigrant populations. Volunteers are inherently motivated. Culturally influenced attitudes and experiences may be a factor affecting the constructs measured by RAPIDD as well as cariogenic feeding behaviors and oral hygiene practices. Findings of previous research have supported community activities beginning at a young age and MI as important for overcoming cultural and socioeconomic barriers to the prevention of ECC.²⁴

Eighty-eight percent of mothers reported cleaning their child's teeth "less than once a week" to "more than once a day" (0 = don't clean or brush, 1 = less than once per week, 2 = about every other day, 3 = almost every day, 4 = once a day, 5 = more than once a day). The control group demonstrated little change pretest to posttest but

Table 3: Frequency of Oral Hygiene Attempts and Shared Utensils (PCCT)

Group	Pretest	Posttest	p value
Control Group			
Cleaned or brushed teeth*	03.2	3.3	$p = 0.796$
Percent of shared utensils	25%	24%	$p = 1.00$
Treatment Group			
Cleaned or brushed teeth*	2.8	3.7	$p = 0.001^{**}$
Percent of shared utensils	40%	18%	$p = 0.035^{**}$
Significant findings from PCCT questionnaire: *0 = don't clean or brush, 1 = less than once per week, 2 = about every other day, 3 = almost every day, 4 = once a day, 5 = more than once a day ** 0.05 significance level			

brushed their child's teeth almost every day. A positive change was found in the number of times the mothers in the treatment group brushed or cleaned their child's teeth. Before the MI intervention, the mothers reported brushing "about every other day" to "almost every day." This translates to about 3 to 5 times per week. After MI, mothers reported brushing "almost every day" to "every day" or approximately 6 to 7 times per week, nearly daily. Daily biofilm removal is essential for good oral hygiene, and heavy plaque accumulation in infants has been associated with development of ECC.²⁵ Additionally, this finding is potentially clinically significant – inadequate oral hygiene practices, leaving cariogenic bacteria undisturbed, feeding practices and diet play important roles in the development of ECC. Effective oral hygiene practices that are established at an early age, such as tooth brushing, can be maintained throughout childhood.²⁶

Although the 2 groups did not differ demographically, a difference in feeding practices was identified at pretest. Fewer mothers in the control group shared utensils at pretest than in the treatment group. Some mothers might have been aware that this practice is potentially harmful prior to the

pilot study. A statistically significant change in the use of shared utensils for the treatment group was found, a finding perhaps related to the higher number of mothers sharing utensils. Nonetheless, this finding is encouraging because the possibility that MI contributed to a decrease in sharing of utensils in this group could have clinical significance. A decrease in shared utensils has the potential to decrease the transmission of cariogenic bacteria from mother to child. A common route of transmission is from mother to child by tasting and testing food on a spoon or pacifier.^{2,26} Delaying or preventing transmission by changing this targeted behavior could theoretically impact the incidence of ECC.

Conclusion

Results of this study found no clinically significant change in valuing dental health, permissiveness, convenience and change difficulty or openness to health information as a result of an MI intervention with mothers enrolled in a WIC program in Southeast Idaho. The short duration of the study could have limited the potential for change. Two practices, sharing utensils during feeding and the number of times a week mothers brushed

or cleaned their child's teeth, were positively impacted in the group of mothers exposed to MI intervention. A long-term study with parallel and diverse populations would add to the literature of using MI. Further research based on the Transtheoretical Model²¹ should focus on development of stage – appropriate interventions to move individuals along the stages of change continuum toward positive behaviors that promote oral health.

Based on Weinstein's experiences, MI is a simple to learn intervention with training and practice. Therefore, peer facilitators could be trained in MI to decrease professional time, cost and adoption probabilities in dental public health settings.^{9,10} Creative interventions like MI are needed to promote positive health practices by parents with young children to lower the risk of oral diseases.

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Women's Health Topics in Dental Hygiene Curricula

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Introduction

Women make up approximately 51 percent of the United States' population, and the majority are between ages of 26 to 44 years old (30%) and 65 years or greater (28%). Females in the United States have a life expectancy ranging from 74 to 79 years. Approximately 13% live in poverty and 33% of the 13% living in rural America are more likely to be medically uninsured.^{1,2} Are health care providers prepared to treat the unique needs of women?

Historically, women's health topics were minimally included in medical, dental and nursing curricula. In the 1990s, federal legislators passed laws and appropriated monies to support change in women's health issues.³ As a result the medical, dental and nursing educational curricula were investigated and deficiencies were identified and modified to more comprehensively include women's general and oral health topics in educational programs.⁴

Minimal research explores the scope of women's health issues included in dental hygiene curricula. As a result, there is no framework to assess the need to alter existing curricula, treatment protocols, and/or research agenda initiatives in dental hygiene education. Therefore, the purposes of these surveys in 2001 and 2007 were to investigate United States dental hygiene school curricula about inclusion of women's health topics in differing degree programs (associate/certificate, baccalaureate) and to report teaching resources. Demographic data about the degree granted and program location within an institution is included.

Abstract

Purpose: Minimal inclusion of women's health topics in dental and dental hygiene curricula may not prepare dental health care workers to provide comprehensive health care to females. The purposes of these surveys in 2001 and 2007 were to investigate United States dental hygiene school curricula regarding inclusion of women's health topics in differing degree programs (associate/certificate, baccalaureate, associate/baccalaureate) and course status (required or elective). The surveys also identified sources used to obtain women's health topics, assessed faculty continuing education participation in women's health, determined satisfaction with current curricula, questioned if change was anticipated and if so in what topics, identified where students apply their knowledge about women's health and in what ways and reported progress of dental hygiene curricula over the 6 year time period.

Methods: Surveys were sent to dental hygiene program directors in 2001 (N=256) and in 2007 (N=288) asking them to complete the questionnaire.

Results: There was no statistically significant association between 2001 and 2007 survey results by degree or program setting. The educational issue, women's general health continuing education courses/topics completed by dental hygiene faculty in the past 2 years, showed a statistically significant difference during that time interval. No statistically significant difference existed between the survey years regarding topics on women's general health and oral health. Regardless of statistical significance, further details investigated percentage differences that may reveal relevant issues.

Conclusions: These surveys establish a baseline of women's health topics included in dental hygiene curricula in order to assess knowledge of dental hygienists in practice.

Key Words: women's general and oral health topics, dental hygiene curricula

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.

Review of the Literature

In 1983, the United States government established a Public Health Service Task Force on Women's Health Issues, which recommended biomedical and behavioral research be expanded to ensure emphasis on

women of all ages.³ In the 1990s, the Women's Health Equity Act provided the stage for improved women's health care into the 21st century. This bill stated that "American women shall no longer tolerate the neglect of their health care needs."⁵ As a result, agencies were directed to work

together to determine the extent to which women's health issues were addressed in medical curricula and identify means to initiate a comprehensive plan to address women's health.

In 1995, the Association of American Medical Colleges (AAMC),⁶ working with the Health Resources and Service Administration (HRSA), the Public Health Service's (PHS) Office on Women's Health (OWH) and the National Institute of Health Office of Research of Women's Research (NIH ORWH), conducted a survey of United States and Canadian medical schools to assess women's health topics included in medical curricula. In 1997/1998, the American Dental Education Association (ADEA),⁴ in conjunction with the NIH and HRSA, conducted a similar survey of the United States and Canadian dental schools. In 1999, the American Association of Colleges of Nursing (AACN)⁷ conducted a survey of the United States entry-level baccalaureate degree nursing schools/programs to identify women's health topics in their curricula. Areas of deficiencies were identified and curricula was enhanced and expanded to strengthen the scope and depth of courses included in health care professionals' education.^{4,6,7}

In Dr. David Satcher's *Oral Health in America: A Report of the Surgeon General*, he stated: "We know the mouth reflects general health and well-being."⁸ This statement verified that government officials in health care recognized the synergistic impact of oral health/disease on total body health/disease. Satcher urged curricular revisions incorporate this message in health professionals' education. He also recommended this be a framework to integrate oral health into overall general health care in America.⁸

As the United State's population multiplies and people live longer, the demand for health care services alter and increase. In 2001, ADEA's President Pam Zarkowski stated: "The

public will look to our institutions to prepare oral health care providers who recognize unmet needs and are competent in addressing those needs."⁹ It is incumbent on educators to ensure competency of oral health care providers to provide appropriate services to people of varying ages, genders, cultures, socioeconomic and educational levels.

Upon review of the dental hygiene literature, a formal study of curricula had not been completed comparable to the medical, dental and nursing professions. One study by Murray and Fried in 1999 identified the need to investigate how knowledge of women's health issues by dental hygienists can be improved.¹⁰ This study randomly selected Connecticut dental hygienists and asked about their knowledge level of effects of menopause on the general and oral health of female patients.¹⁰ With a 56% response rate, the project investigated the influence of the degree level and the resultant knowledge scores. Results revealed that dental hygienists of menopausal and post-menopausal ages had a slightly higher general knowledge of menopause but reported less knowledge of oral effects of menopause than the pre- and perimenopausal respondents.¹⁰ Seventy-one percent of the dental hygienists had completed 1 or more college courses that discussed menopause and scored high in both oral and general effects.¹⁰ The degree earned was most influential in establishing a significant difference in their knowledge level.¹⁰ The baccalaureate degree dental hygiene graduate had more knowledge about the oral effects than those who had earned an associate degree.¹⁰ The authors suggested a national survey of dental hygiene programs be conducted to determine what women's health topics are included in curricula.¹⁰

Methodology

The investigator developed a 2 part survey – part 1 consisted of 13 questions and part 2 included 20

women's health topics in general and oral health. Assistance in refining the survey was obtained from 4 reviewers within the investigator's home institution and 10 external dental hygiene program directors. Suggestions from reviewers were incorporated to assist in clarification and readability of the survey. This project was approved by the West Virginia University Institutional Review Board, May 4, 2001, and the Ohio State University Institutional Review Board, March 12, 2007. This survey modeled the previously discussed medical, dental and nursing surveys originally developed by the Task Force members of the AAMC,⁶ the National Institute of Nursing Research (NINR)⁷ and the American Dental Education Association (ADEA).⁴ The AAMC and ADEA Task Force members, with the NIH, had scrutinized survey content and construct validity to determine its measurement accuracy.¹¹

A mailing list for dental hygiene schools was obtained from the American Dental Hygienists' Association (ADHA) in the respective study years. A cover letter explaining the purpose of the survey was mailed to program directors. The letter also informed program directors that completing the survey was voluntary and there was no incentive to participate.

In 2001, surveys were mailed to 256 entry-level dental hygiene program directors in the United States. In 2007, surveys were mailed to 288 entry-level dental hygiene program directors in the United States.

Section 1 questions included: demographics, sources of instructional materials, faculty participation in women's health, continuing education courses, where and how dental hygiene students apply their knowledge of women's health topics and satisfaction and perceptions regarding women's general and oral health topics in the curricula. In section 1, respondents were asked to mark 1 response for questions 1 and 2 and mark all that apply to questions 3, 4 and 5. Results of survey questions 6

and 7 were not included in this paper. Section I data was analyzed using the Overdispersed Poisson regression (negative binomial regression) for count and Fisher's exact test for percents using the JMP In statistical program.¹²

Section 2 questions consisted of 20 women's general and oral health topics appropriate to include in dental hygiene curricula. Directors were asked to respond according to topic, degree granted and if the topic was included in a required or elective course. Section II data was analyzed using Fisher's exact test by the JMP In statistical program.¹² Fisher's exact test was used to investigate if significant differences existed. P-values < .05 were determined to be significant. Throughout this paper, topic frequencies are reported in percent of those who responded to the questionnaire. Masters' degree program data was not included due to the small number of programs/director respondents. Not all respondents answered all questions or topics.

2001 Section I Survey Results:

Of the 256 survey mailings in 2001, there was a total response of 62.1% (159/256). Not all participants responded to all questions and topics. Since the majority of dental hygiene programs in the United States are associate degree/certificate and located in technical/community based colleges, the highest percent responses from both surveys were directors of associate degree/certificate programs located in technical/community college setting (tables 1 and 2). This does not equal 100% because an institution may have 1 or more degree programs.

In 2001, directors reported using more traditional sources than internet sources to obtain information about women's health topics. The most frequently reported traditional sources were dental hygiene and dental texts/journals, the 2000 United States Surgeon General's Oral Health Report and continuing education materials (table 3). The most frequently report-

Table 1: Women's Health Topics in Dental Hygiene Curricula 2001 and 2007 Survey Demographics by Degree Granted

Degree 2001 n = 159 2007 n= 73	2001	2007	p-value 0.05
Associate/Certificate	69.8% 111/159	71.23% 52/73	0.818
Baccalaureate	10.69% 17/159	12.32% 9/73	0.818
Associate/Baccalaureate	6.91% 11/159	9.58% 7/73	0.818

Table 2: Women's Health Topics in Dental Hygiene Curricula 2001 and 2007 Survey Demographics by Institution

Institution 2001 n = 159 2007 n= 73	2001	2007	p-value 0.05
Technical/Community College	56.60% 90/159	67.12% 49/73	0.638
University not affiliated with a dental school	19.49% 31/159	16.43% 12/73	0.638
University affiliated with a dental school	8.80% 14/159	8.21% 6/73	0.638

ed internet sources were www.perio.org, www.cdc.org and www.nidcr.nih.gov (table 4).

Using a count mean, faculty have completed slightly more women's general health topics (2.42, p-value=0.004) than oral health continuing education courses (2.08, p-value=0.114) in the past 2 years. Women's general health topics completed most frequently were domestic violence issues, menopausal health and heart disease. Topics completed most frequently regarding women's oral health were periodontal/gingival health and disease, effects of hormones on gingival/periodontal health and effects of bulimia and anorexia (eating disorders) on oral/dental health. Approximately 1/3 of directors reported faculty not completing continuing education courses in these areas in the past 2 years.

2001 Section II Survey Results:

Section II of the survey listed 20 women's general and oral health top-

ics that may be included in program curricula. Directors were asked to identify the degree program (associate/certificate, baccalaureate or associate/baccalaureate) and the course status (required, elective or not included) of each topic. Due to small numbers, the statistician suggested reporting only associate/certificate or baccalaureate degree programs and required courses.

Associate/certificate program directors (69.8%, 111/159) reported all 20 women's general and oral health topics were included in programs' required courses. Baccalaureate degree program directors (10.69%, 17/159) reported all 20 topics were included in programs' required courses.

Women's general health topics most included in associate degree programs' required courses included: HIV/AIDs, cardiovascular, hypertension and stroke, use/abuse and cessation of tobacco, alcohol, prescription and other addictive substances. Gen-

eral and oral related topics concerning women included: eating disorders/behaviors, puberty, pregnancy, perimenopause, menopause and postmenopause and autoimmune diseases. Women's oral health topics included: gingivitis and periodontal disease, xerostomia, oral candidiasis and dental caries.

The most included women's general health topics in required courses of baccalaureate programs included diabetes, cardiovascular, hypertension and stroke, anemia and use/abuse and cessation of tobacco, alcohol, prescription and other addictive substances. General and oral health related topics most included were puberty, pregnancy, perimenopause, menopause and postmenopause, eating disorders/behaviors and autoimmune diseases. The most included women's oral health topics in baccalaureate degree programs' required courses were gingivitis and periodontal disease, oral candidiasis, oral cancer and xerostomia. The topic least included in required courses of both degree programs was lung, ovarian, breast, uterine and cervical cancers.

2007 Section I Survey Results: Of the 288 survey mailings in 2007, the response rate was 25.34% (73/288). Not all participants responded to all questions and topics. Since the majority of dental hygiene programs in the United States are associate degree/certificate and in technical/community colleges, the highest percent responses from both surveys were directors of associate degree/certificate programs located in technical/community colleges (table 1 and 2). They do not equal 100% because an institution may have 1 or more degree programs.

In 2007, directors report faculty use of more internet sources than traditional sources to obtain information about women's health topics. Traditional sources cited most frequently included: dental hygiene and dental texts/journals, Healthy People 2000 and 2010 Report, the 2000 United States Surgeon General's Oral Health

Table 3: Traditional Sources of Instructional Materials used by Faculty to Teach Women's General and/or Oral Health Topics in the Dental Hygiene Curriculum

Traditional Sources	2001 62.1% (159/256)	2007 25.34% (73/288)
Dental hygiene and dental texts/journals	141	69
2000 U.S. Surgeon General's Oral health Report	78	31
Continuing Education Course Materials	66	27
Healthy People 2000 and/or 2010 Report	62	36
Basic Science texts/journals	61	18
Medical and nursing texts/journals	46	15
Newsletters/newspapers	39	13
Women's/women's health journals	25	16

Table 4: Internet Sources of Instructional Materials Used by Faculty to Teach Women's General and/or Oral Health Topics in the Dental Hygiene Curriculum

Internet Sources	2001 62.1% (159/256)	2007 25.34% (73/288)
www.perio.org	85	40
www.cdc.gov	48	34
www.nidcr.nih.gov	21	14
www.womens-health.org	18	8
www.niaid.nih.gov/publications.womenshealth	18	12
www4.od.nih.gov/orwh	8	5
www4women.org	7	5
www.hrsa.gov.womenshealth	5	5
www.healthywomen.org	5	3
www.nurseworld.org.mods	3	3

Report and continuing education courses (table 3). The most frequently cited internet sources were www.perio.org, www.cdc.gov, and www.nidcr.nih.gov (table 4).

Using a count mean, faculty has completed more women's general health topics (3.37, p-value=0.004) than oral health continuing education courses (2.44, p-value=0.144) in the past 2 years. Topics most frequently

completed regarding women's general health issues were menopausal health, heart disease and domestic violence issues. Women's oral health topics most frequently completed were periodontal/gingival health/disease, effects of hormones on gingival/periodontal health and oral effects of pharmacological agents on women. Directors reported that approximately 20% of faculty had

not completed continuing education courses in these areas in the past 2 years.

A statistically significant difference was identified in the count mean of faculty taking continuing education courses in women's general health topics when comparing 2001 and 2007. The mean was 2.42 in 2001 and 3.37 in 2007 (p -value=0.004).

2007 Section II Survey Results:

Section II of the survey listed 20 women's general and oral health topics that may be included in program curricula. Directors were asked to identify the degree program (associate/certificate, baccalaureate or associate/baccalaureate) and the course status (required, elective or not included) of each topic. Due to small numbers, the statistician suggested reporting only associate/certificate or baccalaureate degree programs and required courses.

Responding associate/certificate program directors (71.2%, 52/73) and baccalaureate program directors (12.32%, 9/73) reported that all women's health topics listed in this survey are included in required courses.

The most included women's general health topics in required courses in associate/certificate programs were HIV/AIDs, use/abuse and cessation of tobacco, alcohol, prescription and other addictive substances (substance abuse) and cardiovascular, hypertension and stroke and diabetes. Women's general and oral related health topics most included were eating disorders/behavior, puberty, pregnancy, perimenopause, menopause and postmenopause, autoimmune diseases and osteoporosis, osteopenia and osteoarthritis. Women's oral health topics most included were: gingivitis and periodontal disease, dental caries, xerostomia and oral candidiasis.

The most included women's general health topics in required courses of baccalaureate degree programs were respiratory diseases, diabetes,

cardiovascular disease, hypertension and stroke, Alzheimer's disease and anemia. The most included general and oral related topics were pharmacological effects of drugs/medications on women, eating disorders/behaviors, puberty, pregnancy, perimenopause, menopause and postmenopause, autoimmune diseases and osteoporosis, osteopenia and osteoarthritis. Women's oral health topics most included were oral cancer, dental caries, oral candidiasis, xerostomia, gingivitis and periodontal disease and temporomandibular dysfunction. The least included topic in both degree programs' required courses was lung, ovarian, breast, uterine and cervical cancers.

Discussion

When comparing the 2001 and 2007 surveys, it was discovered that dental hygiene faculty are using less traditional sources and more internet sources to obtain instructional materials on women's health. Because it is essential that faculty use Web sites providing current information, it comes as no surprise that program directors reported 9 out of 10 Web sites listed in the survey increased in use. The use of Web sites www.cdc.gov and www.nidcr.nih.gov increased the most during this 6 year time interval, while www.perio.org was most often used and increased slightly.

From 2001 (2.42) to 2007 (3.37), a significant difference ($p=0.004$) was identified in the mean number of faculty completing continuing education on women's general health topics. This finding suggests that continuing education materials are still a favored source of instructional material on women's health issues and preferred by many. In addition, it is interesting to note that 33% of dental hygiene program faculty in 2001 and 20% in 2007 had not completed a continuing education course on women's general or oral health topics. It is suggested that more women's health continuing education courses are offered.

Government publications are no-

ticeably important, whether in traditional or internet format. Such documents as Healthy People 2000 and 2010, the 2000 United States' Surgeon General's Oral Health Report and agencies as the National Institute of Research, National Institute of Dento-Cranial Research and Centers for Disease Control and Prevention are utilized widely by dental hygiene faculty as a resource. Because of the relationship of many diseases with the oral cavity and periodontium, the continued use of periodontal internet sites and journals are quite substantial.

When comparing survey results, it is evident that inclusion of many women's general and oral health issues had increased over the 6 year time period. Although none increased at a statistically significant level, the following 5 topics increased in frequency/percent and are of interest to the authors: puberty, pregnancy, perimenopause, menopause and postmenopause, autoimmune diseases, pharmacological effects of drugs/medications on women, eating disorders/behaviors and osteoporosis, osteopenia and osteoarthritis. These topics are of critical importance because each has oral manifestations or special considerations when maintaining oral health such as pregnancy, gingivitis, xerostomia, pemphigoid vulgaris, erosion of enamel or osteoneurosis of the jaw.¹³ These associations should be included in dental hygiene curricula for dental hygienists to provide appropriate health education to patients. In addition, a key role of dental hygienists is to complete a thorough oral examination and identify abnormal tissues. This is an opportune time to inform and discuss findings with patients of possible pathologic lesions and the need to follow-up with a consultation, diagnosis and treatment by a dentist, oral pathologist and/or oral surgeon.

To the author's disappointment, the topic with the largest decrease in percent over the 6 year time in-

terval in associate degree/certificate required courses was lung, ovarian, breast, uterine and cervical cancers. Although these cancers may not be directly related to the oral cavity, the treatment and metastasis of cancers to other body sites may subsequently affect oral health and dental treatment. Because of the high incidences of smoking and lung cancers among females and cervical cancers related to sexually transmitted viruses,¹⁴ it is within the professional realm of dental hygienists to take an active role in educating patients about related health issues.¹⁵⁻²⁸ This topic slightly increased in percent inclusion in the baccalaureate program required courses.

Alzheimer's disease also had a slight decrease in inclusion in the associate/certificate degree program required courses. This may have been due to the "already full curricula" or new program developments during the 6 year interval. The author was surprised by this finding because of its importance in developing a dental hygiene treatment protocol when treating older adults. On the other hand, there was some increase in the percent inclusion in the baccalaureate degree required courses.

Conversely, the Murray and Fried study surveyed dental hygienists with differing degrees and knowledge levels of women's health topics.¹⁰ As was true of the Murray and Fried study, this study ascertained that baccalaureate degree programs may include more information about women's health topics in required courses. It may be surmised the graduates of baccalaureate degree programs may have more knowledge about the various aspects of women's general and oral health.

Educationally, it is essential that current and pertinent topics be included in the curriculum in an organized manner or a specific course be implemented in the curricula to enhance learning and retention of this information. This is concurrent with Dewey's philosophy in which edu-

cational experiences be progressive, continuous, sequenced and integrated to amplify a student's/graduate's knowledge level.²⁹ With this philosophy in mind, the dental hygienist, regardless of the degree earned, needs foundation information incorporated throughout the curriculum to build upon.

Constructivists purport experiential learning or application of knowledge in "real world" settings rather than lectures. These student-centered events may include activities such as treating patients in clinic, presenting health lessons to public school children or conducting research to assist the learner in acquisition and retention of information.^{30,31} Therefore, the more experiences students have in application of their knowledge, i.e. clinics, shelters, prisons, hospitals, etc, the most influential and valued they are in the health care team.

A potential source of bias in this study was the method in which the validity of the research instrument was executed. The 2001 survey was piloted on dental hygiene directors who were also included in the revised final survey. A better method may have been to ask dental hygiene faculty, not directors, to provide the initial input or to have excluded those directors from the final mailing.

Proposed Working Definition of Women's Health: In 1999, Dr. Sherry Marts, director of the Society of the Advancement of Women, spoke at the American Dental Hygienists' Association Annual Session. In her address, she charged the dental hygiene profession to develop a "working definition" for women's health. She also expressed that a clear articulation of an established policy by the dental hygiene profession may establish the ground work to nurture a collaborative working relationship with other health care professionals, agency officials and government representatives to better address women's health issues. Dr. Marts believed that a working definition may facilitate a common understanding of women's

issues and be more likely to achieve a common goal. Therefore, the author proposes a working definition of women's general and oral health for the dental hygiene profession to consider for adoption.

Proposed Women's Health Definition for Dental Hygiene:

Women's equitable access to comprehensive quality oral health care by a registered dental hygienist using the dental hygiene process of care to deliver preventive, educational and therapeutic services that address the unique physical, oral, social and psychological aspects of the female throughout life.

Conclusion

This study revealed that women's general and oral health topics varied among dental hygiene curricula based on degree offered. All topics were included in the associate/certificate and baccalaureate degree programs. Topics on lung, ovarian, breast, uterine and cervical cancers were included considerably less than others.

Results verify that dental hygiene curricula do include many women's general and oral health topics. Recognizing that curricular enhancement is always in process, existing program faculty and director efforts are commendable. Yet it does not warrant complacency. One program director commented that it was difficult to include more topics in an "already packed curriculum." The integration of women's general and oral health topics into the existing curricula can be accomplished with the use of alternative instructional methods, community and research projects.

An underlying goal of this study was to assist educators in recognizing the need to include more women's health issues in the current curricula. ADEA past president Pam Zarkowski reiterated: "The public will look to our institutions to prepare oral health care providers who recognize unmet needs and are com-

petent in addressing those needs.”¹⁰ It is important that educators commit to adequately preparing graduates to provide competent, comprehensive health care to females of all ages throughout a lifetime.

These results establish baseline data for knowing what women’s general and oral health topics are included in dental hygiene program curricula. The information gathered in this project may be useful for future research. Such topics include:

- Assessing the depth and scope, educational methodology, faculty expertise and time committed to women’s health topics in class, laboratory or clinic
- Investigating oral health care services provided to female patients/clients by dental hygienists in various clinical settings
- Conducting a 5 year follow-up survey to assess if change had occurred in dental hygiene curricula
- In addition, suggestions for developing a continuing education or dental hygiene course might include:
- Participating in community based volunteer service programs, such as women’s homeless shelters, women’s penal institutions, domestic violence shelters, homes for unwed mothers, prenatal and natal health

clinics and long term health care facilities, that provide valuable experiences for the student and practitioners

- Developing a fact sheet/brochure about women’s health to provide relevant information to dental hygienists

This data may also provide information to policy makers and legislators in state and local governments regarding the extent of dental hygiene education and how it may be helpful to influence practice act legislative decisions.

Increased visibility of women’s health issues in dental hygiene education, research and practice may promote interdisciplinary collaboration among health care professionals. With the increased emphasis on interdisciplinary and collaborative practice to enhance access and improve delivery of health care services, it is critical that dental hygienists be prepared to be active participants in the health care team. Dental hygienists may be recognized by achieving a competitive entry-level education degree, conducting and publishing both clinical and instructional research to document and validate outcomes and participating with other health care professionals, i.e., physicians, nurses, dentists, social workers and allied health care providers, to demonstrate the primary

and secondary preventive and therapeutic care expertise of the dental hygienist.

In an article by Gadbury–Amyot et al,³² dental hygiene professionals identified priority initiatives to include dental hygienists an integral part of the health care team. These initiatives included: health services research, access to care/underserved populations and health promotion/disease prevention.³² To conduct and publish research in these areas would enhance the profession’s status and validate its worth. Certainly, additional investigation of women’s health adds to the body of knowledge that dental hygienists desire.

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CLL Poster Sessions

A Scholastic Appeals Process for Dental Hygiene Student Remediation and Retention

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Remediation must meet specific needs of learners. For many students, remediation experiences are critical to becoming competent clinicians. A scholastic appeals process to tailor individualized remediation programs for baccalaureate dental hygiene students not meeting academic standards for graduation was assessed retrospectively from 1999 to 2008.

The purpose was to evaluate retention and academic failure rates, nature of academic problems, type of remediation recommended and success of various recommendations. With approved IRB exemption, academic records of all students (n=55) not meeting academic standards and student petitions requesting an individualized remediation program were reviewed. Successful remediation was defined as passing all subsequent courses, graduation from the program and passing national and regional board examinations.

Overall retention was 92.7%, ranging from 86.7% to 96.6% for each class. Six students (10.9%) withdrew for medical or personal reasons without an appeal, 49 (89.1%) submitted petitions for individualized remediation programs. Reasons for students petitioning included: 4 (8.2%) for preclinical courses, 33 (67.3%) for clinical courses, 8 (16.3%) for a combination of clinical skills, family and/or personal reasons and 4 (8.2%) for academic dishonesty. Options approved for continuation with a formal, remediation program included: a summer clinical course with an individualized contract (n=14) or an independent study course during the academic year plus the required summer course (n=13), both without delaying graduation, repeating a course for a 1 semester delay in graduation (n=9) or auditing and repeating multiple courses for a one-year delay in graduation (n=4).

Nine students were dismissed from the program due to denial of a petition requesting remediation, or a second failure to meet academic standards after an approved program of study. The scholastic appeals process was successful for 91.8% (n=45) of students who petitioned. A student-specific remediation plan based on individual academic appeals is a viable option for assuring student success.

Teaching Basic Life Support to Health Care Providers in a Large Dental School

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Staff, students and faculty are considered Health Care Providers (HCP) and need to be certified in Basic Life Support (BLS) every 2 years according to the American Heart Association (AHA) guidelines. Training and retraining is a challenge in a large dental school. New staff and faculty are employed throughout the year and new classes of students need to be trained as they enter school and progress through their careers. The College has the responsibility of training all clinical employees and students in BLS skills for HCP along with teaching emergency protocol. While the AHA guidelines have changed for bystanders; the guidelines for HCP remain the same. Bystanders are instructed to give compressions only while HCP must be proficient in adult, child and infant compressions as well as breathing and choking lifesaving techniques.

A new program was developed so that college family is trained in a timely and hopefully enjoyable manner. Dental students rotate training every 2 years in June while Dental Hygiene students are trained in January and the dental faculty and staff rotate training in December following final exams. Each College division has at least 1 person who serves as a BLS instructor, so it is the responsibility of the division to train a new hire on an individual basis. A combination of a video timed hands-on experience and instructor focused group training is utilized. The College BLS coordinator manages the video with the hands-on practice concentrating on compressions and breathing.

The instructors teach the other skills in small groups. A written test must be passed with an 85% to earn certification. A 6-question Likert survey was given to the dental students (n=91) following the experience in June 2008. One hundred percent of students either strongly agreed or agreed that the BLS training increased knowledge of BLS standards, the BLS instructor facilitated their learning and respected their needs as learners. A student commented, "Overall, a great and organized experience; you get an A+." The same survey was given to faculty in December 2007 (n=59). One hundred percent of faculty either strongly agreed or agreed that the BLS training was relevant to their practice, met their educational needs and increased their knowledge of BLS standards. Faculty comments were more numerous and included the following: "Was good to have the video,"

“Very effective refresher” and “Sequence of video and then demonstration was good.”

Outcomes of a Standards of Professional Responsibility Report and Self Assessment

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Evaluation of ethics and professionalism is a challenge, and dental hygiene program accreditation requires student competency. Selfassessment of this domain requires reflection.

This retrospective review analyzed outcomes of 1 evaluation mechanism employed at Idaho State University: the Code of Ethics and Professional Responsibility Report and Self Assessment completed by students as a course requirement in each of the 4 semesters of the professional phase of the curriculum. Students receive a satisfactory/unsatisfactory rather than numeric grade for explaining in writing, and ranking ways in which they have met each of the 9 professional standards identified in the ADHA Code of Ethics during the semester. Students also reflect on subsequent actions or important learning outcomes.

This retrospective analysis of the past 5 years of these self assessment reports includes a mixed methods approach, quantitative and qualitative, to assess this new educational approach for evaluating students' reflection and self assessment of professional responsibilities. IRB review allowed for an approved exemption.

ANOVA analyses of data indicating significant differences between students self assessments in various semesters of the curriculum were followed by nonparametric Wilcoxon Signed Ranks Tests with a Bonferroni correction to the p -value (0.05). Quantitative results indicated students perceived growth over time ($\alpha < 0.001$) from semester 1 to semester 4 in relation to themselves as individuals and professionals, clients, colleagues, the dental hygiene profession, the community and society and scientific investigation.

No difference ($\alpha > 0.05$) was noted in their self assessment of family and friends or faculty and staff. Students' perceptions of their competence in meeting certain responsibilities varied over time, and qualitative analysis is in progress to identify themes impacting development of professional responsibility.

Regular self assessment of ethics and professional responsibility provides an opportunity for students to reflect and for program outcomes assessment of this domain.

Benefits of Membership: Perceptions of Michigan Registered Dental Hygienists

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Michigan Dental Hygienists' Association*

Many organizations have a difficult time attracting and retaining members. Social Exchange Theory alludes that individuals pursue a membership if that membership satisfies their goals and if the benefits of membership are greater than the costs. Costs may be monetary, time or other personal reasons. Comparing the perceptions of non-members versus members is one way of identifying factors motivating membership.

The purpose of this investigation was to explore motivation factors of Michigan dental hygienists when choosing to join the Michigan Dental Hygienists' Association (MDHA). A 15-item survey was distributed to a convenience sample of dental hygienists attending the MDHA Annual Scientific Session in April of 2008 and at the September 2008 meeting of local components. Demographic information, such as date of graduation and highest degree held, was also obtained.

Members and non-members were given the same survey. Surveys were returned by 506 hygienists. Of those, 197 were members and 305 were non-members. Four surveys were returned with no membership designation.

The most frequently reported motivation factors for being a member was “Continuing Education” (71%) and “Networking” (66%). One of the least frequently reported motivation factors was “Employment Assistance” (15%). Seventy-five percent of non-members noted “Cost” (78%) as the most frequent reason that prohibited them from becoming a member of their professional association. Almost half (48%) of the non-member respondents stated they would consider joining the association.

Results of the study indicate that MDHA needs to focus on educating dental hygienists to becoming a member of their professional association. Using the data obtained from the investigation, strategies aimed at communicating benefits will be implemented as a component of a comprehensive membership campaign.

Funding for this project was through MDHA Research Council.

Dental/Medical Collaboration in a Safety Net Clinic

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Purpose/Goals: This program assessed the effectiveness of collaboration between a dental hygienist and physician assistant in achieving access to oral health care for children at GraceMed. The goal was ensuring that children seen in the Medical Clinic received needed dental services.

Significance: This program demonstrated the need for collaboration between medical and dental personnel, particularly in settings where patients have little experience with dental care. Prior to the program, no children were referred from the Medical Clinic for dental care, and no fluoride varnish was applied.

Approach/Key Features: For new patients with a medical appointment, the physician assistant notified the dental hygienist, who did a dental screening and applied fluoride varnish. The dental hygienist performed a Caries Risk Assessment and followed up on the implementation of the treatment plan and completion of treatment.

Evaluation: 135 children were referred from medical to dental. Demineralization only was found in 39 children. Fifty-four had caries and 30 had both caries and demineralization. Sixty-one completed their treatment plans, 66 had 4 month fluoride varnish applications and 6 month dental recalls were kept by 57. Due to the collaboration between hygienist and physician assistant, children who had medical appointments were able to access dental care.

Comparison of Methods of Oral Hygiene Instruction and Manual versus Powered Brushing for Improving Gingival Health

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This research evaluates improvements in gingival health among average patients of university dental school training clinics. The research compares subjects using conventional, commercially-available powered toothbrushes versus conventional manual devices versus other groups of the same average dental school clinic patients receiving standard verbal methods of homecare instructions versus the use of videotaped delivery of the same instructions.

Gingival health, using a probing depth chart, bleed-

ing index and plaque index completed before instructions, was compared to the same data collected after instructions and 6 weeks of subject self-practiced home care.

Subjects were randomly selected to receive manual or powered brushes and verbal or videotaped instructions. A total of 137 subjects were enrolled – 114 subjects (85%) completed the study. The study compares efficacy and safety among devices with the content, delivery and repetition of the oral hygiene instruction.

Hypothesis: Standard verbal hygiene instructions at conventional periodontal maintenance recall appointments, supplemented by the use of conventional commercially available powered toothbrush in subsequent home care, will be the most effective available tools for plaque control and to improve gingival health.

Comparison of ADA National Survey Results One Dental Hygiene Program

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The results of the last released ADA Survey of Allied Dental Education (Survey) on dental hygiene graduates was used to compare to a large dental hygiene program (Program) to assess the differences of ages, gender, citizenship, race/ethnicity, highest level of education completed, financial assistance, employment history and post graduation occupation.

The assessment results could be used as potential strategy for future recruitment of students to the Program. The major differences in Survey and Program results are as follows: 62 to 68% of all graduates were 29 years or younger. Of these, the Survey reported 36% were age 23 or younger, while 48% were ages 24 to 29. In the Survey, 36% of female graduates were age 23 or under, and 38% of males were 24 to 29 years old, as compared to the Program whose 50% of females were 24 to 29 years old, and 50% of males were age 40 or over. In the Survey, 82% of graduates were white, non-hispanic and 3.4% black, non-hispanic, compared to the Programs 44% and 22% respectively.

The Survey reported that 96% of graduates were United States citizens and 0.5% were Canadian, as compared to the Program (68% and 4%, respectively). The most frequently reported highest level of education completed by first year students in the Survey was 30.7% who completed 2 years of college, while the Program reported 24% who earned a baccalaureate degree. In the Program group, 100% who requested received assistance aid as compared to 84.3% of the Survey. The post-graduation occupation reported that 75% of

the Survey and 70% of the Program were employed in private practice, and 1.1% of Survey compared to 10% of Program graduates continued their education toward an advanced degree. The reported results demonstrated that there are differences between the Program and Survey information reported.

Personality Styles of Graduates and First Year Students Who Chose the Dental Hygiene Profession

**Rosemary D. Hays, RDH, MS; Judy Kreismann, RDH, MA; Eva M. Lupovici, RDH, MS; Cheryl M. Westphal, RDH, MS
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A survey was administered to 57 graduates and 47 first year students of a dental hygiene program using I-Speak Your Language:[®] A Survey of Personal Styles to obtain a profile of each group that chose to enter the dental hygiene profession based on 4 major personal styles. The survey results identified the primary personal style of each individual and are based on the theory developed by Carl Jung.

The survey is designed to measure individual primary personal style and associated styles of behavior. The 4 major styles are: Intuitor (I), Thinker (T), Feeler (F) and Senser (S). The results of the survey indicated that, under favorable conditions, 37% of the graduates and 38% of first year students were F, who place high values on human interaction. They seek and enjoy the stimulation of contact with others and typically try to understand and analyze their own emotions and those of others. Twenty-eight percent of graduates and 26% first year students were S. The S place high value on action and thrive on getting things done here and now without unnecessary time consuming deliberations. They want to implement whatever they believe should be done. Twenty-five percent of graduates and 23% first year students were T, placing high value on logic, ideas and systematic inquiry. They find satisfaction in identifying a problem, developing a variety of possible solutions and use the most logical systematic approach to problem solving. Ten percent of graduates and 13% of the first year students were I, who place high value on ideas, innovation, concepts, theory and long range thinking. They tend to be more stimulated and personally rewarded by effort in problem solving, rather than in implementing solutions. Survey results indicated that there was little significant difference in primary personal style between the graduates and first year students of a dental hygiene program.

Emerging Trends in Radiography: A Survey of South Dakota Dental Offices

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The purpose of this study is to determine the prevalence of digital radiography versus conventional film-based imaging in South Dakota dental practices, and to determine if some offices still use manual processing (dip tanks) to develop radiographs. The University of South Dakota offers the only dental hygiene program in the state of South Dakota, a rural state with a vast dichotomy of practitioners. The challenge educators face is assuring that the dental hygiene graduate will have the educational background to easily serve in any of these dental practices.

At the time of this survey, there were 333 practicing dentists, including specialists. A phone survey resulted in a 90% response rate. Of the 188 offices participating, investigators discovered 55% (n=103) utilized digital radiography – of these, 56% (n=58) used wired sensors and 40% (n=41) used image phosphor plates (wireless), while 1 office used both 0.5% (n=1). Three respondents were unsure what type of sensor was used. Eight percent (n=15) use both conventional and digital imaging. Sixty-seven percent (n=57) of those using conventional imaging plan to convert to digital, while 32% (n=28) do not. Most surprising is that 13% (n=25) of offices use manual processing – some for all radiographic processing, some for panoramic and cephalometric films and others as a back-up method.

With these results, faculty can modify and enhance current educational methodology. It is determined that students need experience with both conventional and digital radiography to transition successfully into any office setting. Also, exposure to manual processing will help those students who find themselves in practices that still use this method.

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 by establishing tele–health links with dentists and 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 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, xrays, sealants and education. Children who had decay were referred to dentists in the community that were part of a “Dentists Community Care” program.

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.

Effects of Standardized Patient Training on Dental Hygiene Students’ Confidence in Delivering Tobacco Cessation Counseling

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Purpose: The purpose of this study was to determine if the confidence of dental hygienists in providing Tobacco Cessation Counseling could be increased by incorporating Standardized Patient (SP) training into the dental hygiene Tobacco Cessation Counseling (TCC) curriculum.

Problem Statement: Dental hygienists report lack of confidence in their ability to initiate Tobacco Cessation Counseling with their patients who smoke.

Methods: A 2–parallel group randomized design was used to compare change of self–reported confidence of students in a pretest/posttest format. The sec-

ondary outcome measure was knowledge of TCC.

Following IRB approval, all subjects attended a TCC lecture on adapting the Stages of Change (SOC) behavior modification model to TCC. The subjects were randomly assigned to Test and Control groups within stratification levels based on the median score for the pretest knowledge. The Test group received SP training while the Control group did not. A posttest was administered to both groups. A debriefing session was held to obtain student feedback on the process.

Results: Analysis of Covariance (ANCOVA) compared the average confidence and knowledge posttest scores. Subjects (n=27) averaged 25 years in age and were 94% female. There was no statistically significant difference in posttest knowledge between the Control and Test groups ($p=.08$). However, there was a statistically significant difference ($p=.02$) in mean posttest Confidence between the Test (Mean = 34.57, SD = 22.93) and Control (Mean =14.19, SD = 14, 51) groups.

Conclusions: SP training increased student confidence in their ability to counsel their patients who smoke. Students were most confident with identifying the SOC and least confident in providing follow up counseling for their patients. Students reported feeling positive about their SP training experience and reported more self–confidence in their counseling skills. This confidence may translate into dental hygienists being more willing and able to provide TCC to their patients.

Health–Related Quality of Life and Illness Following Periodontal Instrumentation for Patients with Chronic Obstructive Pulmonary Disease And Chronic Periodontitis

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The purpose of this study is to determine if patients with chronic obstructive pulmonary disease (COPD) receiving non–surgical periodontal therapy (NSPT) have a change in health–related quality of life (HRQL) as reflected by symptomology, disease activity and impacts on daily life or experience incidents of posttreatment illness when compared to no treatment (control). It is unknown whether ultrasonic or hand instrumentation during NSPT affects illness or HRQL for individuals with COPD and periodontitis.

Systematic reviews of studies documenting associations between periodontitis, nosocomial pneumonia and COPD include only high–risk individuals in hospitals or long–term care facilities. No evidence documents association between dental treatment, including aerosol generating and respiratory illness/infections

in ambulatory patients – however, precautions or contraindications appear in dental hygiene texts.

The research design is a 3–group (2 treatment and 1 control), randomized, controlled, pretest/posttest experimental design including 17 to 22 participants with COPD and periodontitis in each group (n=51, 66) respectively. NSPT includes Ultrasonic or Hand instrumentation. HRQL will be measured by the valid and reliable St. George’s Respiratory Questionnaire (SGRQ–A) in all 3 groups. The SGRQ–A will be administered as a pretest and posttest 4 weeks prior and 4 weeks following treatment (or no treatment). Another questionnaire will assess pretest and posttest self–reported post–treatment illness. The PI is delivering all treatment to assure blinding – a research assistant and confidential identifiers are being used for survey data.

Results are pending with data collection in progress. Descriptive statistics will determine sample demographics. ANOVA will be applied using SPSS to analyze survey data ($\alpha=0.05$). If differences between groups are detected at pretest, analyses will correct for covariates and determine possible correlation or interaction. Subject recruitment began following IRB approval. Intra–rater calibration was established at $r = 1.00$ for MCAL and 0.97 for PI.

Clinical Decision–Making Skills in Genetics With Dental Hygiene Students: Baseline

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This study established baseline information on dental hygiene students’ ability to develop a dental hygiene treatment plan for patients with oral/facial genetic conditions. Dental hygiene students’ knowledge, experience and confidence were also assessed. This project was supported by an NIH/NIDCR grant #5R25 DE015350–02 focusing on genetics education in dentistry.

Baseline data were collected from sophomore (n=27) and senior (n=24) dental hygiene students as part of a multi–phased study of students’ ability to plan treatments for patients with genetic–related oral/facial diseases. A case simulation and Participant Perception Inventory (PPI) were used. Students were paired and provided patient information including a medical/dental history, clinical photos, a periodontal chart, a plaque index score, a pedigree chart and current self–care practices. Students identified patient problems and etiological factors and developed a treatment plan. A treatment plan was developed through faculty collaboration for comparison and evaluation of student responses. The

PPI required students to rank their knowledge, experience, and confidence levels about treatment planning, collaborating with others, using online resources clarifying patient history information and genetics.

Responses from the PPI were entered into SPSS and analyzed using ANOVA. Results of the case simulation indicated sophomore dental hygiene students scored higher than seniors in treatment planning (46% and 38% respectively), though not statistically significant. On the PPI, seniors rated their knowledge, experience and confidence significantly higher than sophomores ($p<0.0001$). Scores for all students were low on the case simulation, reinforcing the need for a genetic component in the curriculum. This study established a baseline assessment of students’ perceptions of their knowledge, confidence and experience.

Second Life as an Educational Medium for Dental Hygiene

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Second Life (SL) is an online 3–dimensional virtual world. Large numbers of educators and Universities already embrace SL as an instructional, cultural and experiential learning tool. As such, this research dives into the SL experience, and will expound on its relevance to dental hygiene practice and education. Specific emphasis will be placed on basic literacy and navigation in SL, emerging “best practices” for educational applications in SL and sharing the authors’ experiences and research with dental hygiene students in SL.

Methodology includes time intensive explorations in SL, participation in SL educational events and workshops and interactions with other educators in SL.

Evaluation of those activities will be qualitative and presented in narrative. Additionally, authors have involved students in dental hygiene instruction in SL and student group (previously known as SADHA) meetings. Those experiences will be evaluated using participant surveys and in–depth discourse analysis of computer mediated interactions. Further, discourse analysis will be “counted and coded” for content (or “nodes”) related to conceptual understandings and/or relationships that support communities of dental hygiene practice. Data will be presented as descriptive statistics and narrative explaining detectable “nodes” of learning experience and other valuable interactions. It is expected that students will discover new and innovative ways to learn and interact in SL and that faculty will learn to become proficient using virtual worlds software relevant for learning today.

SL is becoming a way to launch educational projects

and to engender scientific research. This is where the future for virtual worlds lies: not simply in fantasy and abstraction, but in real, practical applications for education, science and culture at large.

Funding for this project through Dee Family Technology Grant.

The Nonmedical Use of Prescription Stimulants Among Dental and Dental Hygiene Students

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The purpose of this study was to determine the non-medical use of prescription Attention Deficit Disorder (ADD) stimulant medication among dental and dental hygiene students. Nonmedical use as defined by the National Survey on Drug Use and Health is the use of a prescription type psychotherapeutic drug not prescribed for the respondent by a physician or used only for the experience or feeling they caused.

A questionnaire was used to examine demographic information, student experiences and perceptions of prescription stimulant medication, and to determine if students had used a prescription stimulant non-medically. Four-hundred and one surveys were mailed to participating dental institutions in the South-Central Region of the United States in the fall of 2008. A total of 243 completed surveys were returned, for a response rate of 61%. Statistical analysis revealed that 12.4% of students in this survey reported using a prescription stimulant nonmedically. Of those, 70% reported taking a prescription stimulant to improve attention/concentration.

The results of the study may help administrators and faculty become aware of the potential problems that may arise with the misuse of ADD stimulant medication and enable professional institutions to incorporate prescription stimulants into their drug policy on campus.

Funding for this project was through the Office of the Associate Dean for Research and Graduate Studies, Texas A&M Health Science Center Baylor College of Dentistry.

Dental Hygiene Students' Application of Knowledge of Women's Health Issues

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As part of a dissertation project, the investigator studied United States dental hygiene curricula regarding women's health topics and related teaching methodology. A portion of the study examined where and how students apply their knowledge beyond the academic setting. By analyzing program curricula, changes were identified to enhance learning and promote necessary skills for future hygienists.

Purposes of this portion of the study were to identify settings and methods utilized by students to apply didactic knowledge regarding women's health issues in nontraditional sites, and to investigate differences in associate and baccalaureate degree programs relevant to women's health topics and learning activities. A questionnaire was mailed to all dental hygiene directors in the United States. Section 1 of the study asked respondents to identify locations and methods students applied knowledge of women's health issues. A combined response rate from 2 surveys was 43.5%. The Over Dispersed Poisson regression and Fisher's exact tests were used to analyze the data using JMP statistical package.

Results identified that students most often apply women's health knowledge in dental hygiene clinics, classrooms, community/public health clinics and nursing homes. The most common methods of applying knowledge were research projects, course work with dental students and community based research. No statistically significant differences were identified based on program degree. A preponderance of women's health information is learned in traditional academic setting and applied in familiar/traditional methods. This finding applies to all program degrees. Therefore, educational recommendations include implementing evidence-based andragogical 'experiential learning,' planning interdisciplinary learning experiences with other health care providers and planning learning experiences in communities where patients do not have access to health care. Such educational changes will promote skills and self confidence needed by future hygienists.

Dental Hygienists as Educators in Social Action to Improve Access to Care

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Underserved populations experience the burden of oral diseases from the lack of access to care, preventive services and comprehensive care. Access to dental hygiene care has been enhanced in states where laws have expanded the scope of practice to include direct access.

The purpose of the study was to understand dental hygienists as educators in social action as they provided direct care to underserved populations and worked on legislative initiatives to change laws that regulate practice. The problem addressed by the study was the lack of literature on the role of dental hygienists as educators. The significance of the inquiry was to explore why and how dental hygienists were educators in their struggle to improve access of care.

A qualitative paradigm was used to collect the interview data of 8 participants from California, Oregon and Washington who met the inclusion criteria. The interview data were analyzed using constructivist grounded theory methods: coding procedures, memo writing, constant comparative method, theoretical sampling and situational analysis.

The analysis revealed that dental hygienists were educators for improving access to care through their social action. The practitioners educated others to improve awareness, oral health and the dental hygiene profession.

The educators raised awareness of the population's needs, dental hygiene and legislative initiatives. In addition, they enhanced the oral health of the population and knowledge of support people. Improvement of the profession was attained through creating and mentoring. The situational analysis clarified the role of educator in formal settings, nonformal settings and informal settings of a nursing home practice, public health practice and the professional association. One significant issue emerged from the analysis: building a collective consciousness for an alternative oral health delivery system. In conclusion, dental hygienists engaged in social action as educators improved awareness, oral health and the profession in a variety of settings.

Dental Magnification Loupes and the RDH

**Allison Castro, RDH, BSDH
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The purpose of this study was to determine whether dental magnification loupes affect the hygienist's practice of dental hygiene.

The literature related to magnification loupes suggested the use of dental loupes provides significant improvement in patient assessment and proper ergonomics. The methodology of this study included questionnaires which were distributed randomly to dental hygienists and members of the dental hygiene online community AmyRDH.com. One-hundred responses were obtained through SurveyMonkey.com, a web based survey collection site, and all answers were anonymous.

Data was analyzed using basic descriptive statistics including frequency distribution and analysis of means. A majority of the respondents received most of their clinical experience from a general dentist office. Forty six percent of those surveyed have practiced dental hygiene for 21 years or more. A significant number of respondents reported the practice of dental hygiene had caused problems with their back, neck and hands. Sixty five percent reported problems with their back, while 66% reported neck problems and 59% reported problems with their hands. Among the respondents, 73% reported they practice with dental loupes. One hundred percent of those respondents that practice with dental loupes have found improvement in ergonomic status, oral assessment in patient care and overall improvement in the practice of dental hygiene.

There has also been a reported greater ease of attaining periodontal probe depths according to 71% of the respondents. The respondents of this pilot study indicated the use of magnification loupes has significantly improved the practice of dental hygiene.

Recommendations for further research might be to determine if the type of dental loupes used and the number of years worn would effect the results. An LED headlight used in combination with the magnification loupes may be an additional area for further research.

Enamel Fluoride Uptake and Antimicrobial Effectiveness of an Herbal Fluoride Mouthrinse

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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 deter-

mine 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 mouthrinse (TND, ACT or Phos-Flur). During posttreatment, 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 Service Access, Dental Service Utilization, and Alcohol Use Predictors in Adults

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Dental caries, periodontal disease and reported pain are among the oral conditions which constitute oral health status. Identification of indicators that predict oral health status can improve the health and wellness of Americans.

To identify predictors of oral health status, logistic regression analyses were performed on 2,848 adults included in the 2001–2002 National Health and Nutrition Examination Survey (NHANES). Predictors included socio-demographic factors (race, gender, income, education), dental service access (possessing dental insur-

ance or a regular dentist), alcohol use as a behavioral risk (measured by frequency, quantity and total weekly consumption), dental service use (dental visit past year and annual check-ups past 3 years).

Caries were significantly ($p < .05$) more likely in blacks (OR=2.73), Hispanics (OR=1.71) and males (OR=1.23), and were less frequent in older adults (OR=.99) and those reporting a dental check-up in the last year (OR=.44).

Periodontal and gums problems were significantly ($p < .05$) more likely among blacks (OR=2.34), Hispanics (OR=1.80) and males (OR=1.61) and less likely in adults educated beyond high school (OR=.65) and those who visited a dentist in the last year (OR=.65). Hispanics were significantly ($p < .05$) more likely to report dental pain in the last month (OR=1.79), while males were less likely (OR=.72) to report pain. The largest proportion of variance in oral health status was explained by sociodemographics (9.4% to 16%) with less than 1% variance explained by dental service access, dental service utilization and alcohol use. The limited amount of explained variance suggests the need to construct better measures of oral health status using NHANES data.

Use of Reflective Blogs to Promote Critical Thinking in Dental Hygiene Students

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Introduction: Critical thinking is a crucial element in the practice of dental hygiene. A challenge facing dental hygiene education is identifying strategies clinical dental hygiene educators can implement to promote critical thinking and clinical reasoning.

Purpose: The purpose of this study was to evaluate the impact of an emerging technology, reflective blogs guided by weekly questions about the dental hygiene process of care, on critical thinking of first year dental hygiene students as they began providing patient care.

Method: After obtaining IRB approvals, a 2-group, pre- and posttest design was implemented to gather quantitative data through administration of the Health Sciences Reasoning Test (HSRT), a critical thinking and clinical reasoning measurement tool developed specifically for health sciences. Intervention ($n=28$) and control ($n=30$) group pre- and posttest HSRT scores evaluated the use of a reflective blog to promote critical thinking in dental hygiene students. In addition, qualitative data gathered through analysis of student blogs ($n=25$), utilizing a self-designed rubric ($\alpha > 0.86$), based on Mezirow et al's model of reflection (1990), ascertained if reflective blogging increased dental hy-

giene students' levels of reflection. Finally, Pearson's correlation determined if there was a correlation between these students' HSRT and rubric scores.

Results: Within this convenience sample, the use of reflective blogs with guided questions did not have a significant impact on participants' critical thinking as measured by the HSRT ($F=0.08$, $p=0.782$). However, rubric scores analyses demonstrated statistically significant improvements ($F=5.51$, $p=.0274$) in students'

levels of reflection. Furthermore, data analysis revealed a correlation ($p<0.05$) between these dental hygiene students' pre- and posttest HSRT scores and their pre- and post-reflection rubric scores.

Conclusion: This study intended to provide an initial framework for further research in pedagogy utilizing technology to enhance reflection, critical thinking, and clinical reasoning in dental hygiene students.