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Bethesda, MD, October 16-19, 2014

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Foreword

J. Leslie Winston, DDS, PhD
Director, Global Oral Care Professional and Clinical Operations
Procter & Gamble Oral Health

On behalf of Procter & Gamble Professional Oral Health, we are pleased to support the Proceedings from the 3rd North American/Global Dental Hygiene Research conference as a special supplement to the Journal of Dental Hygiene. Our relationship with the National Center for Dental Hygiene Research & Practice has been in place for many years and we are proud to have provided three educational grants to support the North American/Global Dental Hygiene Research Conferences. As a company, we are working to help advance the profession of dental hygiene around the world and we are committed to research and development initiatives that are relevant to the prevention of oral diseases.

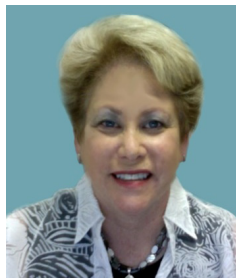
We believe that in order to deliver the best oral health prevention and patient care for the world's consumers that the foundation needs to be science based. The National Center for Dental Hygiene Research & Practice shares similar goals with their mission to promote the public's oral health by fostering the development, implementation and the dissemination of oral health research; establishing an infrastructure to support dental hygiene research; and strengthening the scientific foundation for the discipline of dental hygiene.

The conference continues to bring together the international dental hygiene research community, with original research being presented by dental hygienists from Australia, Canada, the Netherlands, Portugal, South Korea and the United States. The level of scientific exchange is impressive, with a wide range of topics and methodologies used to study problems of direct significance to dental hygiene practice and education. In addition there continues to be a large group of dental hygiene students from both undergraduate and graduate dental hygiene programs. It is essential to continue to fuel their energy and enthusiasm as they are a critical part of the research infrastructure going forward.

For those that had the opportunity to attend the conference, we hope you enjoy revisiting the great research you learned about and discussed. Importantly, for those who were unable to join, we trust that these Proceedings will help you get a sense of the depth and breadth of topics covered and learn something new from your colleagues. We would be remiss if we did not acknowledge the tireless work of Drs. Jane Forrest and Ann Spolarich in bringing these research conferences to life!

Editorial

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



The 3rd North American/Global Dental Hygiene Research Conference

The 3rd North American/Global Dental Hygiene Research Conference, "Beyond the Boundaries: Discovery, Innovation and Transformation," was held from October 16 to 18, 2014, in Bethesda, Maryland. An additional half-day session was held on October 19, 2014 for educators entitled, "A Practical Guide to Incorporating Research & Evidence-Based Decision Making into the Dental Hygiene Curriculum." The Conference provided an opportunity for dental hygiene researchers from the United States, Canada, Asia, Europe and Australia to convene and explore commonalities in their research interests, learn from each other about new and ongoing research programs, and foster future collaborations. It is our hope that discussion and interest generated at the conference provided the networking support and intellectual stimulation needed to systematically and purposefully move our research forward. To this end, the purpose of the conference was to bring the international dental hygiene community together to:

- Share new knowledge obtained through research investigations
- Explore how to translate research to practice in a meaningful and useful manner
- Disseminate new knowledge gained from research to support evidence-based practice
- Increase and diversify the number of individuals engaged in oral health research
- Build collegial relationships among oral health researchers and organizations representing academia, government and industry
- Captivate, advance and nurture a cadre of dental hygiene researchers
- Provide information about valid and useful research tools and resources
- Provide workshops for 'hands-on' training in scientific writing, editorial review, searching for best evidence, and teaching research methods
- Mentor student and novice investigators in preparation for careers in research.

In order to achieve these objectives, a program devoted to a wide range of topics was created. Invited senior scientists presented their ideas and summaries of ongoing research efforts related to tobacco addiction and treatment, and the role of the oral microbiome in oral cancer development. Distinguished dental hygiene scientists discussed the development of a scholarly identity and its relationship to advancing the profession. Invited researchers shared their work, including an examination of the relationship between preventive services and quality of care; how an interprofessional collaboration between nursing and dental hygiene improved health outcomes in patients in the ICU; and about the impact of health literacy on health outcomes. Dental hygiene researchers from around the world presented their original work during both poster and oral scientific sessions in support of national and global oral health research agendas. Opportunities to learn about this research were made through 42 poster and 33 oral presentations.

Finally, based on the outcomes from the second conference in October 2011, a program was created to enhance training and skill development on a wide range of topics. Seven different continuing education workshops were specifically designed on the following topics: Using Best Evidence to Enhance Dental Hygiene Clinical Decision Making; Overcoming the Fear of Statistics; Millennials and Dental Education: Using Technology for Effective Teaching; Getting Your Name in Print; Becoming an Effective Journal Reviewer; Navigating the IRB; and How to Construct and Maintain a Usable Dataset. Educators learned best practices for how to incorporate research and evidence-based decision making into the dental hygiene curriculum. Over 18 hours of continuing education credit were offered over the three and a half day conference.

This conference has required more than a year of planning, and we must acknowledge the contri-

butions and support that we have received from many individuals and organizations along the way. First, we thank the Canadian and American Dental Hygienists' Associations for again partnering with the National Center for Dental Hygiene Research & Practice to invite dental hygienists from across the continent to participate in this event. We also thank the American Dental Education Association and the American Association for Dental Research for their support and participation. Conference attendees represented 11 countries; 34 states in the United States, 6 Canadian provinces, 7 European countries, South Korea, and 2 of the 6 states of Australia. There were 41 international participants from 10 countries outside of the United States; 36 graduate dental hygiene students, 13 full-time dental hygiene clinical practitioners, 126 full and part-time faculty from universities, dental schools, and community colleges, 3 practitioners from hospital settings, 9 representatives from health organizations, 15 professional association representatives, 7 journal editors, 30 dental hygienists and dentists representing various industries, 9 independent consultants, and 1 person representing the military.

We thank the members of our Advisory Board for volunteering their time and talents, for facilitating workshops, and for moderating sessions during the meeting. We also thank our volunteers for managing the registration tables and the many companies who graciously donated copies of their research to share with all of the conference participants to further our knowledge and understanding of their products and services.

Most importantly, we extend our deepest and most heartfelt gratitude to our corporate sponsors: The Procter & Gamble Company, Colgate-Palmolive Company, Colgate Oral Pharmaceuticals, Philips, Johnson & Johnson, Sunstar, Dentsply, Waterpik, and Premier. This conference would not have been possible without educational grants from our corporate partners, and we thank them for their kindness and generosity.

Sincerely,

Jane L. Forrest, RDH, EdD
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Editorial

Rebecca S. Wilder, RDH, MS
Katherine Zmetana, DipDH, DipDT, EdD



Beyond the Boundaries: Discovery, Innovation and Transformation Through Collaboration

The 3rd North American/Global Dental Hygiene Research Conference, held in October in Bethesda, Maryland, was a resounding success. It certainly held true to its mandate to go beyond boundaries, with dental hygienists from 13 countries participating as presenters and as attendees. Discovery, innovation, and transformation were around every corner of the conference venue and in every workshop. But the spirit that animated those conceptual goals was one of collaboration.

Nowhere was this intention observed more explicitly than at the pre-conference working meetings of the Canadian Dental Hygienists Association's Research Advisory Committee and the National Center for Dental Hygiene Research and Practice. After daylong separate meetings to revise, develop, and discuss respective strategic plans and research priorities, the groups came together with representatives of the International Federation of Dental Hygienists as well as members of the American Dental Hygienists' Association Council on Research. This meeting of national and international minds resulted in a sharing of research agendas and visions of future research focus for our dental hygiene profession.

The collective research meeting also resulted in the recognition that our dental hygiene organizations share essentially common interests and goals. Of no surprise, global areas of concern include oral cancer, tobacco cessation, infection control, and health care for aging populations. Yet we also continue to discover, and confirm, more and more oral—systemic links that will have profound effects on the health care professions in general. Consensus appears to be that research strategies should be both patient/client centred and population focused. Core professional education and continuing development, including augmented training in research, are also considered of high importance.

The impact of this discovery of commonalities was immediate. What followed in the meeting was a brainstorming of ways that our common research efforts could be not only shared, but also collected in a more central manner. Participants acknowledged that, although the dental hygiene research community is relatively small, it is growing. Coordinating our research in a purposeful way could advance our efforts maximally using the minimum resources that are available. Working collaboratively, not in independent silos, just makes sense if we hope to realize our ambitious agendas. To open lines of communication and promote cooperation it was agreed that meeting together more often would be ideal; with social technology, that shouldn't be too difficult! Suggestions were made about exploring the possibilities of accessing a common research portal for reference and resources to help fulfill this dream of active sharing and collaboration. We await the exciting new opportunities that may come of this first brief get-together.

Not only does research give rise to clinical results in the way of improved treatment, better materials, and advanced applications of technology, but it also has a social impact—on access to care, education, and public and private policies on oral health. The Bethesda conference brought together like minds who reiterated the value of such achievements and confirmed that the world is indeed small. As oral health professionals, we have much in common in our research visions; what was made clear at this conference was that together we are stronger. Here's to a future of continuing the discovery, innovation, and transformation through global collaboration.

Sincerely,

Rebecca Wilder, RDH, BS, MS
Editor-in-Chief, Journal of Dental Hygiene
Katherine Zmetana, DipDH, DipDT, EdD
Scientific editor, Canadian Journal of Dental Hygiene

Dental Hygiene's Scholarly Identity and Roadblocks to Achieving It

Margaret M. Walsh RDH, MS, MA, EdD, Elena Ortega RDH, MS, Barbara Heckman RDH, MS

Introduction

Dental hygiene scholarship development exists on a continuum. At one end of the continuum, scholarship begins in entry-level dental hygiene programs and then progresses to increasing higher levels of scholarship in research-oriented master's degree programs and in research-oriented doctoral degree programs that require learners to conduct original independent research.¹ Although nursing, physical therapy, and audiology have developed doctoral programs to prepare graduates to engage in discipline-specific research,²⁻⁴ to date there are no U.S. dental hygiene doctoral programs.

The question needs to be asked: Why is dental hygiene so far behind other health professions in establishing doctoral programs to conduct rigorous discipline-specific research? Could it be that dental hygienists are not fully aware of the discipline's hierarchy of knowledge and of the importance of developing a "Scholarly Identity"¹ related to it? Could it be that there are maladaptive patterns of behavior among dental hygienists that create roadblocks to moving the discipline forward of which we are unconscious? And, if these threats are real, then what can be done to counteract them? The purpose of this paper is to challenge our thinking about these questions and to provide some essential information to consider in answering them. Specifically, this paper will discuss (1) the dental hygiene discipline's hierarchy of knowledge; (2) the dental hygiene "Scholarly Identity" and its importance to the discipline's advancement; (3) the "Imposter" Phenomenon^{5,6} and the "Queen Bee" Syndrome⁷ as roadblocks that may jeopardize our discipline's ability to move forward; and (4) the role of "Followership"⁸ in diminishing these potential roadblocks.

The Structural Hierarchy of Knowledge

A discipline's structural hierarchy of knowledge specifies the discipline's unique perspective and distinguishes one discipline from another. Its

components consist of the discipline's definition, its paradigm concepts, which are the major concepts selected for study, global definitions of the paradigm concepts, and conceptual models that shape the direction and methods of the practitioners, educators, and researchers (Figure 1).⁹⁻¹¹ The dental hygiene discipline is defined as "the study of preventive oral healthcare including the management of behaviors to prevent oral disease and to promote health." This definition is unique because its focus is on oral disease prevention and health promotion directed by the dental hygienist.⁹

Dental hygiene's four paradigm concepts selected for study, the "Client," the "Environment," "Health/Oral Health," and "Dental Hygiene Actions,"^{12,13} are defined very broadly to allow for the development of conceptual models about the concepts that are defined by specific theories. For each conceptual model, related theories are tested by scholars who ascribe to a particular conceptual model. Findings contribute to the discipline's body of knowledge providing evidence that influences dental hygiene practice, education and research. To build the discipline's body of knowledge, dental hygiene graduate learners and established researchers need to develop and promote a dental hygiene "Scholarly Identity" in addition to mastering research-related competencies needed for the development of dental hygiene scientists.

The Scholarly Identity^{1,14}

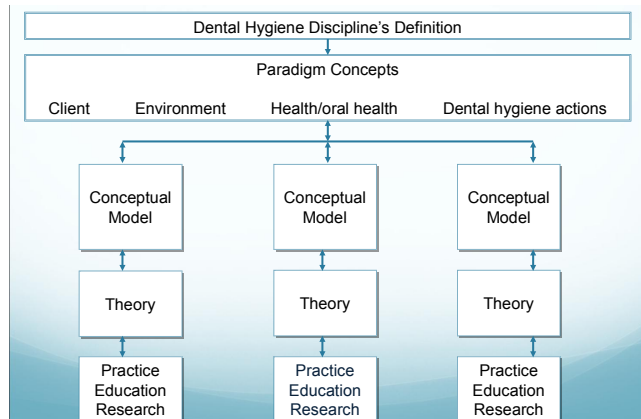
Dental hygiene researchers who have a scholarly identity are dental hygiene scientists who:

- Ask and answer research questions central to the discipline while reaching across disciplines
- Have a sense of the dental hygiene discipline as a whole
- Incorporate the norms and values of the practitioners, and conceptualize theory central to

the discipline as the basis for further knowledge development

- Have a life-long commitment to the development of the discipline's knowledge base^{1,2}
- Welcome philosophical debate about the discipline
- Use evidence to support their viewpoint
- Report one's own results in the context of those of others in the field as well as those of other disciplines
- Disseminate the findings of one's work through scientific publication¹
- Have a dedicated and passionate commitment to how their science relates to our discipline's mission, its values, and its effects on humanity.

Figure 1: Dental Hygiene's Structural Hierarchy of Knowledge Defined in Broad Terms



Equating the development of a scholarly identity only with research methods, statistics, and design courses in isolation from the context of the dental hygiene discipline constrains the development of the dental hygiene scholarly identity. Knowledge gained in research methodology courses needs to be augmented with a critical knowledge of the dental hygiene discipline's research priorities in conjunction with learning how interdisciplinary approaches can be used in addressing those priorities. Moreover, professional socialization and peer interaction are critical for developing the dental hygiene scholarly identity. A dental hygiene "scholarly identity" is not realized unless a whole culture is created to promote and nurture it.^{1,14} It must be acknowledged that dental hygiene doctoral educational programs are needed to enhance the dental hygiene's scholarly identity and this evolution is the essential next step for continued progress in the dental hygiene discipline.

Potential Roadblocks to Developing a "Scholarly Identity" and Dental Hygiene Doctoral Education

Two behavior patterns prevalent among women who have succeeded in their careers that are potential roadblocks to developing a "scholarly identity" and dental hygiene doctoral education are the Impostor Phenomenon and the Queen Bee Syndrome.¹⁵ "The Impostor Phenomenon," prevalent among high achieving women, was first described as the perception of oneself as having an "intellectual phoniness".^{5,6} Although studies report that men also experience the phenomenon, the impostor phenomenon's characteristics have a more deleterious effect upon a woman's career. Women who experience it believe that, despite outstanding academic and professional

accomplishments, they really are incompetent -- and that anyone who believes otherwise has been fooled. Anxiety, self-doubt, inability to accept positive feedback, fear of failure, and guilt about success undermine their ability to function at their highest level. For example, a high achieving dental hygiene leader who suffers from the impostor phenomenon may not be able to find her voice to defend her support of dental hygiene doctoral education when confronted by skeptical questions from members of a more dominant group perceived as having greater prestige, power and status.

To counteract the potential for the "Impostor Phenomenon" each one of us must realistically assess our traits and celebrate our individual strengths and successes while forgiving our imperfections and mistakes. Being aware of and sensitive to the "Impostor Phenomenon" allows one to establish control and identity driven by inner strength, not fear, with an on-going desire to improve ourselves and to be of service to others.

The Queen Bee Syndrome, first defined in 1973, describes a woman in a position of authority who treats subordinates more critically if they are female. The "Queen Bee" is one who has succeeded in her career, but refuses to help other women do the same.⁷ This phenomenon has been documented by several studies.¹⁶ The "Queen Bee" protects her status by developing behaviors that are entrenched with self-centered motivation. "Queen Bee" leaders often shun their dental hygiene affiliation to align themselves with what they perceive as the more powerful reference group, such as dentists. These talented but maladaptive dental hygiene leaders often have the opportunity to support dental hygiene goals, but frequently do not. For example, the "Queen Bee"

who has risen to the level of a deanship or higher and who has considerable influence on academic decisions about establishment of innovative academic programs may sabotage a proposal for the establishment of a doctoral dental hygiene program. Instead of being supportive, the "Queen Bee" is a barrier to power and achievement for other women, especially if they are members of a subordinate group from which the "Queen Bee" originally was a member. Therefore, it is critical that we seek and only count on her support if we already have received the endorsement of someone else in the dominant culture who has more prestige than she.

"Queen Bee" leadership often leads to divisiveness and competition among dental hygienists and cannot be counted on to foster united efforts to develop a scholarly identity, establish dental hygiene doctoral programs, or to initiate any changes in the system that would benefit the dental hygiene community. Dental hygienists must engage in self-reflective processes and look beyond the role of the "Queen Bee" for other leadership styles that will complement not only the needs of the leader incumbent, but also those of the dental hygiene profession and its members and clients. Leadership behaviors needed may lie in the concept of "Followership" that is discussed below.

Followership

Taking action to adopt effective follower characteristics may be key to counteracting roadblocks to developing a "Scholarly Identity." Followership theory¹⁷⁻²⁴ views leaders and followers as "two sides of one process, two parts of a whole."²⁴ It points out that "...performance challenges -- not position -- should determine when one should follow and when one should lead."²¹ The term "Followership" honors and recognizes the crucial role followers play in organizational life and recognizes that followers and leaders are dynamic roles that can be exchanged. Much of a leader's success depends on effective followers and both roles deserve equal weight. We should no longer equate leaders with supervisors and followers as subordinates.

Conclusion

Having a community of passionate dental hygiene scholars with their doctorate in dental hygiene who will ask and answer questions related to the discipline's whole while reaching across disciplines for assistance is essential for our discipline and profession to reach parity with other health professions and to address the oral health challenges of our nation and elsewhere.²⁵

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Advancing the Profession

JoAnn R. Gurenlian, RDH, PhD

Introduction

In his discussion of professionalization, Greenwood¹ stated that one of the characteristics of a profession was a systematic body of theory, which required the application of the scientific method to the service situations encountered. He regarded the use of the scientific method as paramount to the development and sustenance of a profession noting that growth of the profession would occur with a "perpetual readiness to discard any portion of the system, no matter how time-honored it may be, with a formulation demonstrated to be more valid."¹ Given the nature of this research conference, the purpose of this paper is to address how to advance the dental hygiene profession through research.

In examining research needed in dental hygiene to advance the profession, it is important to consider oral health status from a global and national perspective. According to the World Health Organization:²

- Worldwide, 60-90% of school children and nearly 100% of adults have dental caries
- Severe periodontal disease is found in 15-20% of middle aged (35-44 years) adults
- About 30% of people aged 65-74 have no natural teeth
- Oral disease in children and adults is higher among poor and disadvantaged population groups
- Risk factors for oral diseases include an unhealthy diet, tobacco use, harmful alcohol use, poor oral hygiene, and social determinants

Further, the WHO states that most oral diseases require professional oral health care. However, due to limited availability or accessibility, the use of oral health services is markedly low among older people, people living in rural areas, and people with low income and education. To combat oral health diseases and inequalities, the WHO advocates for stimulating the development and implementation of community-based projects for oral health promotion and prevention of oral disease

with a focus on disadvantaged and poor population groups; advocating for a common risk factor approach to prevent oral and other chronic diseases; and, to provide technical support to countries to strengthen their oral health systems and integrate oral health into public health.²

From a national perspective, the oral health status of people in the United States is remarkably poor as illustrated in the following key bullet points.³⁻⁵

- Tooth decay is the most common chronic illness among school-aged children
- From 2007 to 2011, the percentage of persons aged 2 years and older who had a dental visit in the past 12 months decreased by approximately 6%
- Approximately 23% of children aged 2-11 years have at least one primary tooth with untreated decay
- In 2010, 22% of low-income adults had gone 5 years or more without a dental visit, or had never had a visit
- Nearly half (44%) of all Medicare beneficiaries report no dental visit in the past year, and 22% report they have not seen a dental provider in the last 5 years

Solutions proposed to address the oral health conditions of the public should be considered as one component of advancing the profession. Proposed solutions include using professionally applied fluoride gel and varnish treatments; placing dental sealants on permanent molars; providing early identification of those at high risk for oral disease and delivery of effective interventions; providing access to a dental home by the time a child is 1 year old; addressing oral health literacy; implementing and evaluating activities that have an impact on health behavior; facilitating collaboration between state public health and medical assistance departments and other groups to deliver preventive oral health care; and increasing the number of community health centers with an oral health component.^{3,4}

Table I: Research Agenda of the Patient-Centered Outcomes Research Institute⁸

Topic	Agenda
Assessment of prevention, diagnosis, and treatment options	Comparing the effectiveness of safety of alternative prevention, diagnosis, and treatment options to see which ones work best for different people with a particular health problem.
Improving health care systems	Comparing health system-level approaches to improving access, supporting patient self-care, innovative use of health information technology, coordinating care for complex conditions, and deploying workforce effectively.
Communication and dissemination research	Comparing approaches to providing comparative effectiveness research information, empowering people to ask for and use the information, and supporting shared decision making between patients and their providers
Addressing disparities	Identifying potential differences in prevention, diagnosis, or treatment effectiveness, or preferred clinical outcomes across patient populations and the healthcare required to achieve best outcomes in each population
Accelerating patient-centered outcomes research and methodological research	Improving the nation's capacity to conduct patient-centered outcomes research by building data infrastructure, improving analytic methods, and training researchers, patients, and other stakeholders to participate in this research.

Another avenue for advancing the profession is to consider the research agendas of key groups and how these agendas might influence the research agenda for the discipline of dental hygiene. Three research agendas reviewed included the WHO Global Oral Health Programme, the International Association of Dental Research-Global Oral Health Inequalities Research Agenda (IADR-GOHIRA[®]), and the Patient-Centered Outcomes Research Institute (PCORI).

The WHO Global Oral Health Programme focuses on multiple aspects of oral health research. Examples of topics within this agenda include the following.⁶

- Modifiable common risk factors to oral health and chronic disease, particularly the role of diet, nutrition and tobacco
- Oral health-general health interrelationships
- Inequality in oral health and disease and the impact of socio-behavioural risk factors
- Evidence in oral health care: clinical care and public health practice
- Translation of knowledge into clinical and public health practice and operational research on effectiveness of alternative community oral health programmes
- The IADR-GOHIRA[®] identified ten major areas of research. A sample of their research agenda follows⁷
- Develop and implement, in partnership with cognate evidence-based medical and dental organizations, a knowledge base that uses a standard set of reporting criteria and includes a registry of implementation trials

- Emphasize the importance of multi-disciplinary and translational research, seeking input from a range of social scientists and health professionals
- Develop disease prevention strategies based on broad social and environmental determinants of health, adopting upstream rather than downstream strategies
- Develop community-based regional-and country-level systems for oral health promotion and healthcare; recognizing previous experience and resource implications, and, where appropriate, emphasizing whole and at-risk populations.

The Patient-Centered Outcome Research Institute promotes five main areas as their research agenda. These areas include: assessment of prevention, diagnosis and treatment options; improving health care systems; communication and dissemination research; addressing disparities; and accelerating patient-centered outcomes research and methodological research.⁸ These categories are further defined in Table I.

To advance the dental hygiene profession, it is recommended that a new global dental hygiene research agenda be formulated based on the oral health status of the public, proposed solutions to the oral health crisis in the nation and the world, and other targeted research agendas. Specifically, it is recommended that this new dental hygiene research agenda be streamlined and focused specifically on improving the health of the public. Research should target the most vulnerable populations, address risk-based health pro-

motion and disease prevention strategies (such as caries, tobacco cessation, obesity, and human papillomavirus infection) and health literacy, and test new workforce models. Given the limited number of dental hygiene researchers and funding options available, this research agenda should promote a coordinated, collaborative effort creating teams of national and international dental hygiene researchers that can share resources, and broaden data collection using systematic metrics so findings are robust and meaningful. Further, this coordination of dental hygiene researchers

should focus on increasing partnerships among inter-professional groups, agencies and policy makers to promote and sustain research initiatives.

Advancing the profession of dental hygiene requires new initiatives and ways of thinking that are focused on key areas that can be effectively researched with the resources available. In doing so, the profession may realize a growth in the profession while simultaneously discovering methods that significantly improve the health of the public.

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Interrupting the Disease of Tobacco Addiction

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Introduction

Tobacco is the only legal consumer product that kills at least 1 out of 2 of its regular users when used as intended by the manufacturer.¹ There are approximately 1.1 billion smokers world-wide, and it is predicted that the use of tobacco could kill 1 billion people during the 21st century. Cigarettes contain tobacco, and tobacco contains nicotine, delivered rapidly to the brain when smoking tobacco. Nicotine is a single psychoactive substance that affects the brain and the central nervous system, among others. The disease of tobacco addiction (Nicotine Dependence, Tobacco Use Disorder) is recognized as a chronic disease by most authorities including the USDHHS, Health Canada, the many countries' Medical Associations, and the World Health Organization; it is classified as such in major disease classification systems.^{2,3} However, not every person who uses tobacco is addicted to nicotine.

Addiction is a Pediatric Disease

Tobacco addiction is a treatable disease and not simply a lifestyle choice. Addiction is a primary, chronic, neurobiological disease with genetic, psychosocial, and environmental factors influencing its development and manifestations. It is characterized by behaviors that include one or more of the following: impaired control over drug use, compulsive use, continued use despite harm, and craving.³ This condition is typically induced by repeated exposure to nicotine from tobacco, producing changes in the brain's motivational system as a consequence of which a reward-seeking behavior has become out of control.^{4,5} Decision-making and behavior are subsequently influenced by the underlying pathophysiological changes in the brain. Ninety percent of the population will try tobacco at least once in their lifetime, and about 90% of persons who become addicted will do so before the age of 18.

Global Approaches to Tobacco Control

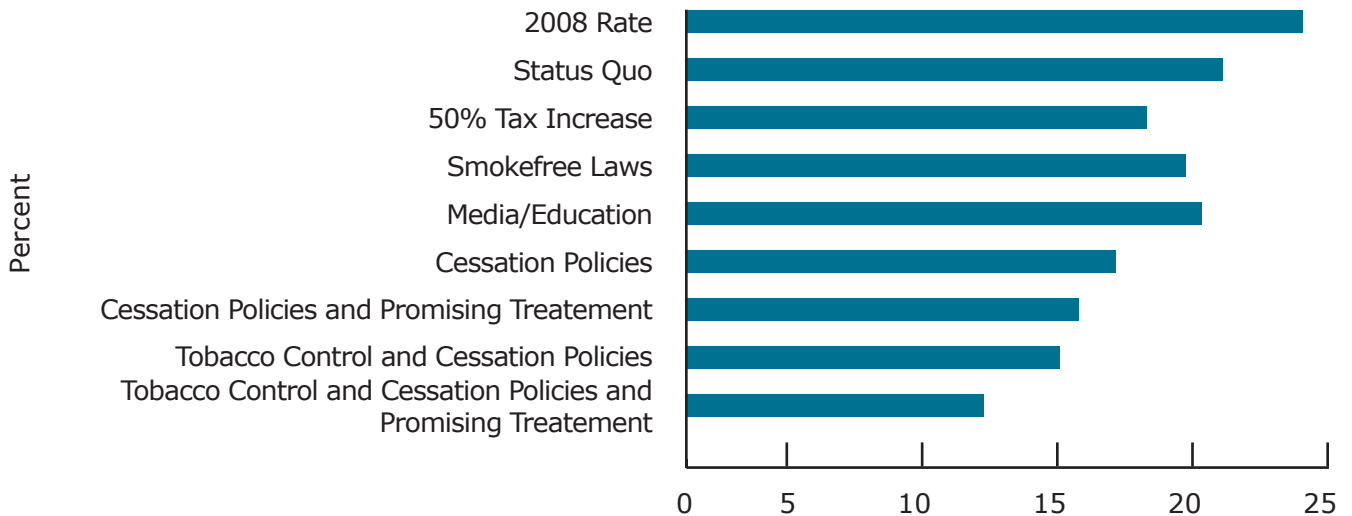
Although much progress has been made in many countries, our current country-specific prevalence rates cannot be seen as the endpoint for success. Increasing adult cessation is considered a major determinant for reducing smoking-related death and disease over the next few decades.⁶ The first international public health treaty—the Framework Convention on Tobacco Control (FCTC)⁷—represents a milestone for public health. Article 14 of the FCTC addresses cessation. In its MPOWER initiative, the WHO describes the six key policy strategies that have been demonstrated to denormalize and reduce tobacco use:¹

- M: Monitor tobacco use and prevention policies
- P: Protect people from tobacco smoke
- O: Offer help to quit tobacco use
- W: Warn about the dangers of tobacco
- E: Enforce bans on tobacco advertising, promotion and sponsorship
- R: Raise taxes on tobacco

Simulation models⁸ examine the overall effect of tobacco control policies and other interventions on estimated population quit rates. Graph 1 demonstrates some of the lost opportunities for cessation interventions on primary care for different disciplines.

Despite the devastating health effects and the associated costs to society, and the availability of safe and effective measures to treat tobacco addiction, there appears to have emerged a plateau in tobacco control's impact. There are numerous plausible explanations for this, including lost opportunities for safe and effective interventions by health professionals. The reality is that, despite the proven beneficial impact on remedying the tobacco epidemic, treatment of tobacco use and addiction continue to be vastly neglected.⁹

Figure 1



Treatment Approaches

There is a robust body of evidence guiding effective tobacco cessation, and there exists a wide array of internationally recognized guidelines and opportunities for intervention with tobacco use and addiction. The US Public Health Service-sponsored Clinical Practice Guideline update identifies the '5-A' model for treating tobacco use and dependence.⁹ This includes asking about tobacco use with every patient at every visit, advising tobacco users to quit, assessing willingness to make a quit attempt, assisting those willing to attempt quitting by offering counseling and medication, by motivating future quit attempts in those unwilling, and arranging for follow-up contacts.

USDHHS Guideline Key Recommendations for Tobacco Use and Dependence⁹

The overarching goal of these recommendations is that clinicians strongly recommend the use of effective tobacco dependence counseling and medication treatments to their patients who use tobacco, and that health systems, insurers, and purchasers assist clinicians in making such effective treatments available.

1. Tobacco dependence is a chronic disease that often requires repeated intervention and multiple attempts to quit. Effective treatments exist, however, that can significantly increase rates of long-term abstinence.
2. It is essential that clinicians and healthcare delivery systems consistently identify and

document tobacco use status and treat every tobacco user seen in a healthcare setting.

3. Tobacco dependence treatments are effective across a broad range of populations. Clinicians should encourage every patient willing to make a quit attempt to use the counseling treatments and medications recommended in the Guideline.
4. Brief tobacco dependence treatment is effective. Clinicians should offer every patient who uses tobacco at least the brief treatments shown to be effective in the Guideline.
5. Individual, group, and telephone counseling are effective, and their effectiveness increases with treatment intensity. Two components of counseling are especially effective, and clinicians should use these when counseling patients making a quit attempt:
 - Practical counseling (problem-solving/skills training)
 - Social support delivered as a part of treatment
6. Numerous effective medications are available for tobacco dependence, and clinicians should encourage their use by all patients attempting to quit smoking—except when medically contraindicated or with specific populations for which there is insufficient evidence of effectiveness (i.e. pregnant women, smokeless tobacco users, light smokers, and adolescents).
7. Seven first-line medications (5 nicotine and 2 non-nicotine) reliably increase long-term smoking abstinence rates:
 - bupropion (Sustained Release [SR])

- nicotine gum
 - nicotine inhaler
 - nicotine lozenge
 - nicotine spray
 - nicotine patch
 - varenicline

Clinicians should consider the use of certain combinations of medications identified as effective in the Guideline.

1. Counseling and medication are effective when used by themselves for treating tobacco dependence. The combination of counseling and medication, however, is more effective than either alone. Thus, clinicians should encourage all individuals making a quit attempt to use both counseling and medication.
2. Telephone quitline counseling is effective with diverse populations and has broad reach. Therefore, both clinicians and health-care delivery systems should ensure patient access to quitlines and promote quitline use.
3. If a tobacco user currently is unwilling to make a quit attempt, clinicians should use the motivational treatments shown in the Guideline to be effective in increasing future quit attempts.
4. Tobacco dependence treatments are both clinically effective and highly cost-effective relative to interventions for other clinical disorders. Providing coverage for these treatments increases quit rates. Insurers and purchasers should ensure that all insurance plans include the counseling and medication identified as effective in the Guideline as covered benefits.

Consistent with the FCTC Article 14,⁷ Canada released its first federally funded set of Clinical Practice Guidelines through the Canadian Action Network for the Advancement, Dissemination and Adoption of Practice-informed Tobacco Treatment (CAN-ADAPTT).¹¹ Given the high level of co-occurrence of mood symptoms in persons who use tobacco and/or stop its use, the basic algorithm included in CAN-ADAPTT allows integrated and brief screening of mood in the treatment of tobacco use and addiction.

Among those who currently smoke tobacco, approximately 70% would like to stop and about half of these will try to quit at least once this year.¹⁰ The use of short-term, acute care models to manage chronic, non-communicable

Figure 2

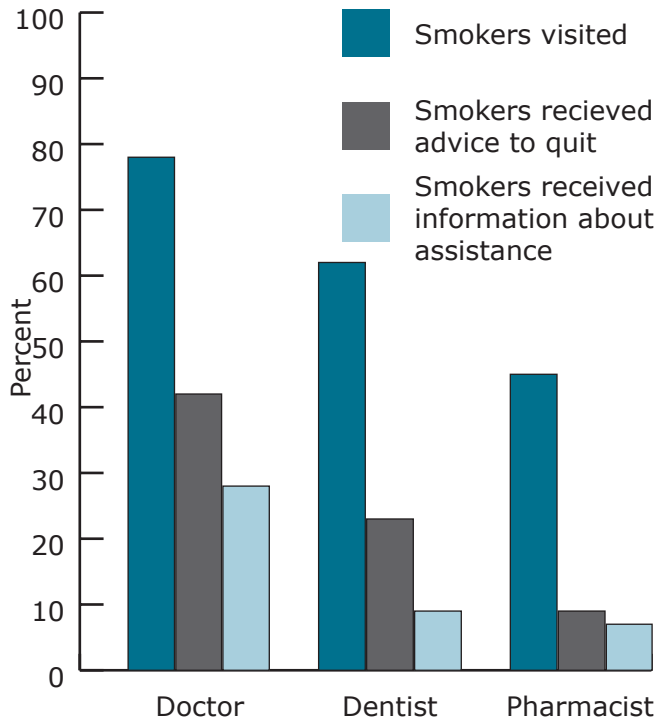
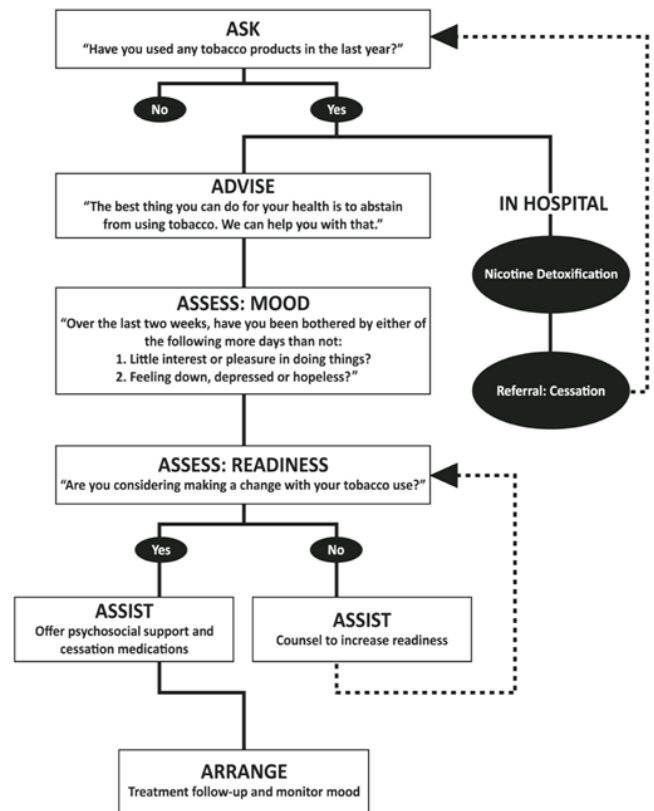


Figure 3: Safety Sensitive Algorithm



diseases is theoretically inconsistent. Hypertension, hypercholesterolemia, obesity, diabetes, depression, chronic obstructive lung diseases and addiction are some diseases that often require repeated interventions. Following a short-term approach for tobacco-addicted individuals is equally illogical and compromises the chances of long-term cessation success. Evidence-based smoking cessation is both safe and effective and appears to be one of the most robust and clinically meaningful interventions healthcare professionals could offer.

Conclusion

Tobacco use remains the leading preventable cause of death and disease worldwide and, having taken into consideration impres-

sive progress over decades, existing smoking rates (as an endpoint) cannot be regarded as a success. Yet the problem of tobacco does not have to be an intractable one. It has been estimated that some of the greatest declines in smoking-related death over the next few decades will come from increasing adult cessation. Tobacco (nicotine) addiction is a chronic disease amenable to treatment. Health professionals are ideally placed to make a substantial difference, utilizing Clinical Practice Guidelines.¹² Despite the highly significant health threat of tobacco, the existence of robust interventions, and the desire of most individuals to quit, opportunities continue to be neglected. Evidence tells a vivid and chilling story of the dire and urgent need to support cessation.¹²

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The Oral Microbiome and Cancer

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Introduction

The human microbiome is defined as the collective genomes of the microbes (composed of bacteria, bacteriophages, fungi, protozoa and viruses) that live inside and on the human body, and there are approximately 10 microbes and 100 microbial genes for each human cell and gene respectively. Collectively the human genome and microbiome is known as the metagenome. The oral microflora comprises a number of specific ecological surface niches (biofilms) that evolve from birth through to death: initially as populations adherent to mucosal surfaces passed on from maternal flora, to tooth-adherent populations following eruption of the dentitions, and with changes in both supra- and subgingival niches (ie dental plaque/biofilm). In disease states, there is a shift in the equilibrium away from the dynamic synergistic interplay of these healthy oral microbial populations towards a narrower diversity of healthy populations in antagonistic interplay with pathologic populations, and coupled with variable inflammatory host immune responses. The structure and function of the oral microflora (and associated microbiome) has been investigated in numerous oral diseases caused by bacteria, fungi and viruses (eg. periodontal diseases) and the systemic diseases linked to chronic infections (eg. diabetes mellitus, cardiovascular disease, and cancer). The purpose of this lecture is to provide an updated understanding about the oral microbiome in health and disease, with a particular emphasis on the relationship with cancer, not only oral and pharyngeal cancers, but also other cancer sites.

Our understanding of the microbiome has been limited by our inability to detect important microbial populations using culture-based methods. Advances in high-throughput genome sequencing led the National Institutes of Health (NIH) to launch the Human Microbiome Project (HMP) as an extension of the Human Genome Project (see <http://commonfund.nih.gov/hmp>), catalyzing multiple studies to explore the diversity of the microbiome across different body habitats in both health and disease states. An

initial landmark study has explored the human bacteriome in health by sampling multiple habitats (ie: oral, gut, urogenital and skin sites) over two time points in a cohort of more than 240 "healthy" adults.^{1,2} An analysis of bacterial diversity was performed using complex methodology including 16S ribosomal RNA gene profiling and shotgun metagenomic sequencing.³ In general, the results showed that there is considerable intra- and interpersonal variation in the composition of the microbiome, yet despite such complexity, sophisticated data analysis incorporating demographics (eg. gender, education levels), life-style factors (eg. diet) and environmental exposures (eg. breast feeding), has allowed a distillation into distinct groups or communities within habitats that share similar signatures. Further investigation is needed to establish if these communities predict risk of disease.⁴

In general, the oral microbiome is diverse, and oral wash samples (surrogates for the oral flora) from 20 healthy subjects analyzed using high-throughput methods revealed the presence of 5 major phyla (Firmicutes, Proteobacteria, Bacteroidetes, Actinobacteria, and Fusobacteria) and that *Streptococcus*, *Veillonella*, *Lepotrichia*, *Prevotella*, and *Haemophilus* genera were the most abundant.⁵ In an effort to discern differences across the different oral niches, a landmark HMP study has explored the microbiome of samples collected from 9 distinct oral/pharyngeal sites: saliva, supragingival plaque, subgingival plaque, keratinized gingiva, buccal mucosa, tongue dorsum, hard palate, palatine tonsils, and posterior pharyngeal wall. Similar phyla were represented in these samples, and statistical analysis allowed a distillation into three distinct community groups:

- Group 1 (buccal mucosa, keratinized gingiva, and hard palate) demonstrated a predominance of organisms from the phylum Firmicutes (with a very high proportion [approximately 50%] from the genus *Strepto-*

coccus) followed in relative abundance by the phyla Proteobacteria, Bacteroidetes and either Actinobacteria or Fusobacteria

- Group 2 (saliva, tongue, tonsils, and posterior pharyngeal wall) demonstrated a decreased relative abundance of Firmicutes compared to Group 1 replaced by increased levels of four phyla: Bacteroidetes, Fusobacteria, Actinobacteria and the candidate phylum TM7, and with a predominance of *Streptococcus* (approximately 20%), followed by approximately equal abundance of the genera *Veillonella*, *Prevotella*, *Neisseria*, *Fusobacterium*, *Actinomyces* and *Leptotrichia*
- Group 3, (the sub- and supra-gingival plaque biofilm) showed the greatest bacterial diversity and had a further decrease in Firmicutes compared to Groups 1 and 2, with a marked increase in the relative abundance of Actinobacteria and with a similar profile of genera as Group 2 plus *Corynebacterium*, *Capnocytophaga*, *Rothia* and *Porphyromonas*⁶

Further analysis of these groups revealed a low but non-zero abundance of known bacterial pathogens in the oral cavity habitat were also consistently detected in these healthy subjects, namely *Treponema*, *Aggregatibacter*, *Porphyromonas*, and *Tannerella* species. Also, comparison of the supra-gingival and sub-gingival sub-sites epitomized niche specialization and confirmed the physiological distinctions known between these two sites: with facultative anaerobic and obligate anaerobic genera populating the supra-gingival and subgingival sites respectively.

Despite the focus on the oral bacteriome, the diversity of both the oral mycobiome and virome, and their interplay with bacterial communities has been explored. In a study of 20 healthy individuals sampled by an oral rinse at baseline, 85 genera and 101 fungal species were detected. *Candida* species were the most frequently obtained genera, isolated from 75% of all study participants, followed by *Cladosporium* (65%), *Aureobasidium*, *Saccharomycetales* (50% for both), *Aspergillus* (35%), *Fusarium* (30%), and *Cryptococcus* (20%), suggesting that fungi play an important role, not only in disease states but also in the healthy microbiome.⁷ The oral virome is mainly comprised of "commensal" bacteriophages mirroring the diversity of the oral bacteriome rather than pathogenic eukaryotic viruses.⁸ Bacteriophages are involved in the exchange of genetic material and hence provide another intricate layer of complexity to

the microbiome. Human papillomavirus communities across various habitats in healthy patients have also recently been described.⁹

In terms of the functional attributes of the oral microbiome in health, little is currently understood and more studies are needed to identify the significance of the communities (ie. the metaproteome or metametabolome). Techniques such as shotgun metagenomic sequencing data provides some insight into the metabolic pathways, and as an example, bacterial small sugar transporters were shown to be of particular abundance in the oral cavity sites.

There is a large literature exploring the oral microbiome in various disease states and a discussion of this literature is beyond the scope of this lecture. In terms of cancer however, it was the discovery of the association of *Helicobacter pylori* infection with gastric adenocarcinoma that spawned an exploration for other cancer-infectious disease associations. Epidemiologic studies have long reported an alleged association of periodontal diseases and tooth loss with cancer, and there is data to support an association with oral, esophageal, gastric, and pancreatic cancer, even after controlling for confounding factors such as tobacco use.^{10,11} More recently, the principal periodontal pathogen *Porphyromonas gingivalis* has been identified as a biomarker for orodigestive tract cancer death (colorectal and possibly pancreatic cancer).¹² Recent microbiome studies lend support for the association of upper digestive tract flora with gastric and esophageal cancers.¹³ There is also some evidence to support associations between both oral fungal and viral organisms and cancer. As an example, human papillomavirus 16 (HPV-16) infection is an established cause for the majority of oropharyngeal squamous cell carcinomas.¹⁴

The mechanisms by which oral bacterial flora might cause carcinogenesis are hypothetical, particularly for sites distant to the oral cavity, and may include local activation of carcinogens by oral microbes (eg. conversion of ethanol to acetaldehyde),¹⁵ or release of pro-inflammatory mediators that can dysregulate cellular cycling, disrupt signaling mechanisms, and act as tumor promoters.¹⁶

Early studies using culture-dependent assays concluded that oral squamous cell carcinomas (compared to normal tissues with the same patient) have a significantly increased abundance of both aerobic and anaerobic bacteria with in-

creases in Veillonella, Fusobacterium, Prevotella, Porphyromonas, Actinomyces and Clostridium (anaerobes), and Haemophilus, Enterobacteriaceae and Streptococcus species (aerobes). In addition, approximately 30% of cancers were shown to harbor Candida albicans, but not at control sites.¹⁷ The oral microbiome in oral squamous cell carcinomas has been recently studied using culture-independent assays. In one pilot study, the microbiome in a series of 10 oral tongue/floor of mouth cancers was compared to that of normal tissue in the same patients using a 16s rRNA assay coupled with denaturing gradient gel electrophoresis (DGGE). Streptococcus intermedius was present in 70% of both cancer and normal tissues. Streptococcus sp. oral taxon 058, Peptostreptococcus stomatis, Streptococcus salivarius, Streptococcus gordonii, Gemella haemolysans, Gemella morbillorum, Johnsonella ignava and Streptococcus parasanguinis were highly associated with the cancers and Granulicatella adiacens was prevalent the normal tis-

sue.¹⁸ Recently, a cohort of oral cancers and premalignant oral lesions matched with normal contralateral tissue sites from the same patient were profiled by sequencing 16S rDNA hyper-variable region amplicons. In cancer samples, the abundance of the phyla Firmicutes (especially Streptococcus) and Actinobacteria (especially Rothia) were significantly decreased relative to contralateral normal samples. Significant decreases in abundance of these phyla were observed for pre-cancers, but not when comparing samples from contralateral sites (tongue and floor of mouth) from healthy individuals.¹⁹

In summary, technological advances have provided insights about the structure of the oral microbiome in health and, to a lesser extent, in disease. Further research is needed to explore the functional implications of the oral microbiome in terms of diagnosis and risk assessment of disease (ie. cancer), or possibly therapeutic strategies to restore the health of the oral ecosystem.

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Creating a Risk-Based Model for Dental Benefit Design

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Introduction

For generations, Americans have been exhorted to “see your dentist twice a year.” This cultural icon is deeply embedded in the minds of the American psyche. Although the earliest origin is in dispute, this advice was featured in toothpaste advertising in the 1950s and was later adopted by both the dental profession and the dental benefits industry. The influence that this cultural meme continues to exert on the dental profession, the dental benefits industry and the public is profound. Despite advancements in understanding the pathophysiology, epidemiology and systemic implications of oral disease,^{1,2} standard dental benefit designs help perpetuate the archetype of the biannual dental visit where many patients receive the same preventive services at the precise frequencies allowed by their dental plan.

Both dental insurers and clinicians benefit from the simplicity of this approach. Patients and dentists tend to “follow the benefits” spelled out in the plan design. Claims submission and processing are simplified when most beneficiaries have the same benefits, helping to control the costs for administration. When the risk for oral disease is not considered, the result can be a trade-off between administrative efficiency and effectiveness in improving oral healthcare outcomes. The “standard” benefit can encourage overtreatment for the healthiest individuals and discourage recommended treatment for those at greater risk.

Strategies for disease prevention and management have been developed based on the concept of individual risk assessment.³⁻⁶ Risk assessment tools use standardized questions to identify factors such as medical history, caries and restoration history, diet, oral hygiene practices, family history, and clinical information such as pocket depth, clinical attachment loss, bleeding, and tooth loss, that influence the likelihood that a person will develop the target condition. The information is weighted based on an estimated value that these factors have as

determinants of future disease, which is then converted to a numerical score or descriptive ranking (e.g. low, moderate or high risk). Most risk assessment tools use paper checklists that guide the user to determine the patient’s risk for oral disease and assist oral healthcare providers in developing prevention-based treatment plans.

Electronic risk assessment technologies have advantages over paper forms including more accurate data entry, automated calculation of scores, customized reports based on each individual’s risk factors, and secure transmission to third party payers. Electronic risk assessment reports can also be stored for later review by the dentist to create a chronological record of an individual’s oral health status. Risk assessment data can be used to create population health reports for employer groups which can reveal whether or not treatment being provided for patients matches a population’s oral health risk profile.

The growing evidence of relationships between oral and overall health and evidence that improving oral health can help employers lower medical claims expenses has encouraged many dental benefit companies to provide additional preventive services, such as prophylaxis and periodontal maintenance for members with medical conditions including diabetes, heart disease and pregnancy. However, providing these services on the basis of a medical diagnosis may miss the chance for primary prevention of dental caries and periodontal disease. Patients should not have to wait until they get sick before they receive benefits for the oral preventive care they need to stay healthy.

Stand-alone dental benefit carriers face a common dilemma: how can they provide wellness programs for purchasers and their insured members that would match the promises made by competing multi-line carriers to reduce medical costs without access to medical claims data

and diagnostic coding? Northeast Delta Dental's choice was to create an oral health and wellness program focused on primary prevention of caries and periodontal disease as opposed to medical diagnoses. We believe that the use of predictive risk assessment for oral disease to authorize guideline-based preventive benefits could encourage the delivery of care matched to individual needs, and actively engage patients and providers to change behaviors and adopt clinical best practices to improve health outcomes.

We developed a set of "enhanced" preventive dental benefits which were mapped as closely as possible to the preventive best practice guidelines from the American Dental Association⁷ and the American Academy of Pediatric Dentistry⁸ for dental caries; and the American Academy of Periodontology for periodontitis.⁹ Eligible patients who have been assessed by their dentist using a standardized electronic risk assessment tool and found to be at moderate to high risk for caries or periodontal disease are pre-authorized for preventive benefits including topical fluoride treatment and sealants without age limitation, up to four prophylaxis and periodontal maintenance visits per year, and oral health counseling. Northeast Delta Dental chose a commercially available clinical risk assessment software platform which provides fully automated risk assessments for caries, periodontal disease and oral cancer for this purpose.¹⁰

When data is entered by the patient or the dental office, it is uploaded to the risk assessment software company's HIPAA compliant database where the patient's risk and disease severity scores are calculated. Risk profile reports are automatically sent securely to the patient or dental office. The data is also downloaded to a proprietary data integration hub jointly developed by Northeast Delta Dental and the risk assessment software vendor. The data integration hub securely aggregates both self-assessed and clinically generated risk assessment data and can automatically authorize guideline-based enhanced benefits in the dental insurance company claims processing system. To be eligible for enhanced benefits, qualifying members also use the data hub to register for an oral health and wellness score which allows us to engage members to optimize self-management for their oral health.

Employers can also use an online oral health self-assessment tool to gain insights into the population health of their employees and their families by aggregating the risk and disease data into the data hub to create a population oral health report that estimates the prevalence of caries, periodontal disease, and oral cancer risk among the insured population, as well as the number of smokers and persons in the population with chronic disease who also have greater risk for periodontal disease. When dental claims data and population health risk profiles are compared, areas where the treatment being provided does not match a population's oral health risk profile can be determined. These "gaps to fill" can help focus efforts to improve patient self-management and the utilization of preventive benefits by dentists through outreach and engagement.

To gain the most from their dental benefits and achieve optimal oral health, members must be engaged and empowered with personalized, objective and actionable information and resources. The oral health risk assessment data hub also provides a communication module that uses patient-provided data to send individualized, HIPAA compliant text and e-mail messaging to engage individual members based on their unique oral health and personal profile.

Conclusion

Northeast Delta Dental has developed a comprehensive oral health and wellness program for employer groups based on an understanding that "one size does not fit all" when it comes to dental benefits. The program provides evidence-based preventive dental benefits matched to each patient's individual needs in order to improve oral healthcare outcomes for individuals and populations. The program provides employers with an objective analysis of the oral health status of their covered populations, and recommends strategies to close gaps that may exist between the preventive oral health care their employees are receiving and best practices for oral prevention. The program engages and empowers patients to take steps to achieve their personal best oral and overall health, and encourages dentists to use evidence-based preventive benefits matched to the needs of their patients to deliver evidence-based oral preventive care.

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Using Prevention and Measurement to Drive Quality Improvement

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Introduction

The term “quality” can mean many things to many people. In healthcare, we speak of “quality of care” to mean “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge.”¹ In order to drive quality improvement, the Centers for Medicare & Medicaid Services (CMS) is pressing forward with the “triple aim” goals of: 1) better individual health care, 2) better population health, and 3) lower per-capita costs called for in health reform’s Affordable Care Act.² CMS’ Quality Road Map promotes a vision for “The right care for every person every time” with a goal of making care: safe, effective, efficient, patient-centered, timely and equitable: indicators of quality for care delivery.³

An assumption in healthcare was that clinical judgment was sufficient to guide wise decision making. This emphasis on the art of medicine was grounded in a tradition that education, the knowledge of pathophysiology, and sufficient clinical experience were all that was needed to develop sound treatment recommendations.⁴ The result of basing care on such personal opinion is wide variations in clinical practice where the most effective treatment is not always used and ineffective treatments often persist. Such issues are indicators for a healthcare delivery system of poor quality. To address the goal of quality through the delivery of effective care, Eddy and others postulated that what happens to patients should be based upon “evidence” to produce recommendations that are valid, reliable and objective.⁵

The goal of Patient Centered Care (PCC) is an important component of prevention. Prevention of adverse outcomes is enhanced when patients comply with treatment recommendations, prescriptions, homecare and post-operative instructions. Studies show that PCC results in increased patient satisfaction and improved pa-

tient adherence with recommended care, each of which can improve care outcomes.⁶

Within oral healthcare, the “triple aim” can be best achieved through a focus on prevention consistent with evidence-based guidelines published by the National Guideline Clearinghouse, the American Academy of Pediatric Dentistry and the American Dental Association’s Center for Evidence Based Dentistry.⁷ A focus on prevention can improve health outcomes as shown in several evidence-based guidelines and can also lower per capita costs over time. However, in order to improve, we must measure the degree to which our dental care system supports the provision of preventive services.

In 2009, the Children’s Health Insurance Program Reauthorization Act (CHIPRA) called for the Secretary of Health and Human Services to establish an evidence-based pediatric quality measures program for primary and specialized pediatric health care professionals, including dental professionals. A measure is a mathematical ratio expressed as a percentage, with exclusions of patients who should not be incorporated for various reasons. An example would be a measure for placement of sealants on first molars. This could be described as the number of patients with sealants ages 6 to 8 years who have had a restoration in the past three years divided by the total number of patients who have had a restoration in the past three years. Included are those at risk for decay, as indicated by restorative history, while excluding children whose adult molar teeth have not erupted.⁸ Measurement allows for tracking the success in delivering care to those in need and it can be benchmarked to incentivize care delivery.

To promote quality measurement, CMS encouraged the establishment of the Dental Qual-

ity Alliance (DQA) in 2010. The DQA is a multi-stakeholder alliance from across the oral health community, including federal agencies, payers, professional associations and public representation, with a mission to advance the field of performance measurement to improve oral health, patient care, and safety.⁹ In 2012, the Dental Quality Alliance (DQA) approved its first fully tested set of ten measures: Dental Caries in Children: Prevention and Disease Management.¹⁰ These were developed over two years after rigorous testing. These DQA measures are validated at the program and plan level and are meant for the purpose of holding health plans accountable for utilization and quality.

Through a consensus process of its stakeholders, the DQA builds measures that are evidence-based.¹¹ An example would be the DQA's sealant and fluoride measures. These are built off of anticipated outcomes found in the ADA's evidence-based clinical recommendations.¹² Measuring the delivery of care with proven outcomes will promote utilization of these services and raise the level of oral health for the targeted population. Tracking measurement performance will provide administrators with the tools that they need to be confident that their plans are designed to promote quality.

Measuring the delivery of preventive services with an anticipated outcome for at-risk patients will drive quality improvement. For example, reduction of caries incidence in children and adolescents after placement of resin-based sealants ranges from 58.6 percent at four years, and rises to 76.3 percent during this period when reapplied as needed.¹³ Use of the DQA's sealant measure will provide assessment of a plan's performance that those covered individuals are receiving this evidence-based preventive service. Failure to achieve anticipated outcomes could signal administrators that flaws exist within their system that impacts the delivery of quality care.

The Institute of Medicine in its 2012 report "Best Care at a Lower Cost. The Pathway to Continuously Learning Health Care in America" called for "continuous learning health systems."¹⁴ Measures are an integral component of this concept due to the cyclic nature of evidence, leading to anticipated outcomes, which lead to clinical guidelines for care decisions which are then measured. Once measured, the realized outcomes create new evidence and the process revolves.

The rapidly changing landscape of healthcare financing will result in greater reliance on quality measures. Employers and purchasers will drive accountability through measurement. Consumers and providers are often fearful that plan design will focus on cost containment at the expense of improving utilization and prevention. Measurement will identify when plan design restricts access to care or impedes improvement of oral health, patient care and safety.

Often measures are designed for reporting using administrative enrollment and claims data. This can pose issues with transparency as many administrators view this to be proprietary data. A solution seen in several states is the creation of "All Payer Claims Databases" (APCD).¹⁵ These APCD may help address concerns for transparency, as well as the call for "continuous learning health systems" through the application of its data to a "dashboard of measures" to show how our providers, health systems and plan administrators are achieving measurement goals and improving the health and safety for covered populations.

Clinicians interested in elevating the quality of care in their practice can adapt measure concepts for individual use. Using sealants as an example, clinical software systems can generate a list of children ages 6 to 8 years that have had a filling in the past three years and those who have had sealants placed. Monthly tracking of performance becomes an exercise of data analysis. A more basic approach could use a spreadsheet where individual providers track patients seen at preventive visits who are at elevated risk for decay and are in need of sealant care. Regular reporting of results within a practice can provide incentive for utilization of preventive services and enhance overall quality of care.

Assuming that a covered population remains with a plan long enough to reap the benefit, access to preventive services and the delivery of that care will improve oral health and decrease health care costs by reducing the need for more costly care in the future. This is most likely to occur when evidence-based preventive services are targeted effectively to at-risk groups and individuals. The transparent use of measures will provide the incentive for the use of preventive services to drive quality improvement and build evidence on the effectiveness of these interventions for the development of future care recommendations.

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Opportunities to Increase Prevention in Dentistry

Robert Compton, DDS

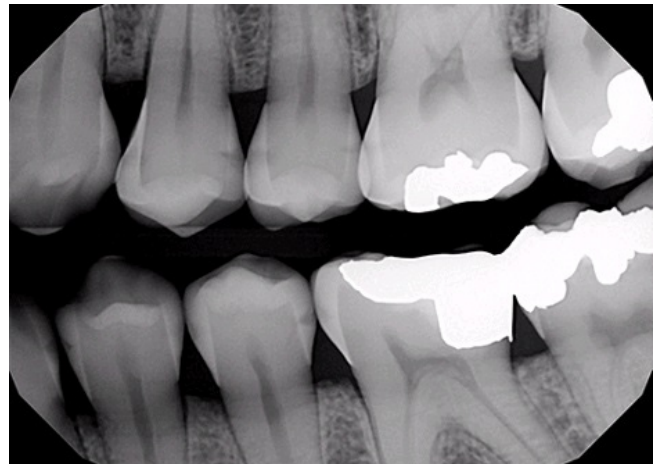
Introduction

According to the CDC, between 12.1% and 41.9% of the American population ages 5 years and older (depending on age and income level) has untreated dental caries. In addition, the percentages of those who have restorations vary from 44.5% to 92.6%. Children at or below the federal poverty level (and most likely Medicaid eligible) have the highest untreated dental caries rates for children, at 25.4%. Yet nationally, only 46.9% of children receiving Medicaid, on average, were able to access any dental care in 2013. Limited Medicaid budgets often lead to Medicaid fees that are below the cost of providing surgical treatment to repair the damage caused by caries. However, it is possible to provide effective preventive treatment by dental hygienists or other health professionals at lower costs before the disease progresses to an irreversible state which necessitates surgical repair.

The construct of classifying health services into three levels of prevention to differentiate them from curative treatment was developed by Leavell and Clark in 1965.³ More recently, Jekel defined the levels of prevention as listed in Table 1.⁴

Our knowledge about dental disease and how to prevent it has increased significantly, which opens opportunities to provide beneficial care to many people who otherwise would not receive it and who would ultimately suffer the consequences of untreated disease. The DentaQuest Institute has been partnering with Boston Children's Hospital (BCH) since 2008 on an Early Childhood Caries Collaborative that makes extensive use of primary, secondary and tertiary prevention. The ECC Collaborative's protocol includes performing a risk and behavior assessment to determine which risky behaviors parents are doing and whether they are using protective factors.⁵ When it comes to the determinants of health, we know that behavior may contribute 40%, while health care services may only contribute 10%.⁶ Changing behavior can have a profound affect, and the clinical staff in the collaborative was trained in

Figure 1: Radiograph of Interproximal Caries



motivational interviewing, behavior modification and simple goal setting. Parents are taught the causes of tooth decay. Most are not aware that the apple juice they put in a Sippy Cup has a pH of 3.5% or that milk in a bottle at bedtime damages their child's teeth. Goal setting asks parents to pick just one risky behavior they can work on during the next month, such as putting water in the Sippy Cup or the bedtime bottle. Or they may choose to add a protective factor, like brushing the child's teeth with a smear of fluoridated toothpaste. BCH found that it was able to reduce the risk status of children from high risk to moderate risk after three of these visits.

Secondary prevention is employed after the patient has developed a carious lesion but before it has cavitated. Figure 1 shows several interproximal carious lesions. The upper bicuspid appear to have demineralization that extends into the dentin and probably have cavitated. They will most likely require surgical repair. However, the lower bicuspid show examples of demineralization that do not appear to be into dentin. A patient with only early stage demineralization could be managed medically rather than surgically by applying topical fluoride and prescribing 1.1% sodium fluoride or calcium phosphate/fluoride enhanced toothpaste to remineralize early stage lesions. The resulting remineralization would be

Table I: Levels of Prevention⁴

Stage of Disease	Level of Prevention	Definition (Jekel, 2007)
Pre-disease but at-risk	Primary	Keeps the disease process from becoming established by eliminating causes of disease or increasing resistance to disease. Primary prevention refers to health promotion, which fosters wellness in general and thus reduces the likelihood of disease, disability, and premature death in a nonspecific manner, as well as specific protection against the inception of disease.
Presymptomatic	Secondary	Interrupts the disease process before it becomes symptomatic. Secondary prevention refers to the detection and management of presymptomatic disease, and the prevention of its progression to symptomatic disease.
Symptomatic	Tertiary	Limits the physical and social consequences of symptomatic disease. Tertiary prevention refers to the treatment of symptomatic disease in an effort to prevent its progression to disability, or premature death. [Tertiary tends to apply to chronic diseases, such as diabetes, which cannot be cured but can be managed to prevent them from progressing to more serious conditions]

better quality care than a restoration, because the fluoride would incorporate into the tooth structure and the pH would have to drop significantly before that area would demineralize. On the other hand, placing a restoration would increase the probability that the area would need retreatment at some point in the future. At BCH the result of behavior modification and goal setting along with frequent application of fluoride varnish and home fluoride toothpaste was a reduction in new cavitation of 65%.⁵ Both of these procedures can be performed by non-dentist health professionals, achieve better health outcomes and cost less than placing restorations.

In addition to these primary and secondary preventive treatments, BCH used tertiary prevention on cavitated lesions. Many very young children are treated at BCH because their disease is so extensive that they cannot be managed in a clinical setting and they are referred for operating room (OR) treatment under general anesthesia. Because of the high demand at BCH, the waiting time for the OR (prior to adoption of the ECC protocol) was between six and nine months – plenty of time for caries to advance into the pulp or cause the child considerable pain.

The ECC protocol includes removing caries with hand instruments without local anesthesia, applying fluoride varnish and placing an interim therapeutic restoration (ITR) of glass ionomer. This stabilizes the infection and reduces pain, and many of these children were subsequently able

to be managed in a clinical setting. This tertiary prevention reduced the need to treat the children in the operating room by 48% at BCH. This is a better experience of care since the use of general anesthesia in young children has inherent risks. Plus, the protocol reduced reported pain by 38%, again a better experience of care. The new ECC protocol was able to reduce the average cost of care for their population of children by 37% in the first year.⁷

The primary focus of the Patient Protection and Affordable Care Act (PPACA) is to bring down the escalating costs of health care that are threatening the American economy and to improve the quality of care. The goal of the Triple Aim is to simultaneously improve the health outcomes for a population, improve the patient’s experience of care, and to lower the per capita cost of care.⁸ BCH with its ECC protocol was able to achieve the Triple Aim. But one of the challenges to spreading this protocol is the fact that Medicaid and commercial insurers do not cover many of these procedures. They do not pay for disease management or motivational interviewing even though they both can achieve dramatic results. Usually they will pay for only two fluoride treatments in a twelve month period, and the ECC protocol may call for three or more. Many do not cover interim therapeutic restorations. These benefit programs are hesitant to cover additional services because of the potential to provide them to children who are not at high risk and thus would drive up cost without providing additional health benefit.

However, a new opportunity may be developing. The PPACA encourages the formation of Patient-Centered Medical Homes (PCMH) and other Accountable Care Organizations with the belief that they can control costs and improve quality.⁹ A PCMH is:

“A primary care practice that gives patients the individualized care and support they need to stay healthy...the patient, the primary care physician and a medical team work together to develop and implement a plan of care for the patient that details the patient’s optimal medication use, diet, exercise, behavioral health treatments, etc. to get and keep the patient healthy.”¹⁰

These types of Patient-Centered Health homes can include dental professionals and could potentially cover other populations besides Medicare recipients. They can share in savings they cre-

ate. Had BCH been part of a Patient-Centered [Health] Home that qualified to share savings, they could have received substantial payment for achieving their outcomes. Before adopting the ECC protocols, the average cost to the hospital of providing care was \$2,023 per child, and after adopting the protocol, it dropped to \$1,271, for a savings of \$752 per child.⁷ For their population of 395 children, they lowered their costs by almost \$300,000. Had they received just 20% of that expense, they would have more than covered their costs of disease management and extra fluoride, earned additional revenue while also saving the Medicaid program money.

It is possible to expand the use of primary, secondary and tertiary prevention to achieve improved health outcomes, better patient experience of care and lower cost of care, which could allow existing benefit dollars to cover more patients and increase access.

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Interprofessional Practice: Translating Evidence-Based Oral Care to Hospital Care

Virginia Prendergast, PhD, NP-C, FAAN and Cindy Kleiman, RDH, BS

Introduction

Oral Hygiene in Hospital Settings

A diagnosis of ventilator-acquired pneumonia (VAP) is made when an intubated, mechanically ventilated patient is diagnosed with pneumonia 48 hours after admission. VAP has been associated with poor oral hygiene, and this link has galvanized healthcare workers and researchers to explore effective methods of oral hygiene to reduce rates of VAP and other nosocomial infections.¹ Oral care regimens to improve oral health have been well established in the outpatient setting, but such standards are not as consistent in critically ill hospitalized patients. While intensive care unit (ICU) nurses rate oral care as important, most oral care practices in the ICU are inadequate. Protocols usually consist of foam sticks, standard toothpastes, and a saline rinse. Although the American Association of Critical Care Nurses (AACN) has advocated toothbrushing and declared it to be one of the standards of critical care, less than 44% of critical care nurses report brushing teeth.²

Toothbrushing has been described as the single most important oral hygiene activity,³ and toothbrushing twice daily reduces oral debris and biofilm. Over the past decade, electric toothbrushes have been shown to be superior to manual toothbrushes in biofilm reduction and improved gingival health. The benefits of oral care for critically ill, intubated patients have been conceded by healthcare professionals.⁴ Studies that have been conducted to examine this link are important but inadequate. One reason that critical care nurses in the neurosurgical field may be reluctant to perform consistent toothbrushing for intubated patients is the concern that toothbrushing may contribute to increased intracranial pressure (ICP). Therefore, some nurses prefer foam swabs to toothbrushes, despite the fact that toothbrushing is the standard of care recommended by the AACN.⁵ Patient safety is a critical aspect of oral health

that must be addressed before oral care efficacy trials can be implemented.

Oral hygiene for intubated patients may be hindered by the presence of the oral endotracheal tube, oral gastric tubes, bite blocks, and the adhesive tape that secures such devices. As a result of restricted access to the oral cavity, nurses may delay tasks such as toothbrushing, which creates a worsened pathogenic state within the patient's mouth.

The Center for Medicare and Medicaid Services has restricted or ceased payment for infections acquired in a hospital setting, and approximately 99,955 beds are dedicated to ICUs in the U.S. Thus, evidence to support the safety and efficacy of oral hygiene for the critically ill patient must be demonstrated to reduce the risk of hospital-associated infection and VAP.

Translating Oral Hygiene into Practice: Results of a Randomized Controlled Trial (RCT)

Recognizing the need for more research on oral hygiene and associated VAP, we performed an RCT to monitor changes in ICP and cerebral perfusion pressure (CPP) while providing oral care. Over a two-year period, we compared variations in oral health during intubation to changes in oral and respiratory nosocomial colonization among intubated neuroscience ICU patients.

Patients were randomized to one of two groups: those who would receive a standard oral care protocol, and those who would receive a comprehensive oral care protocol. The tools used for the standard oral care protocol included a manual pediatric toothbrush, standard foaming toothpaste, and water-soluble lubricant. The equipment provided for the comprehensive protocol group consisted of a tongue scraper, a

power oscillating rotating toothbrush with a non-foaming toothpaste, and a moisturizing agent. Both groups received the assigned oral care protocol twice daily, with toothbrushing lasting two minutes per occasion. Chest radiographs and oral and sputum cultures were obtained upon admission to the ICU and were repeated every 48 hours while the patient remained intubated. Oral health was measured according to the Bed-side Oral Exam (BOE), and these scores were recorded on the day of enrollment in the trial, the day of extubation, and 48 hours after extubation.

An interim safety analysis was performed upon 47 adult neuroscience ICU patients with an ICP monitor. ICP and CPP (cerebral perfusion pressure) were recorded before, during, and after oral care over the first 72 hours of admission. Of 807 ICP and CPP measurements obtained before, during, and after oral care, there were no significant differences in ICP ($P=0.72$) or CPP ($P=0.68$) between toothbrushing methods. In the absence of preexisting intracranial hypertension, toothbrushing was safely performed in intubated neuroscience ICU patients.

Oral health deteriorated in both groups, but key differences existed between the deteriorations. In the standard oral care group, the BOE total score and all eight categories significantly deteriorated (Friedman Test $p<0.001$, Bonferroni correction) and did not return to baseline after extubation. Large effect sizes were present at all three timepoints in this group. In the comprehensive oral care group, total BOE deteriorated during intubation (Friedman Test $p<0.004$) but returned to baseline status after extubation. There was no significant deterioration in the ratings on tongue, mucous membranes, gingiva, or teeth over time in the comprehensive oral care group. Oral colonization upon admission was noted in 25% of patients in each protocol. Although there were trends of reduced oral and respiratory nosocomial colonization among those in the comprehensive oral care group, no significant differences were noted between groups. Incidence of VAP was equivalent ($p=0.61$) for the standard and comprehensive groups at day six.

Discussion

The comprehensive oral care protocol demonstrated superiority to current published standards for ICU oral care protocols as measured by the BOE. The tongue scraper, power toothbrush,

non-foaming toothpaste, and oral moisturizers were found to be the most effective tools for oral hygiene during intubation period as evidenced by BOE item scores of tongue, teeth, gingiva, and mucous membranes. Previously unreported in critical care oral protocols, the tongue scraper was effective in preserving tongue hygiene as noted by the BOE item scores and supported by the reduction in odor compared to the standard protocol (odor was included as a new measurement parameter on the BOE).

Among patients who received comprehensive oral care, there was a trend of a decreased conversion to oral nosocomial colonization. The incidence of VAP, though equivalent in both groups, reflected a decreased trend among patients receiving comprehensive oral care. Because the study was underpowered, larger studies are needed to further investigate the benefits of comprehensive oral care, and further studies are needed to assess the long-term impact of oral hygiene on oral health and patient comfort.

Hospital-wide Changes in Oral Hygiene

The results of this study, combined with other evidence of the benefits of oral care, were the motivation for changes in oral care practices at St. Joseph's Hospital and Medical Center in Phoenix, Arizona. An Oral Health Initiative Committee comprised of experts representing clinical and management areas was established. Members of this multidisciplinary committee reviewed results of the RCT and protocols and ultimately elected to incorporate the BOE and comprehensive oral care protocol for all patient units. The comprehensive oral care protocol was further refined based on BOE scores and subsequently referred to as the Barrow Oral Care Protocol (BOCP). All medical and nursing committees hospital-wide agreed to the implementation of the BOCP.

Using a descriptive case design for implementation and evaluation of oral assessments and oral hygiene, we explored quality improvement data for incidence of VAP and the cost effectiveness of oral hygiene supplies using the expanded range of oral hygiene products. Incidence of VAP and the cost of oral care supplies before and after implementation were compared in the Trauma ICU over a 2-year period.

The incidence of VAP fell significantly from 4.21 to 2.1 per 1000 ventilator days ($p=0.04$). Average monthly costs for oral care products

used in 2011 were \$4000.00. After implementation of the BOE and BOCP, the average monthly cost in 2012 was \$1453.00, a savings of 65%. Cost-effective, comprehensive oral care appears to help reduce VAP, and the BOE and BOCP remain in place at our institution.

Current Practices and Future Recommendations

Although nurses are responsible for conducting assessments and performing interventions for other body systems, such as hemodynamic monitoring and administration of blood pressure medications, oral health assessments and research-based oral care practices are not routinely performed. Oral assessments are done in dental settings every day, by both dentists and hygienists. When dental professionals administer these assessments, they use a wide variety of tools, including mouth mirrors, periodontal probes, loupes, headlights, digital radiography, and cancer screening equipment. Generally, the nurses who perform oral assessments have neither the tools nor the training to do so effectively. Comatose or intubated patients are often unable to indicate whether they are in pain or describe discomfort, and the tubes make it challenging to thoroughly examine the mouth. Ad-

ditionally, the treatment setting is not conducive to provision of detailed oral care, as the patients are in a bed, not a reclining dental chair. Heavier patients are in a wider bed, which makes it difficult for the nurse to reach the mouth.

Healthcare professionals who recognize and advocate for systemic oral health protocols for hospitalized patients and the success of our research have called attention to oral health and hygiene practices. Some facilities have employed an inpatient registered dental hygienist to assess and perform complex oral hygiene assessments, thereby meeting the demand for cost-effective oral health assessments and reducing the rate of nosocomial infections. Our institution plans to collaborate with local dental hygiene schools to establish student rotations as part of the students' curricula.

Though advancements in oral health have dramatically improved in the United States over the past 25 years, the need for further collaboration among health providers in dentistry, medicine and allied healthcare providers is critical.⁶ Such collaboration is fundamentally important in healthcare settings, where the status of oral health has gained heightened awareness to prevent disease.

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Poor Oral Health Literacy: Why Nobody Understands You

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Introduction

It's Our Problem, Not Theirs

Health literacy has been consistently defined as the degree to which individuals have the capacity to obtain, process and understand basic health information needed to make appropriate health decisions and services needed to prevent or treat illness.¹ In this session, we examined the mistaken interpretation of the word "individuals" to be limited almost exclusively to citizens and patients. This misinterpretation may seem logical if we define health literacy as "knowing medical jargon." However, true health literacy reflects a relationship of respect between the citizen and the caregiver in which the caregiver has the responsibility to listen and understand the citizen. The caregiver must also have the "capacity to obtain, process and understand" what the patient says and needs. In addition, as we apply health literacy to the entire communication context of health information, we face a similar confusion. The problem with health pamphlets, fact sheets, and websites is not only the reading level of citizens, but also the ability of the authors to understand to whom they are talking and how they must present information so that it is not only clear, but credible. This session focused on the mutuality of health literacy, on the responsibilities and competencies that caregivers and professional health communicators need to foster effective health literacy, and on the new measures of health literacy we need to capture this perspective.

Teetering at the Tipping Point: U.S. Government Efforts to Promote a Health Literate Society

Health literacy has been identified as a priority area for national action in the United States, first by the Department of Health and Human Services (HHS) as an objective for Healthy People 2010 (HHS, 2000), and again in the Institute of Medicine report *Health Literacy: A Prescrip-*

*tion to End Confusion.*¹ The following decade saw the achievement of many milestones that marked health literacy's ascendancy in both the public and private sectors.²

The year 2010 was a banner year for U.S. health literacy policy. First, the Patient Protection and Affordable Care Act (ACA) was passed in March. According to HHS' Deputy Assistant Secretary for Health, "Health literacy is in the ACA because health policy makers recognized that activated and informed patients are on the critical path to increasing access to coverage and managing costs- the goals of the ACA. Health literacy is mentioned dozens of times, directly or indirectly, in the ACA because policy makers understand health care cannot be reformed in any meaningful way without health literate patients."³

Second, the National Action Plan to Improve Health Literacy was launched in May, 2010.⁴ The product of a public-private collaboration that puts forth seven goals, the National Action Plan includes a myriad of strategies for achieving those goals and creating a health literate society. This roadmap reflects the current emphasis on the need to tackle system-level changes that make it easier for people to navigate, understand, and use information and services to take care of their health. HHS has not only intellectual leadership in making the conceptual case for health literacy, but has also furthered research, trained professionals, and otherwise encouraged adoption of evidence-based health literacy practices.

Third, the Plain Language Act signed into law in October, 2010 made all federal agencies practice what they preached. The law, which is not limited to health care, requires each federal agency to use plain writing in every covered document.

As the decade progresses, health literacy is becoming infused with other health and health care improvement priorities. For example, health literacy is explicitly recognized as an aspect of being culturally competent in HHS' newly enhanced National Standards for Culturally and Linguistically Appropriate Services in Health and Health Care.⁵ The U.S. government continues to make an extensive effort to promote a health literate society.

It Is Our Problem and We Have Some Solutions! The Maryland Model of Oral Health Literacy

In 2007, the State of Maryland was in the limelight concerning children's dental health. This was a result of the tragic death of Deamonte Driver, a 12 year old who died from an untreated dental infection. The leadership of the state responded immediately and charged a taskforce (Dental Action Committee [DAC]) to provide a blueprint for action to address the lack of access to dental care for low-income children. One of the seven recommendations of the DAC report was for the design and implementation of a statewide unified oral health education program aimed at policy makers, parents, health care providers and the public. Our overarching goal was to decrease dental caries disparities among Maryland's children and youth. The approach is based on the PRECEDE-PROCEED model, a comprehensive approach to planning health initiatives. This is an essential first step towards creating a sustainable multi-sectorial state program dedicated to improving and promoting oral health literacy that contributes to the state's capacity to ensure that no more Maryland children succumb to the ravages of dental caries.

Specifically our objective was to determine what parents and caregivers, and health care professional workers know and do about tooth decay and its prevention. In addition, we wanted to know what, if any, communication skills health care providers use on a routine basis, and equally important, know what the public thinks about their health care providers' communication skills.

We collaborated with state medical and dental professional societies to conduct surveys and focus groups of 4 provider groups (dentists, dental hygienists, physicians and nurse practitioners) to determine what they know and do about preventing dental caries among children 6 years of age and younger. We found that all provider groups could improve their understanding of caries prevention and early detection. We also conducted a phone survey of Maryland adults to determine what they know and do to prevent caries and their opinions regarding the communication skills of their dental providers.⁶ To obtain more in depth information, we conducted 6 focus groups, two in Spanish and four in English, with low income adults with young children. Collectively, we found adults greatly lacking in their understanding of caries prevention. Most assumed that early childhood caries is inevitable and must simply be endured. Partnering with the Office of Oral Health, Department of Health and Mental Hygiene, we also conducted surveys and focus groups with Women, Infants and Children's Programs (WIC) and Head Start directors and staff to help us understand what they know and do about caries prevention.

Based on these findings, we then conducted health literacy environmental scans in 26 of the 32 community-based dental clinics in Maryland.⁷ The purpose of these scans was to determine the overall user friendliness of the health facility. Based on the information from our statewide assessment, we identified gaps in knowledge, understanding and practices regarding caries prevention among the public and all provider groups. To help close these gaps, we created English and Spanish language evidence-based tools to address them. We developed educational interventions for gravid women, parents of young children, and health care provider groups, which we share with others. We also provide in-service training upon request to WIC, Head Start and the Area Health Education Centers. Although our focus is on dental caries prevention and early detection, the model could be used for other content areas.

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Using the Best Evidence to Enhance Dental Hygiene Decision Making

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Introduction

An evidence-based approach to healthcare officially started in the early 1990s with leaders such as Dr. David Sackett and Archie Cochrane, although roots of this movement can be traced to earlier times. This approach has continually been implemented in all areas of healthcare, including dentistry. The American Dental Association (ADA) definition of Evidence-based Dentistry can be adapted as “an approach to oral health care that requires the judicious integration of systematic assessments of clinically relevant scientific evidence, relating to the patient’s oral and medical condition and history, with the dental care professional’s clinical expertise and the patient’s treatment needs and preferences.”¹ This definition includes the three critical realms: the science, the clinician’s judgment, and the individual patient’s needs and preferences.

Using evidence-based decision making (EBD) provides specific and individualized health care that is based on the most robust scientific evidence. Much debate has occurred around the role of each of these realms, but Dr. Sackett described it best when he said, “External clinical evidence can inform, but can never replace, individual clinical expertise.” Dr. Victor Montori, another leader in the evidence-based healthcare movement, gave a clear assessment of the role of research when he stated that, “The better the research, the more confident the decision,” but he also stated that “Evidence alone is never sufficient to make a clinical decision.” The key take-home message is that evidence and science informs, but never replaces, clinical decisions.

Learning how to use evidence in making healthcare decisions is a skill learned which is perfected over time. As describe in Figure 1, there are 5 steps in applying EBD. This presentation and manuscript will review these 5 steps and will give the reader insights as to how to obtain the skills necessary to successfully implement each step.

Figure 1



Figure 2: Sample PICO Question

For patients with an orthodontic appliance, would the addition of professional fluoride varnish, when compared to home fluoride toothpaste use alone, reduce caries incidence?

P: orthodontic patients

I: professional fluoride varnish plus home fluoride toothpaste

C: home fluoride toothpaste

O: caries incidence

Step 1. Make the question

This may seem like an easy thing to do, and we have much experience in asking all types of questions. However, developing a strategic clinical question does take skill and practice. The advantages of framing a clinical question is that it helps define exactly what information you are seeking and helps you know when you’ve found the answer. It also helps to define search terms and develop a successful search strategy.

Table I: Sources of Pre-Appraised Evidence: Guidelines and Critical Summaries

Organization	Website	Evidence Type
American Dental Association's Center for Evidence-Based Dentistry (Free)	http://ebd.ada.org	Evidence-based Guidelines Summaries of systematic reviews
Translating Research Into Practice (Free)	http://www.tripdatabase.com/	Evidence-based Guidelines Summaries of clinical studies and systematic reviews
Scottish Dental Clinical Effectiveness Programme (Free)	http://SDCEP.org	Evidence Based Guidelines
Database of Abstracts of Reviews of Effects (DARE) (Free)	http://www.crd.york.ac.uk/CRD-Web/	Summaries of clinical studies and systematic reviews
National Guideline Clearinghouse (Free)	http://www.guideline.gov	Evidence-based Guidelines
Journal of Evidence-based Dental Practice (subscription)	http://www.journals.elsevier.com/journal-of-evidence-based-dental-practice/	Summaries of clinical studies and systematic reviews
Evidence-Based Dentistry Journal (subscription)	http://www.nature.com/ebd/index.html	Summaries of clinical studies and systematic reviews

A PICO question format is typically used, where P refers to the population, I refers to the Intervention about which we are seeking scientific information, C is the comparison group – usually a placebo or current standard practice, and O is the outcome being evaluated. Figure 2 provides an example of a PICO question. In this example, lack of a defined question might lead one to consider a much larger patient population or use a wider pool of outcome measures. However, using the PICO question helps us to narrow our search to those patient populations with orthodontics and narrow our outcome measure to caries incidence. This provides framing and focus for our clinical question. More recently, an S has been added to PICO, creating PICOS, in order to focus the question even more. It can be used for the type of study or for the setting for which the question is needed.

Step 2. Access the Evidence

This part of EBD would undoubtedly be quite a challenge without the capacity to do electronic searches of multiple databases. There are different approaches to search online for evidence, and this is another skill that is acquired over time. One approach is to seek pre-appraised evidence first. This refers to evidence where an individual or organization has evaluated and summarized evidence. The advantage of this approach is that it is typically quicker and provides concise information in a user-friendly format. Examples include evidence-based guidelines and critical

summaries of research. Some resources for pre-appraised evidence are free others require a subscription examples are found in Table I.

A second strategy typically employed if an answer to the PICO(S) question is not identified through searching for pre-appraised evidence is to search databases for systematic reviews (Figure 3) and clinical studies. PubMed is an open access database with handy multiple online tutorials. One very useful PubMed feature is the Clinical Queries Search that will enable the user to quickly identify both systematic reviews and clinical studies.

The Cochrane Collaboration is another online source of systematic reviews. The Cochrane Collaboration is an independent, non-profit, non-governmental organization consisting of worldwide volunteers. The collaboration was formed to organize medical research information in a systematic way to facilitate the choices that health professionals, patients, policy makers and others face in health interventions according to the principles of evidence-based medicine. They conduct high quality systematic reviews, and many consider Cochrane systematic reviews to be the gold standard. The Cochrane Oral Health Group (COHG) is one of 53 groups around the world and has responsibility for preparing, maintaining and disseminating systematic reviews of randomized controlled trials in oral health. The COHG has 1,400 members from over 40 countries who contribute in different ways. The COHG

Figure 3: What is a systematic review?

- Systematic reviews have increasingly replaced traditional narrative reviews and expert commentaries as a way of summarizing research evidence.
- High quality systematic reviews seek to:
 - Identify all relevant published and unpublished evidence
 - Select studies or reports for inclusion
 - Assess the quality of each study or report
 - Synthesize the findings from individual studies or reports in an unbiased way
 - Interpret the findings and present a balanced and impartial summary of the findings with due consideration of any flaws in the evidence

Table II: Questions to be asked when applying evidence into practice

Primary Question	Sub-question
1. Are the results valid?	Are the studies well designed and executed? What are the types of studies used?
2. What are the results?	What is the certainty of the effect? What is the magnitude of the effect?
3. Can the results be applied to my patient?	Is the population similar? Is the provider similar? Is the setting similar?

always welcomes new members, and increasing the membership of this group is a priority. Increasingly, reviews are conducted on topics relevant to hygienists and therapists. For more information please email cohg@manchester.ac.uk or visit <http://ohg.cochrane.org>.

Step 3. Appraising the evidence

Knowing that not all research is of equal quality, it is important to critically appraise published research to understand each study's strengths and weaknesses. This entails careful consideration of the study methods, which is typically the least read part of journal articles. It is critical to first understand the study methods and quality before one can begin to consider the significance of the results. This, too, is a skill that is developed over time. Fortunately, there are multiple checklists that can help one consider the important factors to appraise for each study design. Web links to such tools are available through the Resources page of the ADA's EBD Website under the title of "Critical Appraisal and Evidence Analysis."

One of the advantages of seeking pre-appraised evidence, as described in the first search strategy above, is that there is no need to conduct a formal critical appraisal because this is included in the critical summary or guideline development process. Furthermore, these documents are developed by individuals with expertise in EBD and critical appraisal.

Step 4. Applying the Evidence

Guidelines will provide clinical recommendations, and clinical judgment along with patient preference will influence whether they are adopted. For individual studies, there are three primary questions that need to be answered when determining whether evidence should be applied in practice (Table II). Each has sub-questions that will help you to determine if the evidence is sufficient to enable you to apply it in practice. Answering these questions will help determine if the study results are trustworthy (Are the results valid?), the anticipated outcome of implementing the intervention (What are the certainty and magnitude of the results?), and if this outcome can be expected with your patients (Can the results be applied to my patient?).

Step 5: Assessing the Outcome

One of aims of EBD is critical thinking. Step 5 is to evaluate the applied evidence in the specific clinical situation. This includes determining which course of action is best and evaluating how well the whole process worked. Did the product or treatment work for this patient in this situation? Was the intended outcome achieved? Did the evaluation or treatment method help this patient? How much time did the process take, and even more important, was the cost efficient? Is the magnitude of the benefit of the additional treatment substantial, and is it worth the extra cost and time?

Conclusion

An evidence-based approach to healthcare requires incorporating the most current and comprehensive scientific evidence, the clinician's judgment, and the patient's needs and preferences to make individualized healthcare decisions. This will likely require developing new skills, or enhancing existing skills, to effectively and efficiently use evidence in practice. The 5

steps of an evidence-based approach to healthcare will help any practitioner effectively implement science in practice:

1. Ask the question
2. Access the evidence
3. Appraise the evidence
4. Apply in practice
5. Assess the outcome

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Overcoming the Fear of Statistics: Survival Skills for Researchers

Karen B. Williams PhD, RDH

Introduction

One of the most common complaints I hear from clinician-researchers is that statistics are difficult to understand and apply. Misstatements such as “differences were highly significant, with $p=0.008$ ” or “our study proved X causes Y” reinforce common misperceptions associated with statistics. These statements illustrate 2 common fallacies. The first is that smaller p values can be interpreted as a larger effect, and, that a small p value is evidence of “truth.” In order to understand why these assumptions are fallacies, it is important to know what the p value represents.

The accepted convention for separating potential explanations (X causes Y) from chance happenings is testing the null hypothesis. One can think of testing the null hypothesis as a “ritualized exercise of devil’s advocacy.”¹ The null hypothesis is an artificial argument – that any difference between treatment groups is due to chance, assuming that the treatment has no effect. Researchers hope that this likelihood is small. The p value derived from statistical testing is an estimate – the probability that, assuming the intervention is not effective, that treatment groups are different simply due to chance variation. If a small p value (conventionally <0.05) is obtained, then the researcher rejects the assumption of difference due to chance and accepts the alternative – that differences are likely due to the treatment.

Groups can differ simply due to chance. Two common sources that contribute to this are sampling error and measurement error. Sampling error occurs when groups are inherently different by chance. Random assignment can reduce this error, but does not ensure group equivalence with respect to all factors that might influence the outcome. Measurement error can exist depending on how, when, where and by whom outcomes are measured. Either source of error can introduce doubt as to whether change in the outcome (Y) is solely attributable to the intervention (X). Thus, it is not possible to prove cau-

ality. We can, however, estimate the probability (p) that observed differences between groups are based on “chance” using the null hypothesis.

Getting significant differences ($p<0.05$) is influenced by three factors: magnitude of effect, sample size, and variation in the data. Because sample size influences p value, a small p cannot be simply equated with large effect size. Results from a study with 1,000 subjects will always have a much smaller p value than one with 100 subjects, given the same magnitude of difference between groups. Power of a statistical test – the likelihood of rejecting the null hypothesis when there is a real difference – is influenced by the number of observations/sample size.

Effect size is about actual differences. It can be determined from raw data (e.g., difference between group means) or standardized (raw effect size divided by the standard deviation). It is helpful for researchers to think about raw effect size as the minimally important difference (MID), that is clinically meaningful. The standardized effect size, which takes into account the variance, can be interpreted as a measure of “importance”. Thus, it gives an objective estimate of the strength of association between the outcome and intervention/treatment. Common effect size measures include r^2 , eta square, odds ratio and Cohen’s d.

Statistical Decision Making

So, why do clinicians often equate a statistically significant p value with truth about causality? Humans innately have a need for certainty. When individuals feel uncertain or there are multiple cues that need to be considered simultaneously, individuals often rely on one-dimensional rule-based decision making.² Such is the case with statistical analysis and interpretation.³ Several researchers have criticized this “fantasy” of statistical testing as proving effectiveness, and have called for logical interpretation

of data along with use of the p value, effect size estimate and replication of findings.^{4,5}

CONSORT Guidelines and Improved CONSORT guidelines now encourage researchers to provide information about the MID when publishing. They also suggest that MID be defined in advance and used as the effect size for designing clinical trials.⁶ Despite changes in publication standards and improved statistical techniques available, clinicians and researchers still tend to fear statistics and make rash judgments about the meaningfulness of statistics.

Therefore, the remainder of this paper will discuss issues that may help demystify statistical testing and provide clinician-researchers with realistic strategies for improving the quality of one's own research efforts.

The Logic of Establishing Causality

Establishing the causality between an intervention and outcome requires that 5 tenets be met. First, there must be a logical or biologically plausible relationship between the cause and the outcome. Second, exposure to the cause must precede development of the outcome. Third, there has to be evidence of strength of association. Fourth, and critically relevant to both proper design and statistical testing, is that there has to be a lack of competing explanations for the results. Last, evidence must be replicated. A single study does not provide sufficient evidence to support causality.

Study design is critical to making causal statements. Having a comparison group (or better yet, a control group if possible) is necessary to tease apart whether any observed changes are attributable to the treatment/intervention. While the statistical test (and associated p value) can give us an estimate of chance differences, it alone is insufficient. One must consider why treatment versus comparison groups might (or might not) differ. Some common reasons include:

- Individuals in the respective groups looked similar but differed in subtle ways that were undetectable but important.
- Changes observed over time could be natural occurrences (e.g. aphthous ulcers and healing)
- Measurement was flawed or unequally implemented
- Study length was insufficient to capture im-

pact over time

- Not all subjects were available for all observation periods or differentially dropped from the study (missing data).
- There were too few subjects to capture a difference if it existed or there were so many subjects that even a trivial difference would be statistically significant.

Statistical Tests as Part of a Logical Argument

One of the most compelling books in print today is *Statistics as Principled Argument*.¹ Abelson argues for use of applied logic and good judgment along with hypothesis testing to make good decisions about study results. Psychologists have shown that people are highly susceptible to confirmation bias. Confirmation bias results when people selectively focus on information that reinforces preexisting ideas, thus resulting in overestimating the influence of systematic factors (like an imposed treatment) and underestimating influence of alternative explanations, including chance. This may cause individuals to conclude that an intervention is effective, especially if there is a p value from a statistical test of <0.05 , without thoughtful consideration of other factors.

Since very few clinical researchers have the depth of understanding that underlies the field of methods and biostatistics, they are likely unaware of how a conceptual model, study design and measurement can be used to their maximal benefit to answer meaningful research questions. Actively seeking out a consultation with a biostatistician with experience in the broad field of health-related research is one of the most effective ways to overcome a fear of statistics.

Getting a Statistical Consult

Obtaining a statistical consult during the design phase of a study is one of the best ways to maximize efficiency in the research process. Many institutions have statistical consultation services or individuals who can provide these consults. Find someone at your institution who is knowledgeable with whom you can discuss your project.

Once identified, prepare for the consultation in advance. Be prepared for the questions that the statistician might ask about previous research. In the literature, be attentive to how results may have changed over time. An inter-

esting observation about study results is that effects often decrease over time. Lehrer suggests that “truth wears off” over time because our illusions about the meaningfulness of various research questions declines over time.⁷ Being able to articulate this trend will be important for study design and power analysis. Getting the right estimate for sample size initially improves the likelihood of getting meaningful results.

In advance, draft an abstract that summarizes your proposed project using the PICO format.⁸

(P) Population: Who is the population being studied?

(I) Intervention: What is the intervention or exposure variable?

(C) Comparison or Control Group: What is the most appropriate comparison or control group?

(O) Primary Outcome Measure: What outcomes are feasible to measure?

A good consultation will usually result in modifying some aspects of your original research plan. So, be prepared to capture recommendations either in writing or audio recording. Clarify issues that are confusing at that time. A good consultant will help identify potential confounding vari-

ables that should be controlled either by design or statistically. Make sure you leave with an understanding of how design, measurement and statistical analysis fit together. Once you have drafted your proposal, get confirmation from the consultant that you have “gotten it right.”

Make sure you discuss how to set up your data for analysis. The statistical analysis plan, design of the study, capture of confounders, number and type of outcome measures, and statistical software will dictate the appropriate format. Unless you are completely comfortable with statistical software and the analysis plan, do not do this on your own. There is nothing more frustrating than to have all of your data entered, only to find it is not in an analyzable format.

Conclusion

Most importantly, leave your apprehension at the door and look at the consultation as a unique opportunity to engage in creative planning. Statistics are wonderful tools, but only if used correctly. Statistical analysis programs manage the computational aspects but do not overcome bad design and incorrect analyses. Approach the research process just as you would plan a trip to a foreign country and you can avert the fear of statistics and pain of failure.

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Millennials and Dental Education: Utilizing Educational Technology for Effective Teaching

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Introduction

Millennials arrived on campus in the year 2000 and will continue to be part of the college campus for the next decade. Their unique characteristics, diversity and expectations for the learning environment are transforming the college classroom and challenging faculty to examine traditional pedagogy as well as the learning environments offered to students.¹ Attitudes, beliefs and values are influenced by the people, places and events in our history, and therefore uniquely shape each generation. Like generations before them, these influences establish different motivation levels, work ethics, and worldviews that impact teaching and learning. This presentation will aid in understanding generational differences and may help dental educators improve their teaching effectiveness.

Millennials have and will continue to influence higher education first, as students, then as faculty. Millennials bring a new generational personality to the college campus which includes optimism, structure, team orientation, and a confidence that some believe borders on entitlement.² Millennials are used to being engaged with adults, and have strong bonds with their parents who throughout their lives have told them they were special and included them in decision-making. Consequently, most have the same values as their parents, respect authority and are rule-followers.² Millennials had less academic demands in high school than previous generations and, upon arriving to campus, expect the same minimal demands in college. Faculty have found that these students have unrealistically high expectations of success combined with a surprising low level of effort on their part.³

Millennials exude confidence and are extremely optimistic. The majority of Millennials are personally happy and excited about their future as they believe they will correct the ills of society.² Tangible achievements and rewards are important to them and they expect praise and encouragement from their college professors, as all of their lives they have heard “good job” for most of what they

did. Since their arrival on the college campus in 2000, faculty have been trying to figure out how to manage the amount of involvement and feedback these students demand.

Millennials are high achievers and are focused on grades and performance.⁴ This generation wants a clear, structured academic path and sees a college education as an expensive consumer good. This mind-set translates tuition into a college degree and good grades. In the classroom, students will often dismiss homework as “busy work” when it has no relevance to personal goals. In college, Millennials are finding that self-esteem cannot deliver their expected success and many are showing signs of stress, anxiety, and hence, the rise in academic and mental health resources on today’s college campus.

Leisure time is a priority for Millennials. When these students were growing up, they were highly scheduled with traveling sports teams, music lessons, camps and organized playgroups. As college students, they have less “free time” than any other generation of students due to time commitments to school, sports, social activities, work and volunteerism. Technology allows Millennials to stay connected and has blurred the lines between work and life. They stay in uninterrupted contact with the world around them and consequently, the workday is no longer nine to five, thus motivating Millennials to desire work/school-life balance.³

An abundance of information has focused on the traits of Millennials; however, less has been published on teaching methodology that aligns with the way Millennials learn. Interestingly, many components of Millennials’ ideal learning environment – less lecture, active learning approaches, use of multimedia, collaborating with peers – are some of the same pedagogical approaches research is showing to be effective.^{4,5}

First, because of their highly scheduled childhood, their need for structure carries over into the

classroom. The more structured and planned the course, the more secure and satisfied this student will be. This generation prefers to know the facts and does not like ambiguity. A common question of this cohort is, "What do I need to know?" Millennial students expect emphasis on core knowledge and skills and expect frequent formative feedback on their performance, as well as frequent review sessions. Frequent formative feedback has shown to improve the learning process, and literature suggests people learn when they actively monitor their learning and reflect on performance.⁵

In addition to their focus on what information they need to know, Millennial students want to know why they need to know it. Their desire for learning to be relevant and related to their experiences cannot be underestimated.⁴ However, this student has difficulty seeing the big picture and thinking independently and will rely on the instructor to make a connection between their life and course material. Teaching methods emerging from constructivist theory support the way Millennials want to learn, including active learning strategies such as cases, cooperative learning, group projects or skill demonstration. Millennials also desire variety in the classroom and interestingly, research has demonstrated people learn best when they receive the new materials multiple times but in different ways.⁵ Service-learning in education grew out of constructivist theory as well, and when paired with structured reflection has been demonstrated to improve students' academic, personal, social and citizenship skills.

Millennials' penchant for connection is manifested in the classroom in several ways. After many years of collaborating at day care, sports

teams, school and volunteer projects, Millennials know how and when to work with other people very effectively.² Accustomed to teaming-up, these students desire collaborative learning in the classroom. Millennial health care students are primed for health care reform which emphasizes team-based care and interprofessional education. Their desire for connection extends to faculty as well. Having been raised by caring parents and other adults, Millennials want faculty to get to know them and care more about how their professors interact with them than about what their professors know.⁴

Technology is perhaps the most distinguishing characteristic of the millennial generation. For this generational cohort, personal computers have always been there and are as ubiquitous and common as a coffee pot. Millennials expect a multimedia enriched environment in the classroom. Interestingly, professors who use multimedia (YouTube, movie clips, etc.) saw better student test scores on quizzes and examinations.⁵

They expect that there will be communication with faculty via e-mail and have access to online resources. Faculty will need to serve as a facilitator in order for students to collaborate with each other. It is important for faculty to "frame" the course and supplement student interactions by providing resources and opportunities. Additionally, faculty need to develop a conceptual rationale for incorporating technology into their teaching, identifying how it fits with their philosophy of teaching and learning. In other words, technology should not be used for its own sake but rather only if it enhances teaching and learning.⁶

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Getting Your Name in Print

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Introduction

The conduct of research and the dissemination of resulting relevant findings create a profession's body of knowledge. For dental hygiene to advance, a cadre of adept researchers must be developed. These researchers must have the skill sets that enable publication of their work. The main goals of this workshop were to successfully instill the self-confidence and impart the knowledge necessary for iterant scientific writers to publish in a peer-reviewed journal. Designed to be interactive, participants applied basic principles of scientific writing and the writing process through self-assessment exercises and individual or group opportunities that allowed attendees to critique and create workable documents. The dual emphases of helping writers write well and write well scientifically were intertwined in group activities.

Scientific writing is a unique approach to sharing information. Several characteristics differentiate it from other styles. Scientific writing must be systematic as it reflects information that was obtained through a systematic process. While providing the readership with new findings and ideas, scientific writing is expected to reflect an economy of words, a neutral tone, lucidity and precise wording. The need to link thoughts to each other, present a logical progression of ideas, and methods for emphasizing organization of content and logical flow were highlighted. For example, a literature review must precede from the general to the specific to arrive at a focused research question or hypothesis. This same flow of ideas, i.e., from a broad introduction to specificity, should be apparent in each paragraph of a paper. Participants assessed sample papers that required changes in organizational flow. Determining the relevance of inclusions also was examined. Attendees critiqued writing samples and were asked to identify superfluous information. Participants' self-assessed and modified their own writings to reinforce organization and economy of words.

Scientific writers must address the required components of a research paper and adhere

to the guidelines of their publication of choice. Specific elements of research papers most often include the following: title, abstract, introduction/literature review, methodology, discussion, findings, references and appendices, figures and tables. A scientific, cogent yet attention-grabbing title that reflects the content of the manuscript must be developed. Tips for title creation were delineated, and examples of titles were critiqued and modified. Participants reviewed abstracts and identified whether required parts were included or omitted. How to organize and write the body of the paper, congruent with the paper's abstract, was addressed. Identifying the elements of the methodology section and providing examples of how to group and present results were addressed through group activities. The challenges associated with the discussion section and relationships to the results were discussed. Writers sometimes have a tendency to restate results in discussions and offer discussion points in the results section. Paring down discussions can be challenging in scientific writing. Not all results merit discussion. Similar findings may be summarized and described in a single paragraph. Researchers often tend to overstate their findings. Limitations associated with sample sizes, research design and control of extraneous variance must be addressed when findings are discussed.

The formal stages of the writing process were presented. Specific phases include invention (pre-writing), development of a thesis statement, outlining, writing the first draft, revising and polishing. Since writers process and utilize information differently, their approaches to putting pen to paper differ. Less formalized approaches but useful steps in the writing process include examining the purpose of the paper, how it will be achieved and brainstorming. Pre-writing may include a random collection of thoughts and ideas that adhere to no particular order. Jotting down or typing random ideas when they enter the writer's mind is a commonly used and helpful way to stimulate thinking.

The benefits of outlining were emphasized. Outlining promotes a hierarchical and systematic approach to writing. To promote order and organization, participants were advised to begin each paragraph with a topic sentence and ensure that paragraph content supported and elucidated introductory sentences. Participants created thesis statements to begin paragraphs and then outlined the subsequent related content. Attendees shared their pre-inventive stages and writing approaches. They discussed ways to improve their processes of writing, and the facilitators and other attendees offered suggestions. Other thoughts related to the writing process were shared. Participants were advised that writing takes time and editing and re-editing are continual processes; and, that many authors advise taking breaks during the actual writing of the paper to clear their minds and enable a return to work with a fresh perspective. During editing and reediting, attendees were advised to seek input from other accomplished writers, researchers and objective parties.

Major grammar and punctuation pitfalls and scientific writing taboos were discussed. Scientific as opposed to narrative writing, employs no superlatives, is preferably stated in the voice of third person, and uses active, not passive verbs. Contractions must be avoided and acronyms cannot be used until the proper name for a term has been previously spelled out in the text. Including vocabulary that is difficult to understand in an effort to sound intellectual is discouraged. Flowery prose must always be avoided. Beginning statements with terms such as "there is" or "it is important that" dilute the power of a thought. Subject and verb agreement and parallelism of subjects and possessive pronouns, common grammatical errors, were cited. Participants were advised to be mindful of creating a need to know, beginning with the manuscript title, maintaining an optimal rate to impart information, avoiding ambiguity and jumping to conclusions (particularly in the discussion and conclusions sections). During the writing process, writers were advised to utilize a thesaurus and dictionary (electronically or hard copy) and to take advantage of spell and grammar checks.

Overreliance on spell check was discouraged as a word may be spelled correctly but still used inaccurately in a sentence.

Knowing the prospective audience helps the writer decide what information to include in the research report. An article directed toward a narrow audience will have a different perspective than one submitted to a journal that is relevant to a broad range of disciplines. Regardless of the audience, findings and conclusions must be stated clearly with as few words as possible. Referencing content is critical in scientific writing. A fatal flaw and reason for article rejection is plagiarism. Quoted material must be acknowledged. The use of secondary sources is prohibited. Returning to the original reference is required as the author who first cites the article, i.e., the secondary source, may tweak an original statement inadvertently and that thought could be more distorted in subsequent iterations. A return to an original document ensures that both the original intent of a statement or finding and the details of the citation are accurate. Publishing is not a perfect art so errors can occur. A repetition of the same citation error could indicate the author's use of a secondary source; i.e., copying the inaccurate secondary source's reference information. Authors are required to adhere to the referencing guidelines of the publication to which they are submitting. Any questions about guidelines should be directed to the journal of interest.

Attendees received a list of resources to utilize as they develop their writing skills. A key tool for perfecting one's writing skills is reading and studying published work. Published reports particularly in peer-reviewed journals have undergone rigorous reviews so using them as a guide can be advantageous. Publications also can serve as springboards for developing research ideas. Practicing writing is another way to develop skills and build self-confidence. To quote Dr. Seuss, "So the writer who breeds more words than he needs is making a chore for the reader who reads." In conclusion, rewriting remains the best form of writing.

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Becoming an Effective Journal Reviewer

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Introduction

Peer review is a time-honored process that uses editors and experts to evaluate the scientific merit of 1) manuscript submissions to journals; 2) abstracts and papers submitted for consideration for presentation at professional meetings; and, 3) grant applications requesting funding of research projects. For journal submissions, the process is used to ensure a level of confidence in the rigor of the research process utilized to conduct a scientific investigation and the accuracy of the study findings and conclusions presented. Papers published in peer-reviewed journals are assumed to have a higher level of quality than those published elsewhere. For non-scientists, peer-reviewed publications remain the “gold standard” as credible, trusted sources of information.¹

Challenges

Finding individuals to serve on editorial review boards can be challenging for editors. An editorial by William Perrin explored the issues that editors face in finding individuals who will agree to serve as reviewers.² A primary difficulty encountered is that often the leading recognized experts in a given field who are best suited to review the paper are “too busy” with their own work, requiring editors to then move down the list of choices to locate individuals who have enough knowledge of the subject matter to review the paper. The worst case scenario for the editor is having to reach out to reviewers who are not experts in the subject area or not as closely related to the field, increasing the likelihood that the quality of the review will be less than desired.² Neither editors nor authors benefit from the outcomes of this process.

Reviewer Responsibilities

The primary responsibilities of a reviewer are to inform the editor about whether a manuscript is acceptable for publication and to provide the author with an understanding about how to improve the submission. Reviewers should be able

to identify and discuss strengths and weaknesses of a given paper, minimizing time spent searching for minor strengths in a paper that is obviously weak and should be rejected and the tendency to obsess over minor weaknesses in a paper that is otherwise strong.³ The review should be conducted efficiently and returned back to the editor promptly to avoid unnecessary delays between time of submission and notification to authors.

Zucker states that reviewers make two common mistakes.³ First, reviewers often request that authors conduct additional work and/or submit additional data as a contingency for publication. Reviewers should not approach a manuscript review thinking about how they would have conducted the study. A request for additional data should not be made lightly, as it places considerable burden on the authors. It is important to remember that submitted manuscripts represent a body of work that has been completed; therefore, if the stated conclusions in the paper are not supported by the work described, then the reviewer should recommend to the editor that the paper be rejected. Second, reviewers may fail to consider whether the paper is appropriate for publication based upon how well the paper aligns with the stated goals and requirements of the journal. A reviewer needs to decide whether a paper that is well-written and novel should be accepted if the paper has not been constructed according to stated guidelines.

Reviewers also should consider the amount of work that will be required by the author to revise the paper to meet posted journal standards.³ For example, if a manuscript far exceeds the word count allowed by the journal, the reviewer may recommend that the authors either substantially reduce the word count, or submit to another publication that will accept longer papers. The reviewer should clearly communicate these concerns with the editor early in the review process to come to a consensus about how to advise the author about needed revisions.

Other skills and knowledge are required to become an excellent journal reviewer. The following is a list of important aspects of reviewing for peer-reviewed journals:

1. All reviewers should be familiar with the guidelines to authors. Knowing the suggested word count, format for references, tables, figures, etc. is essential.
2. Respond to the request to review a paper. Reviewers are asked to evaluate papers based on their specific expertise. Editors may have limited numbers of reviewers with the expertise needed for a particular paper. If reviewers fail to respond, it delays the entire process for the authors and the editorial staff. Even responding with a "No" will help the process move forward.
3. Start the review process with an optimistic point of view. Many reviewers find ways to reject a paper expecting authors to convince them otherwise. Good reviews help authors improve their work even if their papers are not accepted for publication. Reviews that "tear a paper apart" are not useful to the editor, author or reputation of the journal. The review should provide a balance between positive feedback and critical assessment of what needs to be accomplished to improve the paper. The best reviews provide critical commentary with concrete recommendations
4. Provide reviews that are tactful, constructive and as professional as possible. Wording such as "Who cares?", "This sentence makes no sense", "I disagree with this statement", "This is bad" can be reworded so the author does not become defensive and overlook the valuable insight of the reviewer. One might wish to approach every review as if it were a graduate student who needs to be mentored. Also, be a role model of good writing by providing reviews that are free of typos and spelling errors.
5. Most reviewer evaluation forms have a section where reviewers can provide confidential comments to the editor. Do not make substantive points about a paper unless those comments also are shared with the authors. It is frustrating to editors if the confidential comments are more crucial than what will be shared with the authors. It also can place the editor in an awkward position if the decision regarding the manuscript does not coincide with the review.
6. Reviews need to be prioritized. It should be

clear what are priority areas for revisions and what are suggested changes to improve the manuscript. In addition, justify statements with references and logical arguments.⁴ Even if the reviewer recommends that the paper should be rejected, a thorough review with some encouragement and advice will help the author improve future research and writing efforts.

7. Submit the review to the editor on time. If the situation changes and more time is needed, communicate with the editor to ensure a timely review process for the authors.
8. After the first reviews are submitted to the authors, resist the temptation to add additional requests in subsequent reviews that are not related to the original revisions. Authors become frustrated if they have responded to all of the recommended revisions only to have others added in the second or third round.

Other Considerations

Serving as a reviewer is an expectation of all scientific professionals, and this responsibility should be included in job descriptions for faculty and as a requirement for tenure.² It also is an honor and privilege to contribute to the profession by supporting and improving the peer review process. However, it is becoming increasingly more difficult to serve as a reviewer, as fields of study are becoming more specialized, scientific technology is increasingly complex, and research projects cross multiple disciplines. For interdisciplinary projects, it is not realistic to expect two or three people to have expertise in all aspects of the project. When a reviewer is asked to look at a paper that is outside of his expertise, the nature of the question asked by the reviewer changes from, "Is this paper a significant contribution to the literature" to "Is there anything about this paper that makes me feel uncomfortable?"⁵ While the reviewer is expected to detect notable design flaws in a paper, it may not be as easy to do if the reviewer has not engaged in a similar type of work or if the reviewer is unaware of subtleties, such as cultural differences or variances due to study setting, that might be inherently important to project design and related outcomes.

Further compounding these challenges is the notion that faculty feel increasingly pressured to publish, who then choose to "split" their work across multiple papers, submitting pieces of the same study to several journals with the hope of

improving the odds of getting a paper accepted for publication. The increased number of submissions and the finite number of available reviewers overloads the peer review system. When there are fewer reviewers available to look at a paper, the process of review is delayed, limiting the dissemination of new knowledge in a timely manner.⁵

To entice more individuals to participate in peer review, individuals need to find a balance between the demands of the typical academic workload and the time needed to serve in this capacity. Some have examined how best to reward the efforts of those who dedicate their time and talents as reviewers, especially for those who consistently provide thoughtful, comprehensive and quality reviews. If serving as a reviewer becomes a stated expectation for faculty promotion and tenure, then a method to measure and document performance is required to help ensure that participation will “count” as a scholarly

activity among the metrics used to determine eligibility for academic advancement. Finally, new software systems used to track manuscript submissions and corresponding documentation can be used to archive reviews, which can be used for reviewer training and evaluate reviewer performance across time.^{6,7}

Conclusion

Serving as a reviewer for a peer-reviewed scientific publication can be a challenging yet rewarding experience. Professionals seeking an appointment as a reviewer or membership on an editorial review board must be willing to dedicate time and expertise and be willing to be constantly educated about how to become a better reviewer. Conducting reviews in a positive manner with a spirit of professionalism will assist in encouraging and mentoring the future investigators in the field.

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Successfully Navigating the Human Subjects Approval Process

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Introduction

In order to successfully navigate the human subject approval process in clinical or behavioral research, one needs a good understanding of the ethical principles guiding the conduct of research involving human subjects. Federal and international codes and guidelines exist which frame the context of ethical research. These codes and guidelines include The Nuremberg Code (1949), the Declaration of Helsinki (1964-2000), The Belmont Report (US, 1979), Council for International Organizations of Medical Sciences (CIOMS) and/World Health Organization (WHO) International Guidelines (1993, 2002) and the ICH/GCP International Conference on Harmonization – Good Clinical Practice (EU, 1996).

There are three ethical principles that guide all research involving human subjects – beneficence, justice and respect for persons. (Belmont Report, CIOMS/WHO).

- Beneficence refers to the ethical obligation to maximize benefits and minimize harm. In effect 'do no harm'. Assessment of risk falls under this principle. Risk in this context is defined as the probability that certain harm will occur to subjects from participation in research. It is the obligation of investigators to minimize this potential by selecting optimal study designs and interventions for their research.
- Justice is the ethical obligation to treat each person (population) equitably and equally. In this principle, distribution of the benefits and burdens or risks of research to participants and populations should be distributed fairly among diverse populations. Justice protects the vulnerable populations from exploitation and protects of the rights and welfare of vulnerable persons.
- Respect for Persons incorporates two ethical considerations – respect for autonomy and protection for persons with reduced

autonomy. Autonomy refers to a person's ability to make sound decisions. In research, an autonomous person must be able to consider the potential harms and benefits, analyze the risks associated with the proposed research and make a decision in his own best interest. This includes the ability to read and understand the informed consent document.

In 2000, Emmanuel et al proposed a framework of seven ethical principles for clinical research studies, believing that informed consent is not sufficient to ensure ethical research. Expanding on the three basic principles described above, this framework adds the principles of social or scientific value – meaning that some enhancement of health or knowledge must be derived from the research and scientific validity, that the proposed research has a rigorous scientific methodology including statistical tests that produce reliable and valid data.

In the U.S., the Office of Human Research Protections (www.ohrp.gov) in the Department of Health and Human Services provides leadership and structure for overseeing the rights and welfare of subjects participating in research conducted by or supported by the US Department of Health and Human Services (HHS). These guidelines and policies are published in the Code of Federal Regulations (CFR) 45 CFR part 46. The Food and Drug Administration (FDA) regulates human subjects in clinical investigations involving drugs, biological products and medical devices. FDA regulations are published in 21 CFR parts 50, 56, 312, and 812, covering not only protection of human subjects, but also regulations for Institutional Review Boards (IRB) and other areas in the review process.

Most academic institutions have ethics or human subjects committees that review proj-

ects involving the participation of human subjects as research subjects for both behavioral and interventional studies. Independent, central IRBs also exist to serve those companies or investigators not affiliated with an academic or medical institution. IRBs such as the Western Institutional Review Board (www.wirb.com) and The New England Institutional Review Board (www.neirb.com) may review pharmaceutical or clinical protocols for studies conducted in private practice.

Is it research? A first step in determining the need for IRB review is to decide if in fact the proposed project is research and then if it is research involving humans. The US Office for Human Research Protection (OHRP) provides a series of decision trees to assist investigators in understanding human subject regulations (<http://www.hhs.gov/ohrp/policy/checklists/index.html>). These decision trees list the categories under which a research project may be exempt from IRB review and are a good resource for the investigator in planning for IRB review. Exempt categories for research can include research involving educational tests, survey procedures or observation of public behavior, and research involving the collection or study of existing data, documents, records or pathological or diagnostic specimens. A primary reason for the exemption is that the subjects involved in the research cannot be identified, meaning there are no personal identifiers that can link the data back to the research subject. IRB submission is still required and final determination of exemption is decided by the IRB, or in some institutions this determination is made by the Scientific Review Officer.

It is the responsibility of the IRB to review non-exempt research proposals prior to the start of any human involvement in the research. An IRB has the authority to approve, require modifications or disapprove all research activities. (§45 CFR 46.109)

- **Approval:** If the IRB has approved the research involving human subjects, the research may commence once all other organizational and/or local approvals have been secured. IRB approval is granted for a limited period of time, not exceeding one year, which is noted in the approval notification letter.
- **Requires Modification(s):** If the IRB requires modifications to secure approval, the notification letter will outline specific

revisions to the Human Research protocol and/or study materials, e.g., consent form. Human Research may not commence until the IRB grants final approval. If the Principal Investigator accepts the required modifications, s/he should submit the revised materials to the IRB within the timeframe specified. If all requested modifications are made, the IRB will issue a final approval notification letter after which time the Human Research can begin.

- **Deferral/Disapproval:** If the IRB defers or disapproves the Human Research, the IRB will provide a statement of the reasons for this decision. Deferral or Disapproval means that the Human Research, as proposed in the submission, cannot be approved and the IRB was unable to articulate specific modifications that, if made, would allow the Human Research to be approved. In most cases, if the IRB's reasons for the deferral or disapproval are addressed in a modification, the Human Research can be approved. In all cases, the Principal Investigator has the right to address his/her concerns to the IRB directly at an IRB meeting and/or in writing.

One of the major areas assessed by the IRB when reviewing a research protocol is the potential risk to the subjects from their participation. As mentioned previously, when discussing the ethical principle of Beneficence, it is incumbent on the investigator to minimize potential risk. Some research will by its nature involve more than minimal risk. In this instance, a risk/benefit analysis is presented to the IRB to assist the review process. A second focus of IRB review is the informed consent document. This document is assessed to ensure it contains the elements for consent as determined by the regulations and ethical guidelines: purpose of the study, risks and benefits associated with participation, alternatives to participation, confidentiality, compensation, a statement of the right to refuse participation at any time without penalty and a person to contact if they have questions about their participation or the research. In addition, the consent should be written in such a manner that it is understandable by a person that can read at the 8th grade level in their native language.

Human Subject Protection Training serves as the initial guidance for new investigators conducting research involving human subjects.

Institutions provide this training and there are online courses available as well. Documentation of Human Subject Protection Training by the investigator and those involved in the project is needed for submission to the IRB. This training provides the investigator with a basic understanding of the current regulatory and ethical information. Topics include: basics of IRB regulations and the review process, assessing risk to participants, avoiding group harms, conflicts of interest, and cultural competence. Also included is information on FDA-regulated research, genetic research, HIPAA-regulated research, informed consent, international research, Internet research, records-based research, research in schools,

research with protected populations, and research with vulnerable subjects, unanticipated problems and reporting, and students in research. Web-based training can be found from the NIH (<https://phrp.nihtraining.com>) and private educational sites such as the Collaborative Institutional Training Initiative at the University of Miami (CITI)(www.citiprogram.org).

Often considered daunting, obtaining review from an IRB for research involving human subjects can be a collaborative effort. The IRB can provide guidance and direction to the investigator to conduct valuable research with the subject's welfare and wellbeing at the forefront.

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Data Management 101: How to Construct and Maintain a Usable Dataset

R. Curtis Bay, PhD

Introduction

We advance our understanding of the human condition by asking questions. In dentistry, these questions are best answered through formulation of hypotheses that allow us to test the validity (truthiness) of one possible answer against others. Most simply, "This new treatment is better than what we have always used," or it is not.

Clinical questions arise naturally in the practice of clinical dentistry. Frequently, they are based on the desire to use the best available practices and procedures to optimize care for patients. Answers to clinical questions are readily available in the numerous dental journals and online content that have proliferated over the past few decades using an evidence-based approach to dentistry. Much of the evidence is trustworthy. Much of it is not. The best and most trustworthy evidence is investigator-initiated, that is, arising from clinical practice and initiated by those who seek a truthful answer, untainted by financial interest. Of course, trustworthy research is the product of sound scientific methodology. Fundamental to sound methodology is the construction of a consistent and replicable plan for data acquisition, recordation and analysis.

This session focused on the basic requirements for designing, constructing and maintaining a dataset collected in the course of conducting a research study. The nature of data was also discussed, and how it serves the purpose of research, including the various types or "qualities" of data that may be collected. Some types of data (interval and ratio-level) are more informative than others (ordinal and nominal data). It is almost always best to collect the most informative type of data that can practicably be collected. Data can always be "dumbed down" by recoding, but it is very hard to "smarten-up" data once it has been collected.

Statisticians tend to like numbers and in-

formation that comes in the form of numbers. Statistical software programs are designed to analyze numbers. Methods to codify information were shared to make datasets more amenable to statistical analysis. Examples included Male as "1"; Female as "2"; Amalgam as "1"; Composite as "2"; Glass Ionomer as "3."

Very importantly, the discussion included strategies about how best to communicate with the project statistician. Researchers should initiate communication with a statistician before and after data collection forms are designed; before these forms are used; after data entry has started and before it is completed; during the statistical analysis, and after it is finished. An open line of communication with the statistician will help to ease frustration and avoid headaches for all parties involved in the process.

Along with the data, the researcher should present the statistician with a "data map," or "dictionary" indicating explicitly what each variable is, the scale on which it was collected, and what the data elements mean. Specifically, what does a "1" mean in an Excel column labeled "Gender"? A "3" which is intended to represent an ordered category (3 out of 5 on a preference scale) will be treated very differently from a "3" reflecting a nominal category (eg. Glass Ionomer). The researcher should formally document the meaning associated with each number in a written form: Word and Excel work well. It is poor form to hand a statistician handwritten notes with multiple deletions and corrections, or to convey this information orally. Doing so may result in forgotten or lost communication, and the potential downgrade in priority of the project.

Find out early on if the analysis planned for the dataset requires a "wide" or "long" format. These are very different, and converting one to the other may be tedious. Simple, one-observ-

vation-per-subject datasets are straightforward: One line per subject, column headings in the first row. If the analyst is planning a mixed-effects treatment of the data, repeated measures on each subject are typically best treated in a one-observation-per-row format, with a unique identifier for each subject repeated across rows (a "long" format). However, some analyses (e.g., repeated measures ANOVA) require that all information, across all observations for a single subject, be entered in one row: a "wide" format.

In a "long" dataset, one or more variables must be included indicating how the multiple rows for one subject differ from one another. If row 1 is for a baseline visit, row 2 is the first follow-up, row 3, end-of-trial, then a column must be created to convey this information. It might be labeled "Visit." This information, of course, must be included in the data map.

Each cell in a spreadsheet can include only one piece of information. If the subject indicates that he is White, African American and Hispanic, this requires three columns in the spreadsheet. The statistical software, on import of the spreadsheet, will interpret a cell entry of "1 2 5" as text, rather than a series of numbers. If a subject is asked to list the years in which he has had restorative dental work performed, and he lists five years, this requires five columns in the spreadsheet. Worst are the "check all that apply" formatted questions. A separate column must be included for every possible response. An endorsement of a category equals "1"; a non-endorsement should be coded as "0".

Missing data should be explicitly coded as such; not with the word "missing," but with a numeric value that could not possibly be valid for a given variable. As an example, "99" entered as a value for a Likert-type variable scored 1 to 7 is an invalid entry, and must be flagged as "missing" by the analyst. Once "99" is defined as "missing," the statistical software will ignore that particular observation in subsequent analyses. Missing values should appear in the data map so that the analyst can define them as such before beginning the analysis. Again, do not type "missing" into a column which is defined as a numeric field. The data will be imported as text, rather than numeric, and will require conversion before the analysis proceeds.

Having analyzed data for over 2000 projects during 12 years at an academic medical center, and another 10 years at a dental, medical and

ancillary health sciences university, I issue this plea: CHECK AND CLEAN YOUR DATA BEFORE GIVING IT TO YOUR ANALYST!

I have re-run hundreds of analyses because the researcher failed to check his data before giving it to me. The analysis is completed; the output is sent to the researcher; we meet to go over the results. "Whoops! Those should be "7's," not "6's". Or, "Those values aren't possible for that variable." "Sorry, I should have checked my data more carefully. Would you mind re-running all of these analyses after fixing my mistakes?" Ask your analyst to run a set of descriptive statistics on the dataset, including means, standard deviations, frequencies, minima and maxima so that the numbers can be reviewed before the actual analysis begins.

And, as an aside, in spite of the fact that the popular press insists upon making "data" singular, as in "The data shows that ..." the word "data" is not singular, but plural. The singular form is "datum." When communicating with a statistician, nothing will mark you as unsophisticated as readily as asking him or her "what the data shows." Asking what the data "show" will immediately convey that you are "adept" with numbers, which will gain the statistician's respect and admiration.

In addition to a discussion about the fundamentals of data preparation such as those above, advantages and disadvantages of using databases rather than spreadsheets to capture research data were explored. Database software offers the potential for more security than software conventionally used for spreadsheets, and is highly customizable. It also requires considerably more skill to navigate, especially during the setup phase. In the case of complex datasets, with one to many relationships and/or highly sensitive content, databases may be worth the extra effort.

The session included a discussion of internet-based data collection systems, such as SurveyMonkey®, Qualtrics and REDCap™ (Research Electronic Data Capture), including the highlights and lowlights of each. Finally, a quick overview of Microsoft® Excel (spreadsheet) SPSS (statistical software) and Microsoft® Access (database) was provided, with a demonstration of how each may be used for research data collection and analysis.

Abstracts: Poster Presentations

Education

Formative and Summative Clinical Assessment: The Student Perspective

Linda D. Boyd, RDH, RD, EdD; Kristeen R. Perry, RDH, MSDH

Problem Statement: Identifying clinical assessment models that ensure successful application of knowledge and competency is a challenge for clinical educators. Current literature suggests that clinical teaching methods place stress on students which may impact student learning.

Purpose: The purpose of this study was to explore dental hygiene students' perspectives on the method of daily clinical grading versus formative feedback and summative (comprehensive patient case competency) assessment.

Methods: Based on the literature a BSDH program developed a method of formative and summative assessment for clinical curriculum. A survey was developed to gather student perspectives on the change from daily clinical grading to formative/summative assessment. A convenience sample of 48 dental hygiene students were surveyed through an online survey tool at the end of fall and spring semesters.

Results: The response rate was 100%. Responses were as follows: I felt like formative feedback allowed for more collaboration with clinical faculty than the daily grading format, 98% agreed/strongly agreed. Formative feedback encourages me to ask questions to enhance my learning, 98% agreed/strongly agreed. When asked about summative assessment, 98% agreed/strongly agreed; Summative assessment was an appropriate method to evaluate my abilities to provide evidence-based dental hygiene care. The main advantage cited: I feel like formative feedback opened more doors for questions, there was less pressure so it was easier to ask faculty questions regarding patient care and to know what's expected of you before being graded. Overall 83% preferred the formative/summative assessment to daily grading.

Conclusions: Based on student comments daily grading makes them reluctant to ask questions which is a necessary part of learning. Finding a balance between creating a safe environment where students can learn and assessing competence to ensure graduates can provide quality care is challenging, but this small study suggests formative and summative assessment system may facilitate student learning.

A Pilot Study to Determine Impact of Germ Simulation on Standard Precaution Compliance in Dental Hygiene Students

Susan L. Tolle, BSDH, MS; Joyce M. Flores, RDH, MS; Leslie A. Mallory, BSDH, MS; Vivienne A. Parodi, RN, DSN

Problem statement: Compliance with recommended infection control practices is essential to the safe practice of dentistry and often rooted in the educational setting.

Purpose: The purpose of this pilot study was to determine if participation in a germ simulation activity had an impact on standard precaution compliance in first year dental hygiene students.

Methods: This two-group, pretest-posttest design study used a convenience sample of 29 dental hygiene students as subjects. After informed consent was obtained, participants were randomly divided into control (n=15) and experimental (n=14) groups. A 10 item pretest/posttest questionnaire was given to both groups to determine level of compliance with standard precautions prior to the experimental intervention, immediately afterwards and 8 weeks later. Subjects only in the experimental group provided dental hygiene services in a treatment environment where simulated pathogens were placed in the oral cavity of a manikin. Following the activity, under black light conditions participants immediately viewed the spread of simulated pathogens. Before and after treatment photographs were also used for participants to further visualize changes in the treatment unit due to pathogen contamination as simulated by the polyethylene microspheres.

Results: Statistical analysis (ANOVA) of the 8 week pre/posttest questionnaire scores revealed no significant differences ($p=0.8207$) in standard precautions compliance in subjects who were exposed to the polyethylene microspheres simulation activity compared to subjects who were not exposed to the simulation activity.

Conclusions: Based on the results of this pilot study exposure to a simulated germ activity did not affect standard precaution practices in first year dental hygiene students. More research is needed involving a larger sample size over a longer period of time to determine the long term impact of germ simulation with polyethylene microsphere on compliance with standard precautions.

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

Kristeen R. Perry, RDH, MSDH; Linda D. Boyd, RDH, RD, EdD; Debra November-Rider, RDH, MSDH; Heather Brown, RDH, MPH

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

Purpose: The purpose of this study was to evaluate clinical dental hygiene faculty perceptions regarding assessment methods utilized in determining clinical competency.

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

Results: Results revealed use of OSCE (objective structured clinical evaluation)/practical

skill exams (83%) was perceived most effective in assessing competency followed by daily clinical grading (63%). Thematic analysis of qualitative data revealed formative assessment with the inclusion of summative assessment rated the highest (44%) as an effective method of evaluation followed by summative assessment (16%). Thematic analysis noted respondents may have a preferred assessment method but feel a blended approach of teaching should be utilized due to student diversity and learning styles.

Conclusions: Findings from this exploratory study show respondents are satisfied with assessments that they are currently practicing but report a variety of methods are needed to evaluate competency. Further research is recommended with a larger sample and more detail on how programs define assessment methods used to assess competency and outcomes to determine what methods are more effective in the evaluation of student competency.

A Survey of Clinical Faculty Calibration in Dental Hygiene Programs

Nichole L. Dicke, RDH, MS; Kathleen O. Hodges, RDH, MS; Ellen J. Rogo, RDH, PhD; Beverly J. Hewett, RN, PhD

Problem Statement: Clinical educators with varying backgrounds unite to develop competent graduates. While the goal is unified, the teaching methods might be conflicted. Calibration exercises that are inadequate could contribute to faculty variance and interfere with student learning, performance, and satisfaction. There was a lack of research studying clinical dental hygiene faculty's perception of calibration.

Purpose: This study investigated the calibration efforts of entry-level dental hygiene programs in the United States. Four aspects were explored: faculty attitudes, satisfaction, and characteristics as well as quality.

Methods: A descriptive comparative survey design was used. Directors of accredited dental hygiene programs ($n=345$) were asked to forward an electronic survey invitation to clinical faculty. Eighty-five directors invited 847 faculty, 45.3% ($n=384$) of who participated. The 17-item survey contained multiple-choice and Likert scale questions and was open for three weeks. Descriptive statistics were used to analyze demographic data and research questions. The Kruskal-Wallis, Spearman Correla-

tion Coefficient, and Mann-Whitney U tests were employed to analyze hypotheses ($p=0.05$).

Results: The demographic profile for participants revealed that most worked for institutions awarding associate entry-level degrees, had 1–10 years' experience, taught clinically and didactically, and held a master's degree. Clinical educators value calibration, believe it reduces variation, want more calibration, and are not offered quality calibration. There was a difference between the entry-level degree awarded and the program's evaluation of clinical skill faculty reliability, as analyzed using the Kruskal-Wallis test ($p=0.008$). Additionally, full-time versus part-time employees reported more observed student frustration with faculty variance, as evaluated using the Mann-Whitney U test ($p=0.001$, $bfp=0.004$).

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

A Faculty Development Program to Enhance Dental Hygiene Distance Education: A Pilot Study

Vicki J. Dodge, RDH, EP, MS; Denise M. Bowen, RDH, MS; Kristin H. Calley, RDH, MS; Teri Peterson, EdD

Problem Statement: Increased use of DE in dental hygiene curricula necessitates faculty members' awareness of pedagogy and methodologies promoting dynamic communication, developing learning communities, and increasing social presence in online courses.

Purpose: This pilot study was designed to assess current practices and perceptions of distance education (DE) dental hygiene faculty and evaluate the impact of a faculty development program to enhance best practices for teaching online dental hygiene courses.

Methods: Following IRB exemption, a purposive sample of distance education (DE) faculty ($N=7$) who taught online courses in DE bachelor's degree completion and master's degree programs listed by the American Dental Hygienists' Association participated in a pretest, distance education faculty development workshop, and posttest. The

Community of Inquiry framework provided the basis for the self-designed, valid, and reliable Distance Education Best Practices Survey instrument that assessed participants' practices and perceptions. Instrument validity was established by five experts in the field of distance education. Seven online faculty members established test-retest reliability of the survey instrument within plus or minus 1 of 97%.

Results: Frequency of use ratings ranged from 4.0 (regularly) to 5.0 (always) on a response scale ranging from 1.0 to 5.0. Results suggested a change in participants' perception of the importance of some factors associated with three essential educational constructs: (a) teaching presence, activities promoting lifelong learning ($p = 0.03$); (b) social presence, faculty communication fostering a SOC ($p = 0.04$), encouraging students' self-introduction ($p = 0.04$); and (c) cognitive presence, encouraging productive dialogue and respecting diverse opinions ($p = 0.04$).

Conclusions: Findings indicate a potential impact of faculty development programs designed to enhance online teaching, community, and satisfaction, even for faculty with high self-ratings regarding best practices. Evaluation of future faculty development programs on the implementation and impact of best practices is recommended.

Using Multiple Mini Interviews to Identify Noncognitive Attributes For Dental Hygiene Admissions

Jacqueline J. Freudenthal, RDH, MHE

Problem Statement: Traditional admissions interviews and selection criteria do not reliably identify non-cognitive attributes desirable for health professionals. The Multiple Mini Interview (MMI) demonstrates the ability to identify non-cognitive characteristics in admissions process but has not been assessed in dental hygiene.

Purpose: To determine if using MMI: 1) identifies desired non-cognitive attributes, 2) differentiates between domains identified as important for professionals and 3) yields admissions information that cannot be obtained by traditional means.

Methods: From 2011-2014, after IRB exemption, applicants ($n=146$) to a baccalaureate dental hygiene program participated in MMI including 5 individualized interviews with faculty. Every seven minutes, applicants moved between stations to

discuss short standardized scenarios, each designed to address an individual domain identified as important: communication, critical thinking, ethics, honesty, and professionalism. The interviewers used a standardized scoring form with six items (clear perception or understanding of the problem, effective communication, critical thinking skills, disambiguation in point of view, clear and focused responses, and overall performance described by a list of traits defined as professionalism) using a 5-point Likert scale to rate candidates. Points were averaged for each station and summed by attribute across the stations. Interviewers had training and written instructions on desired attributes and scoring.

Results: A nested model of generalizability was used to estimate variance component and interaction using a minimum norm quadratic unbiased estimation (MINQUE). A G coefficient of 0.74 compared favorably with the reported range for MMI's of 0.65-0.81. A Cronbach's alpha of 0.58 did not measure desired attributes across all five domains. No correlations were found between MMI and traditional cognitive measures.

Conclusions: Interviewers evaluated the candidates on their responses to domain scenarios rather than evaluating the desired attributes. Attention to all processes in the assessment of the attributes might improve reliability of the MMI in dental hygiene admissions.

Relevance of a Workshop to Prepare For Dental Hygiene Clinical Boards

Marie R. Paulis, RDH, MSDH

Problem Statement: Inadequate preparation for clinical board exams may prevent dental hygiene students from becoming licensed.

Purpose: The purpose of this study is to demonstrate the success of a workshop day to prepare dental hygiene students for their clinical board exam.

Methods: This pre and post survey study utilized a convenience sample of 41 dental hygiene students. The 8-hour workshop consisted of students serving as the voice of a mock board patient and typodonts serving as teeth. The self-designed instruments used were a pre-workshop survey, with 13 closed-ended questions and a post-workshop survey, with 11 closed-ended questions. Anonymous survey responses were collected through pa-

per surveys. Data were entered into an electronic database. Descriptive statistics were used to analyze the data. Since students were surveyed, IRB approval was required and obtained through expedited review from the University of Bridgeport.

Results: A 100% (N=41) response rate was achieved. Prior to the workshop, many students (27%) reported low confidence in identifying "readily detectable" calculus, whereas post-workshop, those "very confident" increased by 10%. The confidence level in completing the required paperwork doubled post-workshop with most (80%) stating they were moderately or very confident about paperwork requirements. The majority of students (70%) were not confident in patient choice but this number decreased by 12% post-workshop. In addition, about 10% of student respondents reported that exam anxiety dropped post-workshop. The majority of the students (66%) thought the workshop helped them realize exam time limits; 63% thought it helped them identify calculus; and 59% thought it helped them improve calculus removal skills.

Conclusions: Most students (80%) stated that they felt more confident in paperwork procedures post-workshop. In addition, the workshop participants perceived significant benefits in the areas of time efficiency, deposit identification, and calculus removal skills. Overall, 95% of students considered the workshop helpful.

A Comparison of Associate and Bachelor Degree-Seeking Students on Self-Perceptions of Senior Dental Hygiene Students as Health Educators

Deborah L. Dotson, RDH, PhD

Problem Statement: Although all dental hygiene programs include a patient education component, it is still unknown whether 4-year programs are more or less demanding as 2-year programs in the development of skills relevant to patient education beyond simple brushing and flossing instruction.

Purpose: The purpose of this cross-sectional study was to determine if dental hygiene students attending a 4-year program of study are more likely to perceive themselves as health educators than are students in a 2-year program.

Methods: Attempts were made to electronically contact all US accredited schools of dental hygiene.

Two hundred eighty-six program directors were successfully contacted and asked to fill out a questionnaire regarding health education in their curricula, and to invite their students to participate in the electronic student survey.

Results: Sixty-five programs (which was a response rate of 22.7%) and 307 students participated (211 in associate programs and 96 bachelor degree students). This was an average student response rate of about 5 students per participating program. Eighty-four percent of each group said their educational experiences have resulted in a positive shift in their views of the patient education role of dental hygienists. However, only 45% of the participating schools report requiring students to show competence in patient education specific to tobacco users or diabetics. T-tests for independent samples ($\alpha=.05$) showed no significant differences between the 2 and 4-year students on the variables of self-perception, behavioral intentions toward patient education, volunteerism, and career expansion. There was a significant difference in the variable of behavioral intentions toward professional leadership with 4-year students more likely to take an active role in the professional organization ($p=0.02$).

Conclusion: The vast majority of students participating in this study show positivity toward their role as patient educators. The expected difference in 2 and 4 year programs with regard to student perceptions of their role as patient educators was not found. The only area where 2 and 4 year students differed significantly was in their intentions toward professional leadership. Results of this study should encourage schools to require students to show competency in patient health education skills for smokers and diabetics. These are two of the most common issues affecting both oral and systemic health and less than half of the participating schools report requiring students to show competence in these areas of patient education. In order for dental hygienists to impact these two significant areas of need, they must be better trained.

Dental Hygienists' Perception of Preparation and Use for Ultrasonic Instrumentation

Joanna Asadoorian, RDH, PhD; Dani Botbyl, RDH; Marilyn J. Goulding, RDH, MOS

Problem Statement: Ultrasonic scaling technology has evolved dramatically providing greater clinical utility subgingivally including

instrumentation of light deposits and biofilm disruption, but it is unknown if dental hygiene curriculum has kept pace and reflects current applications.

Purpose: The aim of this ethically approved study was to assess new dental hygiene graduates' perceptions of preparedness and use of ultrasonic instrumentation.

Methods: All recent Canadian dental hygiene graduates were electronically surveyed about perceptions of preparedness and use with ultrasonic instruments. Descriptive and inferential statistics including frequencies, proportions, means and cross-tabulations were calculated to examine relationships between curricular characteristics and perceived perception of preparedness and use of ultrasonic instrumentation.

Results: Of the 1895 invited dental hygienists, 485 agreed to participate, reflecting a 26% response rate. Participants reported using ultrasonics about half of instrumentation time predominantly with magnetostrictive technology (75%). Of these, approximately 75% of respondents report primarily using straight inserts, demonstrating a lack of curve instrument use. Use focused on heavy deposits with straight, slim inserts, which indicated an incorrect use of the technology. Subjects were generally satisfied with ultrasonic education feeling reasonably well prepared in using ultrasonics. Although not statistically significant, higher levels of perceived preparedness were associated with graduates from the 3-year diploma program ($p=0.69$), whereas graduates from 18-month programs were associated with greater levels of confidence ($p=0.27$). Confidence with ultrasonics did not have an effect on subsequent use—a large proportion (70%) of participants increased use once in practice. An earlier introduction ($p=0.93$) and more practice time ($p=0.93$) in school were both associated with increased feelings of preparation and confidence.

Conclusions: New dental hygiene graduates perceive greater preparedness, confidence and use of ultrasonic instrumentation within a more traditional paradigm. In addition, the results indicate potentially incorrect and/or inappropriate application of current technology.

Funding for this project was provided by Dentsply Canada Ltd.

Teaching Dental Hygiene Students to Utilize the Logic Model for Community Outreach Programs

Karen M. Portillo, RDH, MS; Ellen Rogo, RDH, PhD

Purpose/Goals: A new program was implemented during the 2011-2012 academic year for the purpose of educating dental hygiene students to plan, implement, and evaluate community oral health programs using a Logic Model.

Significance: An essential role of the dental hygienist is to address community oral health needs to improve population health.

Approach/Key Features: In the fall semester, students selected groups of 2-4 and then identified an organization benefitting from an oral health program. Next, the group conducted a needs assessment to determine the type of program the target population required. A literature review on the target population was completed by each group to ensure students understood the dynamics of the population. Afterward, the students began planning the program using a Logic Model outlining the inputs, outputs, outcomes which included goals and objectives aligned with Healthy People 2020, assumptions and external factors. In the spring semester, the groups implemented the community outreach programs, evaluated the outcomes to determine if the goals and objectives were met, and wrote the analysis/evaluation using the Logic Model in a final report.

Evaluation: On the Logic Model assignments during the fall semester, students earned an average of 92.9% (n=26) in 2011; 93.9% (n=26) in 2012; and 92.9% (n=27) in 2013. On the Logic Model final report assignment during the spring semester, students earned an average of 89.1% (n=26) in 2012; 95.0% (n=26) in 2013; and 87.6% (n=27) in 2014. From a community impact perspective, students' programs provided outreach to 245 children and 43 adults in 2012; 246 children and 60 adults in 2013, and 254 children and 138 adults in 2014. For three years, students were successful in learning to utilize the Logic Model to address community oral health needs. The Logic Model was a useful framework for program planning, implementation, and evaluation.

The Effects of a Legislative Advocacy Project on Dental Hygiene Students' Knowledge, Values, and Actions

Leciel K. Bono, RDH-ER, BS; Ellen J. Rogo, RDH, PhD; Kathleen Hodges, RDH, MS; Teri Peterson, EdD

Problem Statement: Advocacy is vital to population oral health and professional growth. Linking leadership theory to practice as students participate in the legislative process is important in extending their knowledge of being change agents and becoming oral health advocates.

Purpose: The intent of this investigation was to assess the self-reported levels of knowledge, values, and actions of undergraduate and graduate students who participated in a legislative advocacy educational unit (LAEU).

Methods: A pretest/posttest design was employed with a convenience sample of 27 undergraduate and 13 graduate students. A questionnaire was administered before and after the completion of the LAEU – IRB approval #3594 and was administered using an online survey tool. Validity and reliability of the questionnaire was previously established. The data collection instrument assessed three subscales (knowledge, values, and actions) and barriers to future advocacy actions using a 7-point Likert scale. Assumptions of normality and homoscedasticity were tested before employing the RM-ANOVA to compare average scale responses.

Results: Both undergraduate and graduate students demonstrated a significant increase in knowledge, values, and actions ($p < 0.001$) from the pretest to the posttest. Bonferroni corrected p-values verified knowledge, values and undergraduate actions were statistically significant; however, actions at the graduate level were not significant. Actions were rated lower than the other two subscales. Cronbach's alphas revealed internal consistency of the subscales ≥ 0.80 . The top four barriers for both MS and BS students were lack of time to be involved, lack of comfort speaking to legislators or staff, lack of comfort testifying before legislators, and lack of priority to be involved in legislative advocacy.

Conclusions: Implementation of a LAEU with BS and MS students can positively influence the development of knowledge, values, and actions; however, mentorship in the professional association is needed after graduation to continue the development of future leaders.

Dental Hygiene Undergraduate Student Specialty Practicum Clinic: Medical and Dental Complexity of Clients

Lindsay Marshall, RDH; Rachel Haberstock; Sharon Compton; Minn Yoon

Problem statement: As the population ages and many older adults retain their teeth, there is an increasing need to better incorporate their complex medical and dental conditions into the dental hygiene care plan.

Purpose: The aim of this project was to determine the complexity of the medical and dental status of clients that attended a rehabilitation hospital based dental clinic as part of an undergraduate dental hygiene program.

Methods: The retrospective medical and dental histories of clients that attended a hospital-based dental clinic between September 2011 and April 2013 were reviewed by two independent research assistants. Information about demographics, existing medical conditions, medications and oral health conditions were recorded. Ten files were randomly chosen and audited to ensure calibrated data entry.

Results: Data from 164 client charts were entered into an electronic database. Clients had an average age of 66.5 years, with 61% (95/164) over the age of 65. Of these clients, 45% had experienced a major medical event while 12% suffered from dementia. 16% of clients required ambulatory support and close to 100% took multiple medications. Dental chart examination showed that 20% of clients had all twelve anterior teeth while 7% had at least sixteen posterior teeth and 22% of clients were edentulous. Review of the dental charts showed that 32% of clients seen had moderate to severe gingivitis while 22% had moderate to severe periodontitis.

Conclusions: Review of the records of these clients illustrates that this population has extensive medical and dental issues that can greatly influence dental hygiene treatment. A more thorough understanding of the complexity of these issues will allow the dental hygienist to better incorporate client conditions into the dental hygiene care plan, resulting in more comprehensive care.

Research funding for the project provided by School of Dentistry, University of Alberta.

Local Anesthesia Training Model Improves Confidence and Reduces Anxiety in Students

Anjum Shah, BSDH, RDH, MS; Tammy K. Swecker, BSDH, RDH, Med; Joan M. Pellegrini, RDH, MS, PhD; Al M. Best, PhD

Problem Statement: Administering the first local anesthesia injection is difficult and induces anxiety in dental hygiene students. There is no research on the benefit of using a preclinical model (eg. Frasco AG-3 IB), to enhance the transition from learning to practice of local anesthesia delivery.

Purpose: The aim of this study was to evaluate whether practicing on a local anesthesia training model prior to the students' initial injection on humans reduces anxiety and increases their confidence.

Methods: Following IRB approval, 29 senior dental hygiene students were randomly assigned to a control (n=14) and experimental (n=15) group. Both groups received the same didactic and cognitive concepts and technical skills necessary to administer local anesthesia. A pre-questionnaire was completed by all students. Participants in the control group took only classroom knowledge to the clinic. Students in the experimental group practiced on the training model for four one-hour sessions. Both groups administered local anesthesia during one 1½ hour clinical session to anesthetize the greater palatine, inferior alveolar and mental nerves of a student partner. All students completed a post-questionnaire.

Results: Univariate and multiple regression analysis revealed statistically significant differences in operator confidence and anxiety levels between experimental and control groups. Students in experimental group reported more confidence ($p < 0.001$) and significantly less anxiety ($p < 0.001$) when compared to the control group. Experimental group also reported fewer visible signs of anxiety (heart pounding, sweating, hands trembling) and needed less faculty guidance ($p < 0.001$).

Conclusions: In this study, practice on local anesthesia training model prior to students' live patient experience reduces anxiety, increases confidence levels and makes students less dependent on faculty assistance. This study suggests that pre-clinical models may have an important role to play in training dental hygiene students. A larger study is required to validate the results.

An Integrated Approach in Teaching Microbiology to Dental Hygiene Students

Laura Mueller-Joseph, RDH, EdD; Robert Elgart, PhD

Purpose: The purpose of this program was to evaluate the effectiveness of a redesigned microbiology laboratory course targeted for dental hygiene students with laboratory exercises focused on clinical applications.

Significance: Student centered learning in foundational science courses requires innovations to connect concepts, engage students and solidify intellectual understanding.

Approach: A foundational course in microbiology was redesigned to include 28 laboratory exercises utilizing microbes encountered in the dental hygiene clinic. The microbes were either confined to the oral cavity or to the clinical environment thereby enhancing the relevancy of the exercises to the discipline of dental hygiene. Each exercise was divided into six units, with a report due at the conclusion of each exercise. The key feature of the program was to utilize discipline related concepts to enhance the students understanding and appreciation of the subject matter. All of the basic laboratory principles of microbiology were covered in the redesigned course.

Evaluation: Evaluation of the program included a student opinion survey that addressed their level of engagement and appreciation of microbiology to the profession of dental hygiene. Students from previous microbiology lab sections taught by the same instructor were also surveyed. Results revealed that (80%) of students in the redesigned course felt very engaged/engaged as compared to (50%) of students in other course sections. Additionally, 90% of the students in the redesigned course felt their lab skills greatly improved/improved as compared to 30% of students in the other course sections. Of the students in the redesigned course who conducted a critique of the lab exercises, 74.3% found the laboratory exercises related well to the discipline of dental hygiene. Average end of course grades revealed (85%) for students in the redesigned course as compared to 83% for students in other course sections.

Funding was provided by Title III Student First Grant.

Enhanced Learning during the Dental Hygiene Process of Care

Cynthia Howard, RDH, MS; Andrea Beal, RDH, MS; Shirley Birenz, RDH, MS; Cheryl Westphal Theile, RDH, EdD; Robert Davidson, DDS, PhD

Purpose/Goals: To revise a dental hygiene care plan form for dental hygiene students whose clinical program is integrated into the curriculum of a large dental school. In this setting, a comprehensive clinical examination is completed by a dental student prior to the first dental hygiene appointment.

Significance: The new form includes both a template and a "guidebook" that: 1) Orients the dental hygiene student through the sequence of dental hygiene care, and 2) Fosters competency in clinical assessment without making the clinical encounter a passive and repetitive exercise for the patient.

Approach/Key Features: The revised form was fully implemented in 2013. Multiple evidence-based thinking skills are fostered by its design. Knowledge schema organization and slot features organize the process of care, coupled with watermarked cues that refer directly to evidence-based resources.

Evaluation: We compared the new form to that used in academic year 2011-2012. The most significant finding was its effect on students' analytical, i.e., predictive, skills regarding patient care. Using the new form, the median number of "Expected [Clinical] Outcomes" increased from a single outcome to three expected results of therapy (Mann-Whitney U Test; $N=50$; $W=1599$; $p < 0.001$). Our results show that the revised dental hygiene care plan form represents an improved instrument for dental hygiene students to gain competency in clinical assessment. Dental hygiene students were able to incorporate the completed dental student's treatment plan into one from a dental hygiene perspective, and identify an increased number of meaningful clinical outcomes.

Online Course Evaluations: Program Directors' and Students' Knowledge, Beliefs, and Practices of Online Course Evaluations From 100% Online Dental Hygiene Education

JoAnn M. Marshall, CDA, RDH, MSDH

Problem Statement: Dental hygiene students from 100% online dental hygiene programs have the convenience of completing course evaluations online, but most do not. It was the intent of this study to investigate reasons/methods to initiate change in student response rates to online course evaluations.

Purpose: This study sought to determine: If a relationship between program directors' knowledge and beliefs and students' knowledge, beliefs, and practices of online course evaluations influence students' response rates.

Methods: Two confidential electronic surveys with open and close-ended questions were sent to thirty-four program directors from 100% online BSDH degree completion programs and 100% online MSDH degree programs via e-mail. The survey instrument developed for the program directors contained 25 items and the student survey instrument contained 24 items. The instruments were pilot-tested with online students and faculty to establish content validity. The survey information was obtained through the use of an online survey website. Participation was voluntary and confidential. Descriptive statistics were used to analyze the data. IRB approval was obtained from the University of Bridgeport.

Results: The data revealed that the majority of program directors (78%) believe that students do not know how the course evaluations are used by the institution. The program directors suggested impressing upon the students the importance of the course evaluation process, a mid-term evaluation, and making the course evaluations mandatory. The data collected from the students revealed that few students (17%) believe their feedback is used to improve course content. The student respondents expressed that the course evaluation instrument is not always applicable to the particular class. Student respondents suggested that incentives would not increase their response rate. Additionally, students are concerned with anonymity.

Conclusions: As institutions of higher education continue to develop online distance education in dental hygiene, it is important to determine what factors motivate students to respond to online course evaluations and for faculty to educate students about the purpose of course evaluations in order for them to fully understand the importance of their participation in the course evaluation process.

Basic Science

Comparative Anti-Gingivitis Efficacy of Oscillation-Rotation Electric Toothbrush versus A Manual Toothbrush

Andrea Johnson, RDH, BS; Malgorzata A. Klukowska, DDS, PhD; Neresh C. Sharma, DDS, MS; Julie M. Grender, PhD; Erin Conde, BS; Pam Cunningham, BA; Jimmy G. Qaqish, BA

Problem Statement: Plaque control is essential for preventing gingivitis. A new brushhead design was developed to increase the potential for better plaque control and ultimately decreasing the risk of developing gingivitis.

Purpose: To evaluate an oscillating-rotating (OR) power brush with a novel brushhead utilizing angled bristle tufts to a manual brush for the reduction of gingivitis.

Methods: This study was a 4-week, randomized, examiner-blind, 2-treatment, parallel group study design. One hundred subjects with mild to moderate gingivitis were enrolled and instructed to brush twice daily at home for 4 weeks with their assigned toothbrush and marketed dentifrice. Gingivitis measurements were evaluated at Baseline and 4 Weeks using the Modified Gingival Index (MGI) and Gingival Bleeding Index (GBI). Data was analyzed using the Analysis of Covariance with Baseline as the covariate.

Results: The average baseline whole mouth MGI score was 2.060 for the OR and 2.048 for the manual group ($p=0.303$). The average BL number of bleeding sites was 14.6 for the OR and 14.8 for the manual group ($p=0.676$). At Week 4 the OR power brush group showed a 15.2% reduction in gingivitis, and 70.7% in number of bleeding sites, differing significantly ($p<0.001$) from baseline. The manual group had a 6.8% reduction in gingivitis and 46.3% in number of bleeding sites,

differing significantly ($p < 0.001$) from baseline. Between-group comparisons showed that the OR brush with novel brushhead was significantly better for reduction of gingivitis (123.7%, $p < 0.001$) and reduction of bleeding sites (51.5%, $p < 0.001$) at week 4 vs the manual toothbrush.

Conclusions: The oscillation-rotation power brush with the novel brushhead provided significant improvements in gingivitis as compared to a manual toothbrush.

Funding for this project was provided by Procter & Gamble.

Effects of Aromatase Inhibitors on Alveolar Bone Loss among Postmenopausal Women with Breast Cancer

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

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

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

Results: AI users had significantly deeper PD and CAL as compared to those not on AIs at the 18 month study visit. A linear mixed model was constructed to investigate bone height as a function of time, AI, calcium, vitamin D and bisphosphonate status, along with an interaction between AI and calcium status. A significant effect of time was found along with a significant AI status by calcium use interaction. Those on AI and calcium had a significantly lower bone height value (Mean=2.509, SE=.137) than those not on calcium (Mean=3.325, SE=.231) ($p = 0.005$).

Conclusions: AI therapy has an impact on the oral health of postmenopausal women. Data suggests a positive relationship between alveolar bone loss and the use of calcium supplementation among postmenopausal women.

Funding for this project was provided by the Michigan Institute for Clinical Health Research/CTSA pilot grant UL1RR024986, and the National Institute of Dental & Craniofacial Research (NIDCR) grant 1K23DE021779.

Gingival Abrasion and Recession in Manual and Power Brush Users

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Problem Statement: An investigation to evaluate if the use of manual and power brushes result in gingival recession and/or abrasion.

Purpose: To assess the presence of gingival recession in manual and power toothbrush users and to evaluate the relationship between the incidence of gingival abrasion and gingival recession. Secondary outcomes were the level of gingival inflammation, plaque scores and brushing duration.

Methods: This was a single center, examiner-blind, cross-sectional study consisting of a single visit including 181 subjects, 90 manual (MTB) and 91 power brush (PTB) users. Baseline assessments included gingival recession (GR) and abrasion (GAS) as primary parameters and level of gingivitis (BOMP) and pocket depth (PPD) were evaluated as periodontal parameters. Subjects brushed with their own toothbrush as they would at home. Plaque (TMQHPI) and brushing

time were assessed. A non-parametric ANCOVA was used for analysis of post-brushing group changes in GAS and an ANCOVA was used to compare brushes for TMQHPI reductions with baseline as the covariate. Two-sample t-test was used to analyze BOMP, PPD and GR.

Results: Whole mouth mean scores for GR were 0.10mm in the MTB and 0.08mm in the PTB group. Full mouth pre-brushing mean GAS scores were 11.5 for the MTB group and 10.6 for the PTB group ($p=0.389$). There was no correlation between GR and GAS for MTB and PTB. Overall GAS for PTB showed less incremental change following a single brushing exercise than PTB ($p=0.004$). The PTB group removed significantly more plaque ($p<0.001$) and brushed significantly longer ($p=0.008$) than MTB users.

Conclusions: In this adult population little gingival recession was observed in either the manual or power toothbrush user group. Both groups had comparable levels of GR and GAS. GAS scores were not explanatory for the observed recession.

Meta-Analysis of Oral Safety Data For 0.454% Stannous Fluoride Sodium Hexametaphosphate Dentifrice

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Problem Statement: Anecdotal reports of desquamation after using a 0.454% stannous fluoride (SnF₂) dentifrice with sodium hexametaphosphate (SHMP) have been documented. Consequently, steps were taken to objectively review the safety data collected from clinical trials investigating the dentifrice where normal, healthy subjects brushed daily with the dentifrice to determine the prevalence of this condition.

Purpose: To evaluate the safety of a 0.454% SnF₂ SHMP dentifrice by conducting a meta-analysis of data from clinical trials.

Methods: Forty-one randomized clinical studies involving 2664 subjects assigned to the 0.454% stabilized SnF₂ SHMP dentifrice leg of each study were included in the meta-analysis. The studies ranged from 2 weeks to 2 years in length depending on the study design. Subjects

were required to use the dentifrice daily under routine conditions at home. In each study, safety was assessed via clinical examination or voluntary subject report. Data from the 2,664 subjects was then analyzed and adverse events (AE) were summarized both by subject and event occurrence and assessed for severity and causality.

Results: The population exhibited considerable diversity in demographics, behaviors and oral health. Of the 2664 subjects assigned the SnF₂ SHMP dentifrice, 50 subjects (1.9% of the population) experienced an AE, with a 95% confidence interval of (1.4%, 2.5%). Desquamation was the most frequent AE identified in 17 subjects (0.6% of the population), with a 95% confidence interval of (0.4%, 1.0%). Desquamation was mild in severity, and contributed minimally to dropout (0.08% of the population). Other findings were less common, and overall, only 8 subjects discontinued use due to a treatment related AE.

Conclusions: This inclusive meta-analysis demonstrated that a 0.454% stannous fluoride dentifrice with sodium hexametaphosphate was generally well-tolerated over periods of up to 2 years daily use, with mild transient desquamation (<1%) representing the most common finding.

Funding for this project was provided by Procter & Gamble.

Access to Care

Dental Hygienist Attitudes Concerning Willingness to Volunteer Care for the Underserved Population

Lynn A. Marsh, RDH, EdD

Problem Statement: In pursuit of healthier communities, disparities in oral health care should be recognized and local resources for oral health services should be more readily available for the underserved population.

Purpose: The purpose of this study was to investigate registered dental hygienist attitudes concerning community service, sensitivity to patient needs, job satisfaction and their frequency to volunteer care for the underserved population.

Methods: The survey instrument was cre-

ated to measure the registered dental hygienist attitudes related to community service, spirituality, volunteerism, job satisfaction, sensitivity to patient needs and social responsibility and their willingness to volunteer care for the underserved population. There were 306 surveys distributed to registered dental hygienists on Long Island for completion. All items on the survey instrument were subjected to a factor analysis in SPSS version 19.0 to acquire distinct variables which were reduced to three variables, including job satisfaction, attitude toward community service and sensitivity to patient needs. This research study was conducted with IRB approval.

Results: This research study indicated that registered dental hygienists tend to be satisfied with their job position, held slightly positive attitudes toward community service and had a strong positive sense of sensitivity to patient needs. Registered dental hygienists who are members of the American Dental Hygienists' Association were more likely to hold positive attitudes toward community service activities than non-members. In addition, registered dental hygienists with higher levels of education had more positive attitudes toward community service. They did not differ in their level of job satisfaction.

Conclusions: Understanding what influences registered dental hygienists to volunteer care for the underserved population provides valuable information to dental hygiene programs and the importance of attitudes toward community service, sensitivity to patient needs and job satisfaction. It is vitally important that dental hygienists volunteer preventive and emergent care to the underserved population.

Dental Hygiene Students and Interprofessional Education in HIV, Involvement in the Institute of Humary Virology's Jacques Initiative (JI)

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Purpose/Goals: One in 40 persons thirteen and older living in Baltimore City has been diagnosed with HIV.

Significance: Preparing the Future (PTF) though the Jacques Initiative is an interprofes-

sional initiative with a goal of addressing the National HIV/AIDS Strategy by normalizing and integrating HIV into health professionals' future clinical practices. Dental Hygiene students participate in this program with peers through a multidisciplinary didactic and hands-on curriculum. In this hands on and didactic curriculum, students from these disciplines are introduced to the HIV epidemic and their role in addressing this issue collaboratively and interprofessionally.

Approach/Key Features: The curriculum emphasizes the dental hygienist's role as a primary care provider. Students were didactically and practically trained how to conduct rapid oral HIV testing. Through case scenarios presented by the PTF mentor, students developed skills in communicating and educating patients based on their test results. During the fall semester 2013, dental hygiene students tested 142 patients in the screening and urgent care clinics of the School of Dentistry. Testing provided awareness to individuals of their HIV status. Patients testing positive were linked to care via the PTF mentor.

Evaluation: Dental hygiene students completed a pre and posttest assessing their knowledge and attitudes toward HIV. Overall scores increased in both categories. The students' rating of 1) ability to have an informed conversation with my patients about HIV; 2) ability to discuss HIV in a culturally competent manner with patients; 3) comfort offering HIV testing to all patient rose by 75%, 48% and 25% respectively. All students (100%) issued high ratings for their experience in the PTF program as very good (63.6%) and good (36.4%) respectively. Interprofessional education creates an environment conducive to collaborative practice. Students also learn and value how members of other disciplines contribute to creating a stronger team when care is provided. Other health care providers gain insight into oral health care concerns which may not have been discussed in their curriculums prior to this innovative experience. This integrated learning experience provides student certification in salivary testing. Students are able to address HIV across the continuity of care spectrum.

Funding provided thru the JACQUES Initiative for testing kits and the University of Maryland School of Dentistry.

The Association between Early Childhood Caries (ECC), Feeding Practices, and an Established Dental Home

Erin A. Kierce, RDH BA; Linda Boyd, RDH, RD, EdD; Lori Rainchuso, RDH MS; Carole A. Palmer, EdD, RD, LDN; Andrew Rothman, MS, EIT

Problem Statement: ECC is a significant public health concern disproportionately affecting low-income children. Consistent preventive dental services are critical for Medicaid-enrolled children to reduce their risk of developing caries.

Purpose: The purpose of this study was to determine the association between the prevalence of ECC and the nutritional intake of a low-income child, with an established dental home. This study also compared ECC among two groups of children, one without an established dental home and one with an established dental home.

Methods: A cross-sectional survey was conducted among 132 Medicaid-enrolled children between 2 and 5 years of age with and without a dental home to compare feeding practices, parental knowledge of caries risk factors, and oral health status.

Results: Children with a dental home had lower rates of plaque ($P < 0.05$), gingivitis ($P < 0.05$), and mean dmft score ($P < 0.05$). Children without a dental home consumed more soda ($P < 0.05$) and juice ($P < 0.05$) daily, and ate more sticky fruit snacks ($P < 0.05$) than children with a dental home.

Conclusions: The results suggest that the establishment of a dental home, especially among high-risk, low-income populations, decreases the prevalence of ECC and reduces the practice of cariogenic feeding behaviors.

Snapshot of Dental Hygiene Diversity Trends

Andrea L. Beall, RDH, MA; Rosemary D. Hays, RDH, MS; Lisa B. Stefanou, RDH, MPH; Cheryl M. Westphal Theile, RDH, EdD

Problem Statement: As the U.S. becomes more ethnically diverse, there is need for health-care providers that can reflect and respond to an increasingly heterogeneous population. Workforce diversity has been associated with greater patient satisfaction with care and improved patient-provider communication. In addition, health profes-

sionals from underrepresented backgrounds are also more likely to provide care to underserved communities and to conduct health disparities research. Unfortunately, there is a lack of racial and ethnic diversity in the oral health workforce.

Purpose: The purpose of this poster is to compare ethnic backgrounds of the current U.S. population to dental hygiene students in the U.S and those specifically at New York University College of Dentistry (NYUCD).

Methods: Distribution of population by ethnicity was compared using the 2010 U.S Census and the 2010-2011 ADA Allied Dental Education Survey results.

Results: According to the survey, there was obvious disparity in the representation of minorities in the future of the dental hygiene profession compared to the U.S population (over 75% of enrolled students in all dental hygiene programs were White). However, the NYUCD dental hygiene program demonstrated a more accurate reflection in all groups. Minorities comprised almost half (46%) of this program's dental hygiene student population and Hispanic students (14.8%) and were almost a mirror image to the U.S. census. Black/African American students were still somewhat underrepresented in the program (7.4% compared to the U.S. population (12%) whereas Native Hawaiian and other Pacific Islanders (14.8%) were almost fifty times the Nation's distribution (0.2%).

Conclusions: Efforts to enroll more minority dental hygiene students across the country may result in a more equitable geographic distribution of dental hygiene health care providers and ultimately address one aspect of the access to care problem.

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

Jacqueline A. Juhl, RDH, MSDH Candidate; Ellen J. Rogo, PhD; JoAnn Gurenlian, RDH, PhD

Problem Statement: The treatment costs for Non-Traumatic-Dental-Complaint [NTDC] patients to Emergency Departments [EDs] has been reported as skyrocketing and ineffective. Local, state, and federal agencies struggle seeking cost-effective options while providing clinically effective quality of care for NTDC treatment.

Purpose: This study investigated rural-to-urban and an urban Washington State hospital Emergency Department [EDs] utilization from March, 2012 to March, 2013 to determine the demographic profiles, institutional administrative experiences, and clinical experiences of 1380 Non-Traumatic Dental Complaint [NTDC] patients.

Methods: After receiving IRB approval, (HSC #4005), data were electronically extracted from de-identified patient records and analyzed using a one-way t-test, Mann-Whitney U test, Pearson Chi-square analysis, and Fisher's Exact test with a 0.05 alpha level.

Results: Results indicated males (RTU=52.8%, URB=63.1%) utilized EDs more than female (RTU=47.2%, URB=36.9%) in both sample populations. Significant differences were found in demographic patient profiles ($p < 0.001$). In the rural sample population, more patients were <10 years of age (RTU=8.1%, URB=0.7%), and >70 years of age (RTU=3.0%, URB=1.0%) presented to the ED than in the urban sample population. Differences between geographic site providers were found in utilization of ICD-9 diagnostic codes ($p < 0.001$). Differences were observed in the kinds of ICD-9 codes used between both institutions and between provider types at the URB site. No significant differences were found for the institutional administrative experiences due to provided data inconsistencies.

Conclusions: Variances existed between URB and RTU institutions in several aspects of NTDC ED patient experiences which could impact policy development, federal funding, and future research. This investigation identified provider variance of ICD-9 codes in diagnoses of NTDC patients between URB and RTU providers and between provider types within EDs which might adversely affect patient outcomes.

Gender Differences in Masticatory Difficulty in Elderly Koreans

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Problem Statement: Masticatory difficulty is a common oral problem in aging people, affecting 50% of elderly Koreans. Thus, factors influencing the occurrence of masticatory difficulty

in males and females are of interest to dental hygienists.

Purpose: To identify gender differences in masticatory difficulty in elderly Koreans.

Methods: This study used data obtained during the 2011 Community Health Survey (CHS) of Korea. Data from 56,624 subjects aged over 65 years old who participated in the CHS were included in this study. Power analysis suggested that this was representative of 5,639,218 persons. Of those persons, 2,368,200 (42.0%) were males and 3,271,018 (58.0%) were females. Masticatory dysfunction was the dependent variable and independent variables were divided into regional factors (regional urbanization), demographic factors (age, education, monthly household income, qualification of basic livelihood recipient, private insurance, economic activity, living together), chronic disease factors (medical history of hypertension, diabetes), and oral health factors (number of teeth, denture status, subjective gingival health). The SPSS 20.0 program was used for statistical analysis, and T-test, ANOVA and multiple logistic regression were performed. To identify the factors that affected masticatory dysfunction, multiple logistic regression analysis was performed with demographic factors set as control factors.

Results: Prevalence of masticatory dysfunction was higher in elderly females than in elderly males (50.2% and 42.6%, respectively ($p < 0.05$)). The number of teeth (males: aOR=2.01, females: aOR=1.68) and subjective gingival health (males: aOR=7.60, females: aOR=7.31) had a higher influence on masticatory dysfunction in males than in females ($p < 0.05$). Hypertension (females: aOR=0.97, males: aOR=0.96), diabetes (females: aOR=1.07, males: aOR=1.05), and type of denture (females: aOR=1.75, males: aOR=1.57) exerted higher influence on masticatory dysfunction in females than males ($p < 0.05$).

Conclusions: Masticatory dysfunction in the elderly is mainly influenced by gender, customized management and education. Considering each influencing factor is required when planning dental hygiene interventions.

This study was performed with financial support of the 2013 Community Health Survey Research Fund of Korea Centers for Disease Control and Prevention.

Attitudes, Behaviors, and Needs of Team Dentists

Lesley A. McGovern, RDH, BS, MS(c); Ann E. Spolarich, RDH, PhD

Problem Statement: Elite athletes strive to attain superior levels of health and fitness; however, many have high levels of oral disease. Oral health may not directly affect physical ability to perform athletically; however, dental pain and dysfunction could alter level of performance during practice and competition. Oral screenings detect disease and need for treatment, and identify opportunities for preventive interventions. Many dentists volunteer their time with sports organizations, but knowledge about their scope of practice and needs are unknown.

Purpose: The purpose of this study was twofold. First, to gather baseline data to learn about practice behaviors, attitudes, and needs of team dentists. Second, to identify if/ how often oral screenings are conducted on athletes, differences in screening practices across leagues, and barriers to implementing regular oral screening programs.

Methods: An online survey using 37 supplied response questions was developed and pilot-tested for face and content validity. All dentist members of the Academy for Sports Dentistry were invited to participate (n=491), and 150 responded, yielding a 30.5% response rate. Data collected included level of athletes, league affiliation, scope of services provided, and type of oral screenings performed. Dentists' attitudes regarding athletes' treatment and preventive needs, practice behaviors, and self-identified needs were assessed. Descriptive statistics were used to analyze the data. IRB approval was obtained (USC UPIRB #UP-14-00326).

Results: Preliminary results revealed that 79.5% (n=116) of team dentists have a league affiliation. The most frequently provided services to athletes were emergency treatment and mouthguards (95.5%), restorative treatment (78.5%), oral hygiene instruction (63%), and prophylaxis (61%). Most team dentists (80%; n=90) perform oral screenings, with the most commonly reported screening being for all athletes prior to the season with individualized follow-up examinations (41%; n=36). The most commonly cited barrier to screenings reported was lack of awareness of the importance of oral health.

Conclusions: The majority of team dentists do perform oral screenings; however, lack of awareness about oral health supports the need for educational strategies for athletes, coaches, owners, schools and leagues.

Clinical Dental Hygiene Practice

Views of Dental Providers on Primary Care Coordination

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Problem Statement: Dental hygienists are well-positioned to screen for diabetes and hypertension and provide tobacco cessation and nutrition counseling at the dental hygiene treatment visit, notwithstanding such challenges as limited time and access to evidence-based resources.

Purpose: To assess dental hygienists' and dentists' perspectives and experiences regarding current scope of practice and the integration of primary care activities with routine dental care; and to assess the needs of hygienists and the office environment around primary care screening using a clinical decision support system (CDSS) at chairside.

Methods: In this exploratory study, we utilized maximum variation sampling to recruit 10 hygienists and 6 dentists from 10 urban dental offices with diverse patient mixes and volumes. A faculty dental hygienist conducted semi-structured, in-depth interviews, which were digitally recorded and transcribed verbatim. Data analysis consisted of multilevel coding based on consistent and systematic review, resulting in emergent themes with accompanying categories and identified hierarchy and predominance patterns.

Results: The majority of dentists and hygienists interviewed identify screening for hypertension and diabetes and discussing tobacco use and nutrition as relevant to their dental practices, particularly for vulnerable patients. Respondents suggested that such activities are important for many of their colleagues, although further analysis suggests certain challenges, including lack of continuity, accountability, resources, and systems-level support, with opportunities for im-

provement regarding timeliness, efficiency, and effectiveness. Dental providers' perspectives of patients' reactions to discussing the aforementioned health matters underscore salient barriers to care and support increased care integration. Overwhelmingly, hygienists reported using electronic devices at chairside to obtain web-based health information, with variation in terms of accuracy, quality, and reliability.

Conclusions: Dental hygienists occupy a unique and vital role in providing trusted patient-centered primary care, and may be well-positioned to help facilitate greater integration of oral and general health care, including screening, monitoring, and care coordination.

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Gingival Bleeding and Oral Hygiene of Women with Von Willebrand Disease

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

Purpose: The purpose of this pilot study was to examine the relationship between vWD, plaque score, and gingival bleeding and to determine oral hygiene habits, oral health quality of life, and dental care utilization in those with vWD.

Methods: This multi-site study included 40 adult women with vWD who completed a questionnaire to evaluate demographics, oral hygiene habits, and dental care utilization. The reliability and validity of the survey have been established, as the questions were derived from a previously conducted study on women's oral health. Clinical dental examinations were conducted to

determine the presence of plaque and gingival bleeding on the 6 Ramfjord teeth. vWD type and severity was determined through a chart review. IRB approval was obtained from the University of Michigan and Michigan State University prior to data collection.

Results: Data collection is ongoing. Current data shows that 50% of sites contained plaque, yet did not bleed upon flossing. Only 4.5% of sites without plaque bled upon flossing. A chi-square test will determine if bleeding is dependent on plaque presence. Each test will provide an odds-ratio and 95% confidence interval. Logistic regression will be used to control for confounding variables.

Conclusions: Current data suggests that vWD has minimal effect on the amount of gingival bleeding that occurs.

Funding for this study was through the Rackham Graduate School-University of Michigan-Ann Arbor.

Diabetes Detection: A New Intraoral Screening Approach in the Dental Setting

Lindsey Cohen Vine; Joanna Pitynski; Rosemary Hays, RDH, MS; Dianne Sefo, RDH, BA; Mary T. Rosedale, PhD, PMHNP-BC; Shiela M. Strauss, PhD, MA, BS

Problem Statement: According to the American Diabetes Association, approximately 25.8 million Americans have diabetes. Of this population, 7 million remain undiagnosed and unaware of their condition.

Purpose: The research study, "Novel Interdisciplinary Intra-Oral Diabetes Screening in Dental Patients," is examining whether oral blood (i.e., gingival crevicular blood (GCB)) collected from persons whose gingiva bleed on probing may be an efficient screening method for diabetes identification. A key component in this examination is the extent to which an optimal GCB sample can be obtained for analysis of hemoglobin A1c (HbA1c) in the laboratory. HbA1c, also referred to as glycated hemoglobin, is currently viewed by the American Diabetes Association (ADA) as an acceptable test for diabetes as it identifies the average plasma glucose concentration over a 2-3 month period.

Methods: Dental and dental hygiene students have been charged with collecting a debris free,

steady stream of GCB into a micro-pipette which is then released onto a sample card. Simultaneously, nursing graduates collected finger stick blood (FSB) from the patient for HbA1c comparison. Armamentarium, site selection and control of contamination factors assist the clinician in obtaining a sample viable for analysis. Several factors, including the patient's medical and social history, may affect the quality of GCB samples. Despite the factors outside of operator control, proper instrumentation, periodontal knowledge of the clinician, and the utilization of a laboratory adhering to ADA protocols can increase the likelihood of obtaining an accurate HbA1c result.

Results: In view of the large number of Americans who remain unaware that they have diabetes, it is imperative that we identify innovative, evidence-based tests and alternate sites for diabetes screening. Utilizing this novel approach to diabetes screening would increase opportunities to screen for this life-threatening condition. In fact, collection of GCB has been proven to be a promising method to enable HbA1c testing in the dental setting with preliminary findings indicating a correlation of GCB HbA1c and FSB HbA1c of 0.99.

The Frequency of Dietary Advice Provision in a Student Dental Hygiene Clinic: A Retrospective Cross-Sectional Study

Johanna Franki, BOH, BHSc(Hons); Melanie J. Hayes, BOH, BHSc(Hons), PhD; Jane A. Taylor, BDS, BScDent (Hons), MScDent, PhD

Problem Statement: While the majority of dental hygienists agree that they should have a role in providing dietary advice, research indicates it is implemented infrequently in practice. The perceived extent of training appears to affect dental hygienists' confidence in providing dietary advice; it would be therefore valuable to review whether students are adequately experienced in dietary counseling during their education and training.

Purpose: The aim of this retrospective, cross-sectional study was to assess the frequency of dietary advice provision by dental hygiene students and to investigate factors that influence the frequency that dietary advice is provided.

Methods: IRB approval was gained (Approval no H-2013-0116) and data were obtained from clinical records (n=1189) of third-year Bachelor of Oral Health students at the University of Newcas-

tle. The study examined the frequency with which dietary advice provision was recorded by students over a 12-month period. The study also investigated the age and gender of patients, as well as other treatment provided during the appointment, to determine whether these factors influenced the frequency that dietary advice was provided.

Results: The results indicated that dietary advice was provided infrequently by dental hygiene students, with only 6.48 percent of all patients seen during the 12-month period receiving dietary advice. Logistic regression analysis revealed a statistically significant correlation between dietary advice and age, with children 2.5 times more likely than adults to receive dietary advice ($p < 0.012$). Additionally, patients who received oral hygiene instruction were 2.5 times as likely to receive dietary advice ($p < 0.003$). Strong correlations were also observed between fluoride applications and dietary advice.

Conclusions: The findings from the present study indicate that dietary advice is provided infrequently by dental hygiene students. Further research is required to investigate barriers to dietary advice provision, including whether education and training in this skill is sufficient for future clinical practice.

Occupational Health

Radiographic Imaging for Disaster Victim Identification (DVI) In Dental Hygiene

Ann M. Bruhn, BSDH, MS; Tara L. Newcomb, BSDH, MS

Problem Statement: The ABFO recommends dental hygienists (DH) on disaster victim identification (DVI) teams; however, no curriculum exists on infection control in mortuary settings or radiation safety and technique when imaging human dental remains.

Purpose: The purpose of this study was to compare two groups (high media/low media) on DVI and errors made with radiographic techniques (paralleling and bisecting) for the exposure of images on simulated victim remains.

Methods: Participants were divided into two groups to compare knowledge and interest: the experimental group (n=20) received a high media lecture with topics on safety and radio-

graphic technique; the control group (n=18) received a low media lecture on the same topics. All participants took a pre-test measuring baseline knowledge and interest, participated in a radiology lab including 11 intraoral exposures with both techniques on simulated victim remains, and a post-test. A handheld x-ray device, (Nomad Pro®), direct digital sensor, lead barriers and modified image receptor holder were used.

Results: Interest was high from baseline (99.9%) to post-test (94.8%) on the role of the DH's for DVI teams. While no overall difference between groups was found for knowledge scores (p=0.6455). All participants improved from baseline to post-test in radiation safety (+58.9%) and infection control in a mortuary setting (+61.5%); scores were decreased from baseline to post-test in dental radiation technique (-17.9%) and forensics (-17.9%). The bisecting technique had significantly higher errors than the paralleling technique at the .05 level (p<0.001); errors in angulation occurred more frequently (mean=8.4).

Conclusions: DVI training is applicable for DH's with interest in safety protocols and radiographic technique when working in a mortuary setting. Knowledge increased similarly between the high and low media groups. The paralleling technique yielded better quality images with fewer errors on simulated victim remains.

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

Beckie M. Barry MEd, RDH; Ann E. Spolarich, RDH, PhD

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

Purpose: The purpose of this study was

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

Methods: A 47 item questionnaire was developed and pilot-tested for face and content validity. The online survey was sent to all licensed Mississippi dental hygienists (n=1,553), obtaining a 22% response rate. This IRB-approved study utilized a correlational design examining relationships between operator positioning and development and time to onset of MSDs, and impact of MSDs on practice behaviors and workforce retention. Data analysis consisted of Pearson chi-square correlation and Kaplan Meier survival analysis.

Results: There was no significant difference in prevalence of MSDs between those sitting in front of or behind the patient ($\chi^2 (1) = 1.67$, p=0.196), although those who sat behind the patient developed MSDs sooner ($\chi^2 (1) = 3.92$, p=0.048). Regardless of operator position, by 16+ years in practice, 80% (n=271/338) of dental hygienists developed MSDs. Having MSDs did not impact ability to work, need to take time off from work, reduce work hours or reduce patient load. Ergonomic devices were used by only 21.6% (n=73/338) of study participants.

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

Dental Radiographic Prescribing Practices: Survey of Illinois Dental Hygienists

Kathleen B. Muzzin, RDH, MS; Diane J. Flint, DDS, MS; Emet Schneiderman, PhD; Frieda A. Pickett, RDH, MS

Problem Statement: Potential harm from ionizing radiation has led to the development of guidelines to protect patients and practitioners from unnecessary radiation exposure, which may or may not be followed in practice.

Purpose: The purpose of this pilot study was

to survey Illinois Dental Hygienists regarding radiology policies in the workplace.

Methods: The survey was based on the 2004 American Dental Association (ADA) and Food and Drug Administration (FDA) "Guidelines for the Selection of Patients for Dental Examinations" and consisted of 46 knowledge and practice items regarding use of dental x-rays. Study granted exempt status by TAMU, BCD, IRB. All 823 dental hygienists, who were members of the Illinois State Dental Society, were sent an email that contained the survey link.

Results: Descriptive statistics were used to identify trends in decisions for taking radiographs within Illinois dental practices. One hundred twenty-two dental hygienists completed the survey for a 16% response rate. Approximately 48% of the respondents reported the dentist determined the need for radiographs and 47% reported the decision was made by the dental hygienist. The majority of respondents (81%) reported that a clinical examination was not performed before radiographs were taken. However, 91% stated they "sometimes or always" took radiographs based on the patient's clinical symptoms. A majority (92%) reported radiographs were ordered based on a set time interval and/or were taken when no clinical disease was evident (91%). Approximately 54% took radiographs based on insurance reimbursement. Roughly 62% had not taken a dental radiology course within the past 8 years.

Conclusions: This study suggests that dental practices were not following the ADA/FDA radiographic guidelines. However, due to the low response rate, the results cannot be generalized to all dental practices. A national study will be conducted to determine whether the radiology practice trends observed in this pilot study is widespread throughout the U.S.

Technology

Efficacy of Total Mouthwash Compared To Pro-Health and Placebo Mouthwash

B. Stewart; M. Morrison; J. Miller; J. Chung, DMD, MPH; S. Pilch; A. R. Elias-Boneta; R. Ahmed

Purpose: The objective of the double-blind, randomized clinical study was to evaluate the

clinical efficacy of Colgate Total Mouthwash - 0.075% CPC (fluoride and alcohol free) and Crest Pro-Health Mouthwash - 0.075% CPC (fluoride and alcohol free) vs. a negative control mouthwash in controlling established dental plaque and gingivitis after six weeks of product use.

Methods: Subjects were randomly assigned to one of three treatment groups according to their baseline gingival and plaque scores. The three treatment groups were: (1) Colgate® Total® Mouthwash containing 0.075% CPC - fluoride and alcohol free (Test Group), (2) Crest Pro-Health Mouthwash containing 0.075% CPC - fluoride and alcohol free (Positive Control Group) and (3) Placebo Mouthwash - fluoride and alcohol free (Negative Control Group). After brushing, subjects were instructed to rinse their mouth with 20ml of their assigned mouthwash twice daily for thirty seconds.

Results: After 6 weeks of product use, the Test Group exhibited statistically significant ($p < 0.05$) reductions of whole mouth gingival (24.4%), gingival interproximal (25.0%), gingival severity (46.4%), whole mouth plaque (21.5%), plaque interproximal (20.1%) and plaque severity (25.4%) index scores as compared to the Negative Control Group. After six weeks of product use, the Positive Control Group exhibited similar statistically significant ($p < 0.05$) reductions vs. the Negative Control Group. After six weeks of product use, no statistically significant ($p > 0.05$) difference was observed between the Test Group and the Positive Control Group.

Conclusions: The results of this double-blind clinical study support the conclusions that (i) both mouthwashes containing 0.075% CPC - fluoride and alcohol free - provide a significant reduction in dental plaque and gingivitis after six weeks of product use and (ii) no statistically significant ($p > 0.05$) difference was observed between the two CPC-containing mouthwashes in controlling established dental plaque and gingivitis after six weeks of product use.

Funding provided by Colgate-Palmolive Company.

Clinical Investigation of Whitening Efficacy on Colgate Optic White Dentifrice

A.R. Elias-Boneta; L.R. Mateo; E. Delgado, DDS, MSc; Y. P. Zhang; S. Miller

Purpose: The aim of this two-cell, double-blind clinical study was to assess the intrinsic tooth whitening efficacy for (1) Colgate Optic White Toothpaste (1% H₂O₂ and 0.76% sodium monofluorophosphate), and (2) matching placebo (0% H₂O₂ and 0.76% sodium monofluorophosphate).

Methods: Baseline Mean shade guide scores (Vitapan Classical) among maxillary anterior teeth were calculated for each of the consenting participants 7 days after a professional dental prophylaxis procedure. Participants were then randomly assigned to brush twice daily (morning and evening) for 1 minute each time with either the test or placebo dentifrice. Mean tooth shade guide and soft tissue examinations were repeated after 1 and 4 weeks of assigned product use. All examinations were performed under the same lighting condition and by the same examiner.

Results: Eighty voluntary participants entered the study, complied with the protocol and completed the four-week clinical trial. Both study groups (test and placebo) were balanced for Vita shade guide scores and all participants had an A3 or darker mean shade score at the baseline examination. The mean tooth shade improvements after 1 and 4 weeks of product use were respectively 1.05 and 2.38 for the test group and, 0.09 and 0.23, for the placebo group. The test group demonstrated statistically significant ($p < 0.05$) whitening improvements of 0.96 in mean tooth shade as compared to the placebo group after 1 week of product use and 2.15 after 4 weeks of product use.

Conclusion: The clinical results demonstrate that the 1% H₂O₂ and 0.76% sodium monofluorophosphate dentifrice provides statistically significant intrinsic tooth whitening improvements in mean shade scores as compared to a matching placebo dentifrice after 1 and 4 weeks use.

Funding provided by Colgate-Palmolive Company.

Efficacy of Total Mouthwash Compared To Listerine and Placebo Mouthwash

P. Chaknis; J. Miller; M. Morrison, PhD; S. Pilch; B. Stewart; A.R. Elias-Boneta; R. Ahmed

Purpose: This double-blind, randomized clinical study evaluated the clinical efficacy of two commercial mouthwashes against a negative control mouthwash in controlling established dental plaque and gingivitis after six weeks of product use.

Methods: Subjects were randomly assigned to one of three treatment groups according to their baseline gingival and plaque scores. The three treatment groups were: Colgate Total Mouthwash containing 0.075% CPC - fluoride and alcohol free (Test Group), Listerine Mouthwash containing essential oils with 21.6 alcohol - fluoride free (Positive Control Group) and Placebo Mouthwash - fluoride and alcohol free (Negative Control Group). After brushing, subjects were instructed to rinse their mouth with 20ml of their assigned mouthwash twice daily for thirty seconds. Gingivitis and plaque assessments were conducted after six weeks of product use.

Results: After six weeks, the Test Group exhibited statistically significant ($p < 0.05$) reductions of whole mouth gingival (27.0%), gingival interproximal (27.9%), gingival severity (48.5%), whole mouth plaque (27.4%), plaque interproximal (24.5%) and plaque severity (30.6%) index scores as compared to the Negative Control Group. After six weeks, the Positive Control Group exhibited similar statistically significant ($p < 0.05$) reductions vs. the Negative Control Group. After six weeks, no statistically significant ($p > 0.05$) difference was observed between the Test Group and the Positive Control Group.

Conclusion: The results support the conclusions that (i) Colgate Total Mouthwash containing 0.075% CPC - fluoride and alcohol free and Listerine Mouthwash containing essential oils with 21.6 alcohol - fluoride free provide a significant reduction in dental plaque and gingivitis after six weeks vs. the negative control mouthwash and (ii) no statistically significant ($p > 0.05$) difference was observed between Colgate Total Mouthwash containing 0.075% CPC - fluoride and alcohol free and Listerine

Mouthwash containing essential oils with 21.6 alcohol - fluoride free in controlling established dental plaque and gingivitis after six weeks.

Funding provided by Colgate-Palmolive Company.

In Vitro Stain Prevention Efficacy of Commercially Available Whitening Dentifrices

H. Strotman, MS; V.P. Maloney; S. Chopra

Purpose: To evaluate the stain prevention effects of four commercially available whitening dentifrices.

Methods: HAP discs were cycled through treatments to model daily exposure to toothpaste and stain components. HAP discs were treated with a 1:2 (w/w) dentifrice slurries made with Colgate® Optic White Whiten and Protect, a toothpaste containing 1% peroxide and a pyrophosphate system, Crest 3D White Luxe Glamorous White, a toothpaste containing disodium pyrophosphate, Rembrandt Deeply White + Peroxide, a toothpaste containing peroxide, and Colgate® Cavity Protection Paste, a toothpaste that does not contain peroxide or pyrophosphates. The discs were rinsed and baseline CielAB values measured with a spectrophotometer. Discs were cycled through three alternating exposures of a staining broth composed of coffee, tea, and wine (15 minutes), and saliva (20 minutes). CielAB measurements were recorded after the completion of each cycle. The HAP discs were treated with a 1:2 (w/w) toothpaste slurries and CielAB values measured. The change in whiteness before and after cycling is reported as ΔW^* . Analysis of variance was used to compare the mean ΔW^* values with $p < 0.05$ indicating significant differences.

Results: The dentifrice containing peroxide and pyrophosphate after cycle completion achieved a ΔW^* of 9.358 ± 0.330 , which is statistically significantly lower than the other tested dentifrices. The dentifrice containing pyrophosphate and the dentifrice containing peroxide produced ΔW^* values of 21.260 ± 0.681 and 21.738 ± 0.966 , respectively, and were not statistically different from each other. The toothpaste without peroxide or pyrophosphate gave a ΔW^* value of 32.172 ± 0.282 . This value represented statistically significantly more staining than the other three dentifrices.

Conclusions: In vitro testing demonstrated that Colgate® Optic White Whiten and Protect, a dentifrice containing a combination of 1% peroxide and pyrophosphates, provides superior stain prevention effects to other commercially available products.

Funding provided by Colgate-Palmolive Company.

Health Literacy/Cultural Competency

Avatar-Mediated Practice Scenarios to Evaluate Cross-Cultural Knowledge and Understanding

Tara Newcomb, RDH, MS; Joyce Flores, RDH, MS; Amy Adcock, PhD; Brett Cook, MS; Laurie Craigen, LPC, PhD

Problem Statement: Identified as a critical issue in dental hygiene education, to date there is no standardized assessment tool for cultural competence.

Purpose: The purpose of this study was to evaluate cross-cultural knowledge and understanding using avatar-mediated practice scenarios.

Methods: With IRB approval, 71 students from various mid-Atlantic community colleges, colleges and universities participated in this study. All materials and data collection instruments were embedded into an online computer-based instructional unit, which integrated instructional content, assessment items, and interview simulations into a seamless, dental hygiene environment. Participants were randomly assigned to one of the two groups: the experimental group received a pre-instructional unit, evaluation survey, knowledge posttest and culminating role play simulation and the control group did not receive the pre-instructional unit but completed the same other materials. Patient agent response was designed to be indicative of their culture.

Results: Using a One-way Analysis of Variance (ANOVA), results yielded an unexpected significant difference ($p < .01$) for the experimental group receiving both the pre-instructional and culminating role-play simulations. Formative evaluation on instructional content and simulation package were favorable. Participants were asked to rate the quality of instructional content, quality of

visual content, quality of audio content, and ease of use. A composite score for all categories yielded an average rating of 3.9 with a median of 4 and a mode of 5.

Conclusions: Instructional simulations mimicking real-world scenarios may be an effective means of instruction for complex and ill-structured diagnosis-solution problem types when participants are repeatedly exposed to the instructional simulation.

Health Behaviors

Systematic Review of Medical Providers' Knowledge and Attitude towards Oral Health Screenings for Children

Denise M. Claiborne, BSDH, MS, PhD
Student; Deanne Shuman, BSDH, MS, PhD

Objective: The incidence of Early Childhood Caries (ECC) remains a global concern; and affects a child's growth, development, cognitive and speech abilities. Unlike dental providers, medical providers such as pediatricians, nurses and physician assistants have more encounters with the mother and child during the first 12 months of life. Therefore, assessing the risk for ECC and educating mothers on establishing a dental home for the child should be encouraged among medical providers.

Search Strategy/Selection Criteria: Systematically review the literature of medical providers' knowledge and attitude towards oral health screenings for children.

Data Collection and Analysis: The literature was searched for articles published from 2000-2014 in the following databases: Pubmed, Medline, CINAL Plus Full Text, Cochrane Library. Inclusion criteria were: peer-reviewed journal articles of medical providers' knowledge and attitude towards oral health screenings for children, dental caries prevention, or caries risk assessments to children <6 years. The two researchers independently assessed quality and results of studies. Studies were organized according to specialty of the medical provider, type of study, sample characteristics, methodology and results.

Main Results: Preliminary results from the

databases used contained 819 articles to which 41 articles met inclusion criteria.

Conclusions: Medical providers' age, time of education, exposure to oral health training and the environment of medical practice influence the knowledge and attitude towards oral health screenings. Curricular modifications and continuing medical education (CME) courses pertaining to oral health education have been made in medical field to increase competency among providers.

Statistical Methods: Meta-analysis was not performed due to variations in methodology, research design and inferential statistics among studies.

Motivational Interviewing: Assessment of Dental Hygiene Students' Perceptions of Importance in Using and Confidence in Applying

Angela J. Mills, RDH, BSDH; Wendy E. Kerschbaum, RDH, MA, MPH; Philip S. Richards, DDS, MS; Gail A. Czarnecki, DDS; Anne E. Gwozdek, RDH, BA, MA

Problem Statement: Motivational Interviewing (MI) is an evidence-based, patient-centered counseling approach for eliciting behavior change. In 2012, the University of Michigan (U-M) Dental Hygiene Program significantly enhanced their Motivational Interviewing curriculum.

Purpose: The purpose of this study was to examine students exposed to the enhanced MI curriculum and assess both their perceptions of the importance of MI and their confidence in using it.

Methods: A convenience sample of 22 dental hygiene students receiving the enhanced curriculum from the U-M Class of 2015 participated in this study utilizing a retrospective pre-test/post-test design. A comparison group of dental hygiene students from the Classes of 2014 (28) and 2013 (25), who did not experience the enhanced MI curriculum, completed one of the post-tests. The U-M IRB approved this study as exempt.

Results: A t-test compared the Class of 2015 means and standard deviations reported for the importance and confidence questions. Students' perceptions of importance increased with statistical significance in five out of eight MI strate-

gies. Perceptions in confidence increased in seven out of eight strategies. Comparisons between the Class of 2015 and the Classes of 2013 and 2014 were analyzed using one-way ANOVAs. Significant cohort differences were found for importance with three MI strategies and for confidence with two MI strategies. Assessment of qualitative data provided additional insight on student experiences.

Conclusions: Class of 2015 student perceptions of importance of using and confidence in applying MI increased in a majority of the strategy categories. Successes with patient health behavior change and challenges with time to integrate this in practice were noted. Minor modifications in the curriculum have resulted. Research on longitudinal impact, utilization of individual strategies and faculty feedback calibration is recommended.

Funding for this project was provided by the U-M Center for Research on Teaching and Learning Faculty Development Grant.

The Role of Technologies in Promoting Periodontal Health

Mário R. Araújo, RDH, M. Psych; Cristina A. Godinho, MA; Maria-João Alvarez, PhD

Problem Statement: In order to improve our knowledge on the role of technologies (intra-oral camera, SMS and Gum Chucks) in dental hygiene appointments, we propose to investigate their predictive power in the Health Action Process Approach (HAPA), a self-regulation model of health behavior change.

Purpose: The aim of the study is to verify the applicability of the HAPA model in studying a sample of patients with gingivitis and the role of different types of technologies used in a dental hygiene appointment.

Methods: We are in the process of launching a four-wave longitudinal study for participants, patients with gingivitis, who will answer an online self-reported questionnaire, which will analyze their oral health behavior and the determinants of behavior proposed by the HAPA model (risk perception, outcome expectancies, self-efficacy, planning, and action control). Since the literature on dental hygiene behavior and on dental floss in particular has been criticized for being solely based on self-reported data collection, concrete clinical measures will be considered. Clinical data to evaluate the state of gingival health will be collected since, for instance, the fact that a person uses dental floss does not mean that its use is clinically effective. Thus, the data of Bleeding on Marginal Probing (BOMP) will enable the assessment of gingival health. The strategy for data collection, according to a quasi-experimental design, will be based on the use of qualitative and quantitative measures that will facilitate understanding the role of technologies in oral health behavior change.

Results: A multiple regression analysis will be performed to ascertain whether the use of technologies is among the best predictors of oral health behaviors.

Conclusions: We expect the study to help Dental Hygienists to decide when and what type of technologies to use in appointments on the basis of their role in health behavior change.

Abstracts: Oral Free Papers

Education

Linking Dental Hygiene Admissions Criteria to Licensure Examination Pass Rates

Tammy R. Sanderson, RDH, MSDH; Marcia H. Lorentzen, RDH, MSED, EdD

Problem Statement: Research specific to dental hygiene is needed to discover admissions variables currently implemented by programs, and to validate these variables as predictors of student success as evidenced by successful completion of the National Board Dental Hygiene Examination (NBDHE) and regional clinic licensure exams.

Purpose: Dental hygiene research can provide programs guidance to implement the best admissions practices for the profession. This study sought to first identify the many admissions variables currently being utilized by dental hygiene programs. Secondly, this study looked for associations between these variables and program pass rates on national and regional clinical board examinations.

Methods: An online survey was sent via email to 309 dental hygiene chairs/program directors. The survey was comprised of eighteen questions to collect program demographic information, program admissions requirements, and program pass rates on both the NBDHE and regional clinical board examinations.

Results: One hundred thirty-nine respondents participated in the survey for a response rate of 45%. Twenty-nine admissions variables were analyzed and correlated to program pass rates on regional clinical board examinations (N=131) and program pass rates on the NBDHE (N=133). Program demographic information indicates that the two admissions variables most often used by dental hygiene programs are overall college grade point average (GPA) at 67.6% and college science GPA at 61.2%. Multiple regression analysis detected no statistically significant variables as positive indicators for neither the NBDHE nor regional clinical licensure examination pass rates.

Conclusions: Currently there are no defined variables associated with clinical and national licensure pass rates. Further research is needed to identify variables that are associated with clinical and national licensure pass rates.

An Evaluation of the Effects of Blended Learning Pedagogy on Student Learning Outcomes

Luisa Nappo-Dattoma, RDH, RD, EdD

Problem Statement: The paradigm shift in healthcare reform has altered healthcare delivery and subsequently the role of the dental hygienist. It is imperative for dental hygiene education to incorporate engaging student-centered pedagogy to promote the critical-thinking and problem-solving skills required for the profession of dental hygiene.

Purpose: The purpose of this study was to evaluate the effectiveness of blended learning (BL) pedagogy on successful learning outcomes of sophomore dental hygiene students as compared to the learning outcomes of traditional face-to-face (F2F) teaching and learning.

Methods: Forty-one dental hygiene students in an Associate Degree program were enrolled in an IRB approved redesigned blended learning nutrition course required within the dental hygiene curriculum. Successful student achievement was evaluated by comparison of percent distribution of student final course grades between the redesigned BL course and the F2F traditional course from the previous academic year. Student scores on unit exams, final exams, in-class audience response system (ARS) clicker assessments, and pre-class online quizzes and puzzles were examined for student learning outcomes. Student engagement was determined by evaluating interaction and attendance in all online pre-class activities. To monitor student perceptions toward the BL pedagogy a mid-semester course evaluation was utilized.

Results: Blended learning was as effective as face-to-face learning in achieving successful student learning outcomes as evidenced by no significant difference between percent dis-

tribution of final course grades of A through C. Mean scores of exams illustrated similar results as compared to the previous year's F2F scores. Mean scores of in-class clicker assessments and pre-class online quizzes and puzzles demonstrated successful student learning outcomes.

Conclusions: Value added benefits of blended learning include increased pre-class preparedness, better attendance, enhanced student engagement, and active peer teaching and learning.

Funding for this project was provided by Title III- Students First Grant.

Factors Associated With Clinical Skill Remediation in Dental Hygiene Education Programs

Donna F. Wood, RDH, MS; Tanya V. Mitchell, RDH, MS; Lorie A. Holt, RDH, MS; Bonnie G. Branson, RDH, PhD

Problem statement: Evaluation of students in a clinical environment can be difficult for a variety of reasons, including faculty calibration, patient conditions and institutional guidelines. Early identification of skill deficits is critical in order for remediation to begin early in the educational process before deficiencies become complex.

Purpose: The purpose of this study was to examine the challenges related to formal clinical remediation in dental hygiene programs, which include timing of student identification, policy development and the issues of methodology and scheduling.

Methods: A 23 item investigator-designed survey was electronically distributed to 303 United States entry-level dental hygiene program directors. This questionnaire included 23 forced-choice questions with the options to add comments to eight of the questions. One hundred eleven surveys were returned yielding a response rate of 36%. Descriptive statistics and Chi-square analyses were utilized to analyze relationships between responses and the degree earned from the dental hygiene program.

Results: All schools reported having a remediation policy; however, 13.6% of the respondents revealed this information was not readily

available to students. The majority of respondents (67.8%) reported identifying students with clinical deficiencies in the pre-clinical semester, and 15.5% of respondents identified students in the second year, second clinical semester. Instrumentation technique was identified as the area in greatest need of remediation (81%), followed by critical thinking skills (12%). Coordination of faculty and student schedules to conduct remediation was identified as one of the greatest challenges by one-fourth of the respondents (25.2%).

Conclusions: These findings indicate that respondents are well aware of the need for remediation policies in dental hygiene programs. The point in time varies when students in need of remediation are identified. Therefore, further research needs to be conducted to determine the reasons for this difference.

Current Issues of Community Dental Hygiene Practice Education in Korea

Nam-Hee Kim, RDH, MPH, PhD; Yang-Keum Han, RDH, MD; Young-Kyung Kim, RDH, MPH; Hyun-Ju Lim, RDH, MPH, PhD; Yang-Ok Kwon, RDH, MPH, PhD; Han-Mi Kim, RDH, BA; Yeun-Ju Kim, RDH, BA; Jeong-Ran Park, RDH, PhD

Problem Statement: It has been 50 years since dental hygiene education started in Korea. Today, many dental hygienists are working in the clinical field; but more students wish to enter in the community field. On this context, we explore the practical training practice and issues regarding it in the current education program for community dental hygiene in Korea. We consider it is important to share the information with the dental hygienists around the world.

Purpose: We aim to find out the current issues of community dental hygiene practice education in Korea.

Methods: Cross-sectional study directed toward the 82 dental hygiene education institutions across the nation was conducted to explore this topic. We requested the cooperation of a faculty member of community dental hygiene for each institution. The data were collected via online with Survey Monkey, a web survey development program. Among the recipients, those who rejected to answer and who answered do

not participate in practical training for community dental hygiene was excluded from the final analysis. 46 faculty members (response rate: 60%) from 79 institutions were included in the analysis. Statistical analysis includes the descriptive and frequency analysis using SPSS 20.0 program.

Results: The 60% of the dental hygiene education programs in Korea are currently conducting the community health center practical training, which is mainly operated during the junior or senior of the students. The main curriculum of the practical training allows students to experience government-leading dental hygiene projects, including fluoride and scaling. Through the community health center training, the students are able to experience their institution's dental hygiene field, meet members of the community to examine their oral health need and design the promotion plans for them. Since the curriculum mainly consists of exposure to the field and hands-on experience of the everyday practice of the field, the program is helpful in building up field experiences.

Conclusions: Showing actual practice and having students to have hands-on experience help students to accumulate the field experience. However, the program needs to be enhanced in terms of basic planning capability of the students, where they can capture the needs of the community, decide priorities, set goals, conduct the projects to achieve those goals and assess the results, all under the continuously changing needs of the community dental hygiene project.

Funding for this project was provided by the Korean Association of Dental Hygiene Professors.

E-Model of Online Learning Communities

Ellen J. Rogo, RDH, PhD; Karen M. Portillo, RDH, MS

Problem Statement: The literature is limited on the phenomenon of learning communities in an online program.

Purpose: The intent of this inquiry was to explore graduate students' experiences with learning communities as they progressed through an online dental hygiene curriculum.

Methods: Approval was granted by the IRB (HSC #3618) before implementation of the qualitative case study. A cross-sectional approach was used to recruit participants. The interviewer was a recent graduate of the program and was responsible for completing informed consent procedures. A semi-structured interview was employed to gain deeper responses related to the phenomenon. Interviews were audio recorded, transcribed and then verified to assure accuracy. Data analysis was completed by a three step process involving open coding, focused coding and theoretical coding.

Results: Seventeen participants completed interviews. The data revealed that learning communities followed four stages throughout the graduate program (1) building a foundation for the learning community; (2) building a supportive network within the learning community; (3) investing in the community to enhance learning; and (4) disconnecting from the learning community. Three key elements were constructed from the analysis to create the e-model: experience with strengthening online relationships through fellowship, collective and synergy; metamorphosis through the affective domain from the awareness level to the highest level where values guide actions in the online learning community; and metamorphosis through the cognitive domain from the remembering level to the highest level of creating knowledge.

Conclusions: The interrelationship between the experience with strengthening online relationships, affective development and cognitive advancement are the essential factors needed for maximizing the potential of learning communities in an online program. Dental hygiene students and educators need to be mindful of these factors when participating in and designing an online curriculum.

Funding for this project through American Dental Hygienists' Association.

Assessing The Cultural Competence/ Faculty Development Needs among Florida's Allied Dental Faculty

Linda S. Behar-Horenstein, PhD; Frank A. Catalanotto, DMD; Cyndi W. Garvan, PhD; Yu Su, MEd candidate; Xiaoying Feng

Problem Statement: The Council of Dental Accreditation (CODA) requires that prospective

dental health care providers become culturally competent, socially responsible practitioners. However little is known about the skills of the State of Florida allied dental faculty who train the state's workforce.

Purpose: The purpose of this study was to assess the cultural competence and faculty development needs among Florida's allied dental faculty.

Methods: Participants were asked to take the Knowledge, Efficacy and Practices Instrument (KEPI), (RR= 117/193 or 61%) and the faculty development assessment survey (RR = 115/204 or 74%). The KEPI, a validated measure, provides mean scores for three subscales: efficacy of assessment, knowledge of diversity, and culture-centered practice. The faculty development assessment measures knowledge of and priorities in teaching, scholarship, and career advancement. IRB approval was obtained from the University of Florida.

Results: Mean scores for KEPI subscales are 3.30 ($\alpha=.88$), 3.58 ($\alpha=.88$) and 2.85 ($\alpha=.74$), (4 is highest) respectively. Participants indicated low knowledge and high priority needs in 18 of 25 faculty development assessment measures.

Conclusions: Professional schools are typically diligent in ensuring students' technical and procedural skills. However, rarely do they assess if faculty meet the needs of ever-changing, diversified student body. This problem is further exacerbated by a lack of training in pedagogy and assessment methods. Given the CODA mandates, it is crucial to assess faculty needs and priorities. Previous studies have shown that there is an inverse relationship between knowledge areas and priorities. Similar findings were observed in this study, though participants showed higher mean scores on the KEPI compared to the dental faculty. The findings suggest the faculty development assessment needs among allied dental and dental faculty are similar and that allied faculty seem inherently more culturally competent than dental faculty. Whether the latter result is due to training or socialization into the profession is unknown.

Funding for this study was provided by the Health Resources and Services Administration Award # 1 D86HP24477-01-00.

The Impact of Clinicians' Interpersonal Skills: Differences between Dentally Anxious and Non-Anxious Patients

Laura J. Dempster, RDH, MSc, PhD

Problem Statement: The clinician/patient relationship has important implications for patient care. Evidence supports the importance of this relationship based primarily on clinicians' interpersonal skills, less on technical skills. Interest lies in the impact of this relationship for patients in general and dentally anxious patients in particular.

Purpose: To investigate patients' perceptions of clinicians' interpersonal skills related to communication, trust, control and ethical behavior.

Methods: Third year dental students randomly selected patients at the University of Toronto, Faculty of Dentistry to complete a paper questionnaire regarding their thoughts and feelings about dental treatment. Dental anxiety was assessed (Modified Dental Anxiety Scale (MDAS), Dental Fear and Avoidance Scale (DFAS)), plus patients' perceptions of clinician behavior based on the Revised Dental Belief Survey (R-DBS) scored 1 (never)- 5 (almost always). Data was confidential with all personal identifiers removed when reported. Ethics approval was received from the University of Toronto.

Results: 281 patients participated (60.2% female; mean age 55.3 years; range 14-86 years). Patients reported the following issues: communication (17.7%; mean(sd) 2.0 (0.6)); ethics (20.3%, mean(sd) 1.8(0.50)); trust (17.3%, mean(sd) 1.7 (0.6)); and lack of control (2.1%, mean(sd) 1.8 (0.6)) as occurring somewhat/often/nearly always. 39.1% of subjects (n=110) reported dental anxiety based on the MDAS (score >15) and DFAS (scoring >5 for fear and avoidance) with significantly higher ($p<0.05$) mean(sd) scores and percentage of communication, trust, control and ethical issues for the majority of questions with the exception of 3 ethics related questions.

Conclusions: Clinicians' interpersonal skills appear important to patients in general, but more so for dental anxious patients. All patients reported concern that clinicians do not provide all the information needed to make good de-

cisions for treatment; are reluctant to correct unsatisfactory work; and do not take the time to talk to patients. This should be noted by clinicians as well as educators to ensure inclusion of curriculum related to interpersonal skills.

Guiding Dental Hygiene Students in Creating Employment E-Portfolios That Can Help Hygienists Find Jobs

Sharon L. Mossman, RDH, EdD

Problem Statement: The assessment portfolio used in the entry-level degree dental hygiene curriculum at Delaware Tech Community College validates the effectiveness of the students' training but offers limited use for their employment search. This oral presentation identifies the need to develop student employment e-portfolios for use in job searches from the employers' perspective.

Purpose: The goal of this study was to assess the usefulness of student portfolios in the dental hygienists' employment search. In order to assist dental hygiene students with this endeavor, it is necessary to identify what types of resources students have available to them.

Methods: A qualitative research approach investigated how the current portfolio could be modified to meet employment search initiatives. The data collection used a combination of literature/document review, surveys with 20 senior dental hygiene students/7 dentists and face-to-face interviews with thirteen dentists. Interviews were audio-recorded; notes were transcribed and emailed to the participants for content approval. The interviews captured information about desirable content, navigation strategies and how the employment portfolio could be used in the hiring process. An inductive data analysis was used to identify coding frames. A systematic technique was designated to determine subdivisions in the transcripts that contain common themes. Two doctoral candidates provided a peer debriefing strategy to confirm accuracy of common themes identified in the analysis of the interview transcripts.

Results: The data analysis supports the use of electronic portfolios for the students' job search. Desired content was recommended based on the interview results. This included education/honors, professional experience, validation of licensure and references.

Conclusions: The development of a professional tool to assist students and employers in the hiring process aligns with the college's mission to prepare students for successful employment.

Theory Analysis of the Dental Hygiene Human Needs Model

Laura L. MacDonald, DipDH, BScD(DH), MEd

Problem Statement: Over 20 years ago, dental hygiene scholars challenged the profession to identify dental hygiene concepts and theories purporting to be dental hygiene-knowing (epistemology) and dental hygiene-being (ontology). The Dental Hygiene Human Needs Model (DH HNCM) offered by Darby & Walsh (1995) informs curricula and practice of many dental hygiene programs; the model guides student knowing of the profession's way of being.

Purpose: The purpose of this scholarly activity was to conduct a theory analysis on the DH HNCM using the Walker and Avant Theory Analysis (2011) method. This methodology focuses on concepts, relations, and propositions of a profession's phenomenon of interest; it promotes scholarship and professional accountability to advancing professional theoretical underpinnings.

Method: A single scholar used the Walker and Avant seven step theory analysis to explore the DH HNCM: 1) origins; 2) concept(s) relationship(s); 3) logic of structure; 4) usefulness to practice; 5) generalizability; 6) parsimony; and 7) testability.

Results: The DH HNCM was deductively derived from a middle range nursing theory, the Yura and Walsh (1983) Human Needs and Nursing Process Theory. It was constructed based on the four dental hygiene concepts (client, health/oral health, environment, and actions). Respecting humans have needs and dental hygienists are positioned to facilitate the client in satisfying these needs, the DH HNCM provides logic, ease and generalizability independent of practice setting. It is parsimonious and testable, though it remains theoretical in nature at this time.

Conclusion: Conceptual models, schematics of a theory, depict relationships between concepts and constructs of the theory. The Darby and Walsh DH HNCM is a depiction of a middle

range dental hygiene human needs theory. The Walker and Avant Theory Analysis of the DH HNCM affirmed the model is reasonable and insightful, adding greatly to the epistemology and ontology of the dental hygiene profession.

Dental Hygiene Student Practicum Experiences In A Hospital-Based Dental Clinic

Minn N. Yoon, PhD and Sharon M. Compton, RDH, PhD. University of Alberta, Canada

Problem Statement: To prepare dental hygiene students to serve the dental needs of medically complex populations, it is crucial students have experiences to develop familiarity and comfort with a variety of practice settings such as hospital-based clinics, and develop confidence in their skills to treat such populations.

Purpose: The aim of this study was to gain an understanding of the dental hygiene student perspective of experiences in an external practicum at a hospital-based dental clinic.

Methods: This study was approved by the University of Alberta Human Research Ethics Board. Reflective journals submitted by senior dental hygiene students were subjected to content analysis to identify major themes. Questionnaires were presented using an online tool, which asked students to self-report their level of comfort and confidence in domains of practice readiness on a 4-point Likert scale.

Results: The presentation will overview the practicum and findings from the reflections in which students expressed initial fear of the experience, an enhanced understanding of current disparities in oral health and oral care for vulnerable and medically complex clients; a working through of physical and emotional reactions to the experience; and an appreciation for the learning they have obtained. An overview of the previously validated Readiness for Practice Survey will be provided as well as how it was adapted to address the dental hygiene student population. The domains of practice readiness: comfort and confidence with both clinical and relational skill performance and the development of professional identity of the dental hygiene students will be outlined.

Conclusion: Providing a clinical learning en-

vironment that exposes students to more medically complex and vulnerable populations can impact the level of comfort and confidence of dental hygiene students' capacity to treat such clients and enhance their understanding of complexities involved in treatment.

Funding for this project was provided in kind by the University of Alberta.

Basic Science

Identification and Characterization of Novel Human Papillomaviruses in Oral Cancers

Juliet Dang PhDc, MS, RDH; Nancy B. Kiviat, MD; Qinghua Feng, PhD; Stephen Hawes, PhD; Greg Bruce, PhD

Problem Statement: To identify novel human papillomaviruses (HPVs) using high throughput sequencing technology in oral lavage samples (OLS) collected from oral squamous cell carcinoma (OSCC) and oropharyngeal squamous cell carcinoma (OPSCC) patients.

Purpose: In our previous study, we identified and cloned 3 full-length novel HPVs in OLS collected from healthy individuals. We hypothesize that novel oncogenic HPVs can be detected in OLS collected from OSCC/OPSCC patients.

Methods: We collected OLS from 110 healthy subjects and 100 from OSCC/OPSCC patients. HPV 16 and 18 were detected using type-specific real-time PCR Taqman assays. Multiply-primed rolling circular amplification (MP-RCA) was performed on 49 OSCC/OPSCC samples to preferentially amplify circular HPV genomes. Four pooled samples were selected to undergo Next Generation Sequencing (NGS) using the HiSeq 2500 platform, and sequence data was analyzed using VELVET and BLASTN search.

Results: Only one control sample (1/110) was positive for HPV 18 and none were positive for HPV 16. Twenty-three OSCC/OPSCC samples (23/100) were positive for HPV 16 (p-value <0.001), and none were positive for HPV 18. We identified five potentially novel HPV types in OSCC/OPSCC samples using NGS.

Conclusions: HPVs can be detected in OLS, which could be used for oral cancer detection in

the future. Novel HPV types are identifiable in OSCC/OPSCC samples using NGS after MP-RCA enrichment. Future studies are needed to determine whether the novel HPV types we identified are oncogenic.

Funding for this project was provided by the ITHS TL1 Training Program and the University of Washington Royalty Research Fund.

Access to Care

Effects of Power Toothbrushing on Caregiver Compliance and Oral and Systemic Inflammation in a Nursing Home Population

Salme E. Lavigne, RDH, MSDH, PhD(c); Malcolm B. Doupe, PhD; Anthony M. Iacopino, DMD, PhD; Salah Mahmud, MD, PhD; Lawrence Elliott, MD, MSc

Problem Statement: Oral care in nursing homes is deplorable and caregiver compliance problematic. Power brushes may improve oral hygiene and caregiver compliance.

Purpose: The purpose of this study was to investigate whether twice-daily use of a rotating-oscillating power toothbrush (Oral-B Professional Care 1000™) with nursing home residents will improve caregiver compliance with oral care and reduce oral and systemic inflammation.

Methods: In this repeated measures single-blinded randomized controlled trial, after receiving IRB approval from the University of Manitoba, 59 residents of a nursing home in Winnipeg, Canada, were randomized to receive either twice daily brushing with a power toothbrush or standard care. Consent was obtained from either residents or their proxies. Participants had some natural teeth; oral inflammation; non-aggressive behaviour; no communicable diseases; non-smokers and non-comatose. Baseline and 6 weeks outcome measures included: oral inflammation (Lobene); bleeding (Loesche); plaque (Turesky); systemic inflammation (hsCRP); caregiver compliance (daily care chart); and an 11-item caregiver survey. Oral & systemic data were measured by ANOVA and Wilcoxin and Mann-Whitney tests; compliance and survey data using descriptive statistics.

Results: No significant differences were found between groups in oral or systemic outcomes;

both groups significantly improved oral parameters ($p < 0.0001$). Caregiver compliance was 41% with no difference between groups. Caregivers preferred (69%) the power brush and 78% found it easier to use.

Conclusions: Power toothbrushes may be preferred options for use in nursing homes but caregiver compliance remains an issue.

Funding was provided by the Canadian Foundation for Dental Hygiene Research and Education; power toothbrushes were provided by P&G.

Transforming the Culture of Oral Care in Long-Term Care

Mary F. Bertone, RDH, BScDH

Purpose: Older adults residing in long-term care are at high risk for compromised oral health due to frailty and dependence on others for oral care.

Significance: Several studies have cited significant barriers to the provision of oral care for older adults including: lack of knowledge among nursing staff, competing care needs taking greater priority, limited oral care supplies and limited access to oral care services (BC Seniors' Oral Health Secretariat, 2011; Samson, Berven & Strand, 2009).

Approach: This presentation shares preliminary findings on a pilot study of a new model of care that includes a dental hygienist on the interprofessional care team in a 175 bed long-term care home. This conceptual model is based on oral health promotion strategies built on the pillars of standards, commitment, education and training, assessment and professional care, and daily mouth care. These pillars are supported by the principal actions of assessing strengths and challenges, collaboration, engaging personnel effectively and applying best practices. The outcomes of a dental hygienist providing oral health education, training and mentorship on staff knowledge will be discussed. The pilot, currently in progress, is testing a "new" oral health assessment tool and daily care plan. The role of the dental hygienist in improving access to dental treatment will be assessed.

Evaluation: Baseline data, oral health as-

assessment tools and nursing education and mentorship strategies will be shared. This innovative and collaborative strategy brings together nursing and dental professionals to advance care approaches and improve the oral care of older adults in long-term care.

Funding for this project was provided by Rivera Retirement Living.

Oral Cancer Awareness among Community-Dwelling Senior Citizens in Illinois

Ewa Posorski, RDH, MS; Linda Boyd, RDH, RD, EdD; Lori J. Giblin, RDH, MS; Lisa Welch, RDH, BS, MSDH

Problem Statement: Low oral cancer (OC) survival rates are disproportionally over represented in the low SES population. While the socioeconomically disadvantaged individuals are at highest risk for OC, they are also typically the population without access to preventive and screening care.

Purpose: The study assessed participant awareness of oral cancer, risk factors, signs and symptoms, and history of an OC screening exam and whether a relationship exists between these factors and the participant's age, level of education, SES, ethnicity, and gender.

Methods: The study was granted a Certificate of Exemption by the MCPHS University Institutional Review Board. It was a descriptive survey research with a non-randomized sample. Participants were a convenience sample of seniors participating in a congregate dining program. Data was collected through a written, self-administered survey. The survey was validated by Dodd et al., the original authors.

Results: Ninety-three individuals were approached to participate, and 62 surveys were completed. Statistical tests included; frequency distribution, mean, standard deviation, t test, and Spearman rank Correlation. A statistically significant relationship was found between the level of education and awareness of OC risk factors ($r=0.26$; $p=0.04$). An inverse relationship was found between the level of education and the level of OC awareness questions, "have you ever heard about OC?" ($r=-0.37$; $p=0.004$), and "how much do you know about OC?" ($r=0.35$; $p=0.008$). A trend toward signif-

icance was noted for the level of education and awareness of OC signs and symptoms ($r=0.24$; $p=0.06$).

Conclusion: The levels of OC awareness in the surveyed seniors were low. Additional research is needed to determine how to best communicate OC awareness, and design and implement programs specifically for this high-risk group.

The Integration of Dental Hygienists as Part of the Primary Healthcare Team: A Strategic Analysis of the Barriers to Direct Dental Service Delivery by Federally Qualified Healthcare Facilities

Trisha M. Johnson, RDH, MHA

Problem Statement: The gross necessity for oral healthcare providers and the general lack of dental programming in underserved areas is not being fulfilled due to current workforce policy in Indiana.

Purpose: This study identifies the barriers to dental health access and suggests opportunities to expand access to care. It explores the feasibility of dental hygienists working collaboratively in a primary care setting.

Methods: This qualitative, aggregate interview process focuses on three of Indiana's nineteen Federally Qualified Health Centers. Key informant interviews were conducted with the Chief Executive Officer of each health center, and the results were developed into a SWOT analysis based on the predominant themes from each facility, and their access to care.

Results: Dental professionals in the primary care setting are necessary and desired. If practice act changes are implemented, all of these facilities would be willing to implement a dental hygienist into the primary care setting to achieve more comprehensive care for their patients. Within a Federally Qualified Health Center, a model based on these results would satisfy the necessity for dental concerns to be addressed and managed more appropriately.

Conclusions: This study will aid in a dental program to be designed for Federally Qualified Health Centers to implement a dental hygienist into a primary care setting and for other outlets, such as local dental students, to receive rotation-like experiences in these medically underserved areas.

This study has provided the qualitative data that will be needed to assist in implementing a model for hospital systems, long-term care facilities, and any health care setting.

Oral Health Knowledge of Eating Disorder Treatment Providers

Lisa Bennett Johnson, RDH, MSDH; Linda D. Boyd, RDH, RD, EdD; Lori Rainchuso, RDH, MS

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

Purpose: The aim of this study was to assess oral health knowledge among professionals who specialize in treating eating disorders, and identify to what extent their education and training addresses oral health care delivery and recommendations for individuals with eating disorders.

Methods: A research instrument was developed by comparing question agreement between six experts; a question with item agreement average of 0.80 was deemed valid and included in the survey, and then piloted by an unrelated group of experts (n=6). A descriptive, exploratory survey of licensed behavioral and medical health providers assessed level of oral health related education, knowledge, and treatment recommendations. An invitation to participate in a web-based survey was sent via electronic newsletters and/or list-servs to three professional eating disorder organizations. An inability to track the use of electronic media within the study time frame precluded an exact number for the study population; however the proportion of respondents directly corresponds to the framework of the eating disorder treatment team.

Results: Of the 107 respondents who completed surveys, a majority (64.4%) reported dissatisfaction with their level of oral health education, and 19.5% reported no oral health education. Respondents consider their knowledge of clients risk for oral disease as average or above (84%), and ranked tooth erosion as the greatest reason for oral care (63%) while dry mouth led in the rankings for least significant (33%). Referral for oral care was found to be more common after reports of complication (55%).

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

A Comparison of Dental Hygienists' and Dentists' Clinical and Telehealth Screening for Dental Caries in Urban Children

Susan J. Daniel, RDH, PhD

Problem Statement: Telehealth has been identified as an effective and efficient means of increasing access to care for screening, referral, and treatment. Use of telehealth in some states is restricted and dentists must provide a clinical examination prior to the delivery of oral care services. There is no comparison of dentists' and dental hygienists' clinical and telehealth screening for caries and restorations in the literature.

Purpose: The purpose of this study was to determine whether or not there was a difference in dental hygienists' and dentists' screening for dental caries with either clinical or telehealth methods.

Methods: A convenience sample of 82 children 4–7 years of age was selected for the study. The clinical dentist's screenings were required for an urban mobile preventive program. Two clinical examiners, dental hygienist and dentist, and two telehealth examiners, dental hygienist and dentist, screened for dental caries and existing restorations. Each professional's findings were recorded on separate charts. Photographs of each child's teeth were obtained using the iPhone 4S, images were stored in an album by participant number, uploaded to the Cloud® for retrieval, checked for quality and uploaded to a course in Blackboard® accessible by the two telehealth examiners. The telehealth examiners reviewed photographs for caries and restorations, and charted findings. Caries and restorations on the four charts for each child were converted to decayed filled surfaces (DFS) scores used to compare the professionals' screening.

Results: Seventy-eight children met inclusion criteria. Spearman's correlation between the clinical screening of the dental hygienist and dentist was 0.99; $p=0.001$. Spearman's correlations in other group relationships with the clinical

dentist were 0.75; $p=0.001$ (telehealth dentist) and 0.81; $p=0.001$ (telehealth dental hygienist). No significant difference was found between the telehealth dental hygienist and the clinical dentist ($p>0.10$) using the Wilcoxon Signed Ranks.

Conclusions: Dental hygienists' telehealth or clinical screening for dental caries is not significantly different from screening performed by a clinical dentist.

Clinical Dental Hygiene Practice

Exploring Dental Hygiene Clinical Decision Making: A Mixed Methods Study of Potential Organizational Explanations

Joanna Asadoorian, RDH, PhD; Evelyn L. Forget, PhD; Mahmoud Torabi, PhD; Lesley F. Degner, RN, PhD, FCAHS; Joan Grace, PhD

Problem Statement: Dental hygienists are targeted for practice expansion to improve public access to oral health care, but they have not established their decision making capacity within alternative practice models.

Purpose: This mixed methods study aimed to identify and test the impact of influential factors in dental hygiene decision making capacity.

Methods: An ethically approved, mixed methods two-phased study was conducted. PHASE I: A series of focus groups were conducted with a purposive sample of dental hygienists in Manitoba. Using a semi-structured interview guide, data was collected until reaching saturation. Data underwent coding and thematic analysis and a qualitative decision making model, including key predictor variables and outcome variable (decision making capacity), was developed to guide Phase II. PHASE II: Aspects of the qualitative model were tested via an electronic survey questionnaire of a census of Manitoban dental hygienists and through key informant interviews. Statistical and qualitative thematic analyses were conducted respectively and findings merged for interpretation.

Results: Focus group data yielded 75 codes and 6 themes plus 1 theme from the literature comprising the model and guiding the survey. The Phase II survey was completed by 161 dental hygienists (38%). Moderate to weak correlations

were demonstrated between predictor variables and outcome measure. Rather, the final statistical model demonstrated individual characteristics and graduating from a 3-year program together significantly predicted decision making capacity. Thematic analysis of key informant data revealed 8 broad environmental influences on decision making capacity. When data were merged, individual characteristics were shown to be a product of broad environmental factors and educational preparation had a particularly strong influence.

Conclusions: Individual characteristics and education are predictive of decision making capacity but are outcomes of broad structural influences. Modifications to these structures are recommended to support dental hygiene decision making capacity within expanded practice scopes and/or settings.

Efficacy of Novel Brush on Paste "MI Paste Plus One Step"

Annette Scheive, RDH, MS; Linda Bellisario, RDH, BS; Gina Durkin; Sayako Hotta, DH, PhC; Takuya Sato; Yoko Ishihara; Tomohiro Kumagai

Problem Statement: CPP-ACP (RECALDE-NT™) known for its anti-caries and anti-sensitivity effect, contains high level of bioavailable ions. To improve patient compliance with this material, we developed CPP-ACP topical cream with "One-Step" brush on concept.

Purpose: Purpose of this study was to measure content of bioavailable ion and to evaluate efficacy of this new product against tooth sensitivity.

Methods: Three materials examined in this study were MI Paste Plus One Step (MOS, GC Corp.), MI Paste Plus (MIP, GC Corp.) and Clinpro tooth crème (CTC, 3M ESPE). Slurry (10 wt %) was prepared and centrifuged at 12,000g for 15 min. Supernatant (water soluble) was collected for analysis. Levels of calcium and phosphate ion were determined by atomic absorption spectrometer (Z-2300, HITACHI High-Technologies) and molybdenum acid colorimetric method respectively. Level of fluoride ion was measured by ion meter (pH / ION METER F-23, HORIBA). Block specimens ($n=4$) for evaluation of the effect against dentin sensitivity were made of bovine maxillary incisor root dentin. Blocks were

embedded in resin and polished with SIC paper. Each Paste was applied to test samples and immersed in water for 30 min with gentle shaking. Then, test samples were observed with SEM (SU-70 FE-SEM, HITACHI High technology). The levels of dentin blockade were measured using image analysis software (ImageJ). Data were statistically analyzed with ANOVA and Turkey test ($p < 0.05$).

Results: Mean values of each bioavailable ion level of MOS and MIP were not statistically different. Bioavailable calcium and phosphate was not detected from CTC containing TCP. Level of dentin blockage of MOS (63% ; SD 8.4) was same as MIP (49% ; SD 8.3) and significantly higher than CTC (3% ; SD 2.1).

Conclusions: MOS has high level of bioavailable ion. Effect against dentin sensitivity of MOS is expected to be better than CTC.

Funding for project through GCC.

An In Vitro Comparison of the Effects of Various Airpolishing Powders on Enamel and Selected Esthetic Restorative Materials

Caren M. Barnes, RDH, MS; David A. Covey, DDS, MS; Hidehiko Watanabe, DDS, MS

Problem Statement: Specially processed sodium bicarbonate was the only airpolishing powder available until 2004, when aluminum trihydroxide was introduced for sodium intolerant patients. Since 2004, four airpolishing powders have been introduced: glycine, a second type of sodium bicarbonate powder, calcium carbonate, and calcium sodium phosphosilicate.

Purpose: The purpose of this study was to compare the effects of each airpolishing powder on the surface characterization of enamel (E), composite resin (CR) and glass ionomer (GI).

Methods: Six airpolishing powders, sodium bicarbonate A and B, aluminum trihydroxide, calcium carbonate, glycine and calcium sodium phosphosilicate were investigated on surfaces of E, CR and GI samples. Samples were uniformly polished using 1200 grit abrasive paper. Each type of airpolishing powder was applied with the same airpolishing unit. Each type of powder was used for 1, 2 and 5 seconds on 5 samples each of E, CR and GI samples, for a total of 225 samples. Custom equipment was fabricated to hold each

sample 4 mm from the airpolishing nozzle and airpolishing was applied using a constant circular motion. Each sample was analyzed with a profilometer, gloss meter and scanning electron microscope.

Results: A three-way ANOVA model was used to determine differences in outcome based on type of powder, material, and time. The model included interaction terms for powder type and material and powder type and time. Based on the ANOVA model, there were statistically significant interactions between type of powder and material for difference in gloss, roughness. There was a statistically significant difference between roughness and gloss at 5 seconds of treatment.

Conclusions: Overall analysis of roughness revealed order of abrasiveness of airpolishing powders to be (least to most abrasive): glycine sodium bicarbonate B, sodium bicarbonate A, calcium carbonate, aluminum trihydroxide and calcium sodium phosphosilicate.

Funding for this project is through EMS.

Utilization of an American Diabetes Association Adopted Diabetes Risk Survey to Identify Patients at Increased Risk for Type 2 Diabetes Mellitus in Asymptomatic Patients

Lori J. Giblin, RDH, MS; Lori Rainchuso, RDH, MS

Problem Statement: National data indicates the incidence and prevalence of Type 2 Diabetes Mellitus (T2DM) is on the rise. T2DM is a preventable disease with early diagnosis.

Purpose: To implement an American Diabetes Association (ADA) adopted diabetes risk survey to assess patients at increased risk for T2DM and rate of compliance for A1c screening in a dental setting. This descriptive cross-sectional study contributed to the feasibility of implementing a diabetes risk survey and rate of compliance for A1c screenings in dental settings.

Methods: The Institutional Review Board of MCPHS University ensured the protection of the subjects engaged in this study. Participants consisted of a purposive sample of Forsyth School of Dental Hygiene patients, 18 years or older not diagnosed with prediabetes or diabetes. The ADA diabetes risk survey determined patients at in-

creased risk for developing T2DM were offered an opportunity for a point of care A1c screening.

Results: To date: 160 of 422 solicited patients agreed (compliance rate 38%, 95%CI: 33% - 43%). As per the ADA survey 77 patients were at increased risk for T2DM for an at-risk prevalence of 48% (95%CI: 40% - 56%). The 77 at-risk patients were asked if they would take an A1c test of which 45 agreed (compliance rate 58%, 95%CI: 47% - 70%). Results of administered A1c tests are in the process of being aggregated.

Conclusions: Implementation of the ADA diabetes risk survey determined a 38% rate of compliance and 58% of patients at increased risk agreed to an A1c screening.

Funding for this project through a MCPHS University faculty development grant.

Capability of a Dental Hygienist to Perform a Clinical Oral Diagnosis in Various Settings: A Multi-Level Analysis

Kelly T. Williams, RDH, MSDH, CDA; Joyce M. Flores, RDH, MSDH

Objective: The purpose of the systematic review was to identify the capability of a dental hygienist to perform a technically competent clinical oral diagnosis in various settings.

Search Strategy/Selection Criteria: Electronic databases were searched to identify relevant articles. Searches were limited to the English language and publication date from the earliest available date for each database to March 31, 2014. Literature searches were conducted using APA, Alexander Street, EBSCO, Elsevier, FirstSearch, Gale, ISI, JSTOR, Oxford, OVID, ProQuest, PubMed/ Medline, Thomson Reuters, and VIVA databases. The search strategies included subject headings and subheadings, combined with keyword searching. Search focus included such words as dental hygiene diagnosis, dental diagnosis, oral diagnosis, and dental therapist diagnosis. The study identified 1,576 unique articles with 43 meeting the inclusion criteria. Inclusion criteria were quantitative studies that compared technical competency between groups of dental hygienists and/or dental therapists and dentists and/or dental specialists. Capability in this study is defined as the process utilized to achieve a technically competent

outcome utilizing critical thinking and evidence based decision-making.

Data Collection and Analysis: A meta-analysis was used to calculate the results of each study, and calculate an average of those results. We performed meta-analysis for overall associations by head and neck assessment, intraoral soft and hard tissue assessment, radiographic, and clinical settings. This meta-regression will be used to determine the homogeneity between the studies.

Main Results: Results will reflect the degrees of complexity and variability among the studies.

Conclusions: The dental hygienist appears to be as effective as a dentist in their capability to perform a technically competent clinical oral diagnosis in various settings.

Soft-Rubber-Interdental-Cleaner Compared To an Interdental Brush on Plaque/Gingivitis/Gingival Abrasion

D.E. Slot, RDH, MSc; D. Ekkelboom, RDH, BoH; E. Van Der Sluijs, RDH, BoH; S.C. Supranoto, RDH, BoH; G.A. Van Der Weijden, PhD

Problem Statement: Different interdental devices are available for dental professionals to recommend; however, it is not clear as to which is more effective or acceptable to patients.

Purpose: To determine the effectiveness of a rubber bristled interdental cleaner (RIBC) as compared to an interdental brush (IDB) on gingivitis, plaque and gingival abrasion scores, and to evaluate participants' attitudes towards these two devices.

Methods: After IRB approval, an examiner-blind, randomized split-mouth design was used. After a dental prophylaxis, 42 subjects refrained from brushing their mandibular teeth for 21 days to allow for the development of gingivitis. During a subsequent 4-week treatment phase, participants resumed twice daily toothbrushing. Contralateral quadrants were assigned to the use of either the RIBC or the IDB. Plaque, gingivitis and gingival abrasion were assessed at baseline (Day 0), after 21 days of no oral hygiene, and after 1, 2 and 4 weeks of once daily product use.

Results: After experimentally-induced gingivitis (EIG), use of both interdental devices (N=42) resulted in a significant decrease in bleeding and plaque scores. Mean plaque scores at day 21 reduced from 3.29 to 2.49 for the IDB, and from 3.32 to 2.44 for the RIBC. Mean bleeding scores changed from 1.06 to 0.52 for the IDB, and from 1.09 to 0.45 for the RIBC. At the end of the treatment period, there was no significant difference between the two interdental cleaning devices. For the intermediate assessments at 2-weeks, a significant difference in favor of the RIBC was observed for gingivitis ($p < 0.05$). The mean gingival abrasion score at the end of treatment was 0.26 for the IDB and 0.22 for the RIBC. Out of the 42 participants, 27 preferred the RIBC over the IDB.

Conclusions: When used in combination with toothbrushing, there were no statistically significant differences between the 2 interdental devices in reducing plaque and gingival inflammation. Less gingival abrasion occurs with the RIBC, and participants preferred using this device.

Study products were provided by SUNSTAR, Japan/Switzerland, and funding support was provided by ACTA Dental Research BV.

Effect of Chemotherapeutic Agents and Mechanical Tongue Cleaning on Morning Bad Breath

Eveline Van Der Sluijs, RDH, BoH; Dagmar E. Slot, RDH, MSc; Sam C. Supranoto, RDH, BoH; Fridus A. Van Der Weijden, PhD

Problem Statement: The specific anti-halitosis mouthwash containing amine fluoride, stannous fluoride, 0.2% zinc lactate and oral malodour counteractives has not been evaluated in combination with tongue cleaning and tooth brushing using a dentifrice formulated with similar ingredients as the mouthwash.

Purpose: To assess the effect of a regimen using this specific mouthwash and a dentifrice with chemotherapeutic agents, and a tongue cleaner on Morning Bad Breath (MBB) in periodontally healthy subjects.

Methods: In total, 66 non-dental University students participated in a 3-week parallel single-blind, randomized, controlled clinical trial. After

selection, the subjects were provided with a toothbrush and randomly assigned to the test ($n=32$) or the control regimen ($n=34$). Those in the test group used the tooth/tongue gel, mouthrinse, and a tongue cleaner, whereas those in the control group used only fluoride toothpaste. Written lifestyle instructions regarding food intake and personal use of cosmetics were provided regarding use prior to the breath analyses being performed. Clinical measurements were taken between 7:30 am and 12:00 pm, at baseline, overnight (day 1), day 7 and day 21. The primary outcome was the mean of duplicate Organoleptic scores (ORG) by trained examiner. The secondary outcome was Volatile Sulphur Compounds (VSC) measurements assessed using Oral Chroma (H₂S, CH₃SH and (CH₃)₂S) and Halimeter (HM) readings.

Results: At baseline, according to ORG, H₂S and HM, there was no statistical significant difference between the regimens. At day 1, a statistical difference ($p < 0.05$) was obtained in favor of the test treatment regimen for ORG, H₂S and HM measurements. On day 7, this effect according to H₂S and HM was still maintained. At day 21, only the HM readings showed a statistical difference ($p < 0.05$) in favor of the test regimen.

Conclusions: MBB was significantly reduced overnight with the test treatment regimen for several parameters. At day 21, the prolonged effect on VSCs of the test treatment was only detectible with the HM readings.

The study was performed with a grant from the ACTA Dental Research BV. GABA, Switzerland initiated the study project and provided study products. ACTA Research BV received financial support for their commitment to appoint this study to the ACTA Department of Periodontology.

Oral and/or Peri-Oral Piercings Are Not Without Risks!

Nienke L. Hennequin-Hoenderdos, RDH, BoH, CRC; Dagmar E. Slot, RDH, MSc; Fridus A. Van Der Weijden, PhD

Objective: Oral complications of oral and/or perioral piercings have been documented, although knowledge of the prevalence of piercings and related complications is lacking. To date, the estimated effect size of this phenomenon is not known.

Occupational Health

The Effect of Stainless Steel vs. Silicone Dental Instrument Handles on Hand Strength and Comfort

Melanie J Hayes, BOH, BHSc(Hons), PhD

Search Strategy/Selection Criteria: To systemically search the literature to determine the prevalence of oral and perioral piercings in young adults; the incidence of complications associated with lip and/or tongue piercings; and, to provide an overview of case reports describing adverse effects.

Data Collection and Analysis: This systematic review was performed in accordance with PRISMA guidelines. The MEDLINE-PubMed, Cochrane-CENTRAL and EMBASE databases were comprehensively searched to identify appropriate studies (case reports, case series, case controls and cohort studies). Independent screening by 2 reviewers of 1500 unique titles and abstracts resulted in 13 publications that provided information concerning prevalence; another 13 publications evaluated incidence of complications; and 67 case reports described complications concerning hard and/or soft tissues of the oral cavity and/or effects concerning general health. Data extraction regarding the three different purposes was performed by 2 reviewers. Data was summarized in a meta-analysis, and quality of the selected studies was graded.

Main Results: The mean prevalence of oral and/or peri-oral piercings was 5.2%. Tongue piercing (5.6%) was most common, followed by lip piercing (1.5%). Gingival recession was the most frequently described complication. The incidence of gingival recession was 50% of subjects with lip piercings and 44% of subjects with tongue piercing. Tooth fracture was reported in 37% of subjects with tongue piercing. Oral and/or perioral piercings were observed in a relatively small percentage (5.2%) of young adults. Both lip and tongue piercings were frequently associated with risk of gingival recession and tooth injuries. Among the case reports, there were minor complications, but also more severe complications that were potentially life-threatening.

Conclusions: Oral and/or perioral piercings are not without risks. Dental care professionals are in an ideal position to offer information regarding safe piercings and to provide advice regarding oral hygiene, aftercare and possible complications.

This project was self-funded by the authors and their institutions and supported by a seed grant from the Dutch organization that promotes oral and dental health (Ivory Cross).

Problem Statement: Many dental hygienists experience musculoskeletal pain during the course of their careers, often as a result of the sustained grips and repetitive movements employed throughout the work day. Current research suggests that lighter instruments with a larger diameter reduce force and load on the hand during scaling tasks; therefore, the texture and weight of silicone handles is designed to decrease the strain placed on the hand and fingers.

Purpose: The purpose of the research is to investigate the effect of silicone instrument handles vs traditional stainless steel instrument handles on hand comfort and strength; it is hypothesized that the silicone handle design will be more comfortable to use, and have less impact on hand strength measures than traditional stainless steel instrument handles.

Methods: IRB approval has been obtained from the University of Newcastle (Approval no H-2014-0024). Using a crossover study design, a convenience sample of dental hygiene students ($n=23$) participated in two simulated scaling sessions for 30 minutes, one week apart. During the first session, students were required to use traditional stainless steel instruments (10 mm diameter and 21-26 g weight), while during the second session students used instruments with silicone handles. Following each session students were required to complete a Hand Health Profile and undertake hand strength tests.

Results: Paired t-tests will be used to analyze the data as the same subjects will be tested in this cross-over design. The analysis will look for significant differences ($p<0.05$) between the survey and hand strength measures after each session.

Conclusions: The study has the potential to broaden the current knowledge base on ergonomic instrument design and prompt the further investigation on the design of periodontal instruments. Future studies should consider random assignment to the intervention being tested to limit potential confounders.

Technology

Teledentistry-Assisted Affiliated Practice Dental Hygiene

Fred F. Summerfelt, RDH, AP, MEd

Purpose: The 2010 Patient Protection and Affordable Care Act (PPACA) calls for midlevel dental healthcare providers to work in underserved areas with underserved populations. In 2004, Arizona passed legislation allowing qualified dental hygienists to enter into an affiliated practice relationship with a dentist to provide oral healthcare services for underserved populations without general or direct supervision in public health settings. The Northern Arizona University (NAU) Dental Hygiene Department developed a teledentistry-assisted affiliated practice dental hygiene model that places a dental hygienist in the role of the midlevel practitioner as part of a digitally-linked oral healthcare team.

Significance: Utilizing current technologies, affiliated practice dental hygienists can digitally acquire and transmit diagnostic data to a distant dentist for triage, diagnosis, and patient referral while providing preventive services permitted within the dental hygiene scope of practice.

Approach: NAU has pioneered an innovative teledentistry-assisted affiliated practice dental hygiene model to answer the call of the PPACA to provide comprehensive preventive oral healthcare and diagnostic services for the growing population of underserved in both urban and remote areas. NAU's initial training endeavors show that teaching the data acquisition technologies to dental hygiene students and dental hygienists has been easily and successfully accomplished. With only six-hours of training, dental hygiene students and dental hygienists have demonstrated their ability to set up and manage remote patient-service facilities. While providing preventive oral healthcare services within the scope of affiliated practice, dental hygiene students and dental hygienists have acquired and forwarded diagnostically efficacious digital data from remote locations using both store-and-forward and cloud-based technologies.

Evaluation: NAU's teledentistry-assisted affiliated practice dental hygiene model has

proven qualitatively to serve the patient, the teledentistry-assisted affiliated practice dental hygienist, and the affiliated practice dentist. Wilcoxon Signed Rank Tests demonstrate hygienists' abilities to obtain diagnostically efficacious digital data from remote locations.

Plasmadent: Advances in Plasma Medicine Provides Promise for Applications in Dentistry

Gayle B. McCombs, RDH, MS

Problem Statement: The need for developing new therapies to meet the challenges of dentistry opens the door to utilizing plasma as a medium to inactivate bacteria, enhance adhesion and whiten teeth.

Purpose: Plasma is one of the universal four states of matter, the others being solid, liquid, and gas. In nature, the sun is a superheated ball of plasma; however, in the laboratory, low temperature bio-compatible plasmas can be generated. Plasma is an ionized gas that has been charged/energized to excite particles such as electrons and ions, and produce reactive oxygen species (ROS). Plasma-cell interactions are complex, but studies show that ROS exhibit strong oxidative properties that bacteria were found unable to survive. PlasmaDent, the utilization of plasma in dentistry, represents a major paradigm shift from mechanical and chemical treatments, to device-based molecular therapies. Low temperature atmospheric pressure plasma (LTAPP) is under investigation as a medium to inactivate pathogenic microorganisms associated with biofilms, dental caries, periodontal diseases and root canal infections. Other applications are in development to enhance tooth whitening, adhesion, and surface modification.

Methods: An electronic search was conducted in PubMed, Medline and Google scholar. Key search words included: cold plasma, dentistry, and low temperature atmospheric pressure plasma. Literature revealed numerous studies related to LTAPP utilization in dentistry.

Results: Increased interest in plasma has brought about considerable research in the field. Studies have shown that various pathogenic microorganisms can be effectively reduced or rendered nonculturable after exposure to LTAPP. Literature obtained revealed some contradictions

and/or inconsistencies among studies; however, these may be due in part to the characteristics of individual microorganisms and configuration of the plasma equipment. Overall, preliminary data supports the use of LTAPP to inactivate bacteria associated with numerous oral conditions. LTAPP has also been shown to enhance tooth whitening and surface modification related to adhesion.

Conclusions: Based on success in plasma medicine, a myriad of plasma applications in dentistry are plausible.

Health Literacy/Cultural Competency

Cultural Competence Curriculum: Are We There Yet?

Cheryl M. Westphal Theile, EdD, RDH

Purpose: The goal of this project is to demonstrate outcomes which indicate effective curriculum content for building cultural competence.

Significance: There is a need to develop evaluation mechanisms designed to monitor knowledge and performance indicating the graduate is competent to communicate with diverse groups. The U.S. population is growing so diverse that by 2050 ethnic groups will make up 48% of the total U.S. population. In 2010-2011 white dental hygiene student population was 75.4% compared to 64% of U.S. population.

Approach: In order to evaluate the effectiveness of a curriculum two groups of students are compared in this study. The first group enrolled in a formal online course and participated in all assignments. Pre and post-tests were assigned and evaluated by the instructor. Qualitative and quantitative analysis was done to develop trends in responses and to evaluate each learning module. The comparison group is the current students in the program who have received only the experiential curricular content without structured lecture content. The two groups will be compared to determine which cultural content needs to be required for all students. An IRB is submitted for second group of students as they are still in the program. The first group has completed the course and the data is historical.

Evaluation: The first group indicated that all aspects of learning were positive. They demon-

strated effectiveness based upon self-assessment surveys and reflection. They were able to apply this course material to practice and developed culturally relevant case scenarios to integrate the unique ethnic data with the practice of dental hygiene. The comparison group is a work in progress. They have had clinical experiences to deliver care to diverse patient population yet not been evaluated to confirm the outcomes.

Funding for this project was through the Dental Hygiene Programs at New York University.

Racial/Ethnic, Cultural, and Linguistic Diversity among the Dental Hygiene Students

Anna Matthews, RDH, MS; Susan Davide, RDH, MS, MEd; Anty Lam, RDH, MPH

Problem Statement: Data collected about students is usually limited to race/ethnicity and doesn't include students' cultural and linguistic background.

Purpose: to study the racial/ethnic, cultural, and linguistic diversity of the dental hygiene students; to determine the number of students who are first-generation Americans, their countries of origin and first/primary languages; and to investigate whether non-native English speakers experience language-related difficulties.

Methods: This study was approved by CUNY IRB #461429-2. In 2013 we administered a 24-question survey to 149 dental hygiene students. The survey consisted of two main parts: 1) basic demographics, including race/ethnicity, country of birth, cultural and educational background; and 2) questions for students whose first/primary language was other than English about their language use, preferences, and specific difficulties/concerns. Data was analyzed by descriptive statistics.

Results: Most students were female (n=133, 91.7%); average age was 27 years. Responders identified as: White – 52 (35.6%), Asian – 37 (25.3%), Hispanic/Latino – 31 (21.2%), Black/African-American – 13 (8.9%), and Mixed Race/Other – 13 (8.9%). Eighty-one responders (54.3%) were first-generation Americans born in 33 countries. Eighty-three students (56.1%) reported one of 26 different languages other than English as their primary. Although major-

ity reported using English while communicating at work (65.9%), reading (58.9%), watching TV (57.3%) and using internet (73.0%), 20.7% of these responders translated material when studying, 23.5% had difficulty understanding texts, and 42.0% felt they needed more time during tests. Additionally, 33.7% of responders had difficulty expressing their thoughts in writing and 32.5% orally.

Conclusions: Our dental hygiene students are very diverse racially/ethnically, culturally, and linguistically. Students who are non-native English speakers can experience language-related difficulties and barriers to success.

Iatro-Compliance: An Unintended Consequence of Excessive Autonomy in Long Term Care Facilities

Melanie V. Taverna, MSDH, RDH; Carol Nguyen, MS, RDH; Rebecca Wright, MS, RDH; James W. Tysinger, PhD; Helen M. Sorenson, MA, RT

Problem Statement: Periodontal disease and caries remain the most prevalent preventable chronic diseases for seniors. Seniors transitioning into long term care facilities (LTCF's) often present with oral health challenges linked to systemic diseases, plaque control, psychomotor skills and oral health literacy. Many retain a discernible level of physical and cognitive ability, establishing considerable autonomy.

Purpose: This study examines the effect of autonomy on residents' ability to perform oral hygiene.

Methods: Descriptive data were developed utilizing mixed methodology on a convenience sample of 12 residents and 7 care staff of a LTCF. One-on-one interviews consisted of Likert Scale questions about demographics. Fixed data were analyzed using descriptive statistics to supplement qualitative findings. Qualitative information was analyzed using NVIVO 9™ in the constructivist tradition to develop themes about ageism, respect, and time constraints and their influence on resident autonomy in oral care practices.

Results: Data suggested shortcomings, such as a failure of the staff to ensure oral hygiene oversight and failure of the resident to ask for assistance. Autonomy, while laudable, was used

by residents to resist staff assistance, partially motivated by residents' lack of confidence in care staffs' oral hygiene literacy and skills. In turn, by honoring resident's independence, the staff enabled excessive autonomy to occur and did not provide oversight in oral hygiene; creating an environment of iatro-compliance.

Conclusions: While it is beneficial to encourage autonomy, oversight and education must remain an integral component of oral hygiene care in this population. Improved oral hygiene skills can be fostered in LTCF's by utilizing the current oral health care workforce. Registered dental hygienists (RDHs), under indirect supervision of a dentist, can fulfill the role of an oral health care director (OHCD) in LTCF's. A director's presence in a facility can decrease staff caused iatro-compliance and increase oral hygiene skills and literacy of the residents, while enhancing their autonomy through education and support.

Health Behaviors

Association between Cigarette and Electronic Cigarette Use and Perceptions of Risks in Urban High School Males: A Pilot Cross-Sectional Study

Elizabeth T. Couch, RDH, MS; Benjamin W. Chaffee, DDS, MPH, PhD; Stuart A. Gansky, DrPH; Gwen Essex, RDH, MS, EdD; Margaret M. Walsh, RDH, MS, MA, EdD

Problem Statement: Tobacco use, a major risk factor for oral and systemic diseases, is often established during adolescence. Although youth cigarette use has declined recently, electronic cigarette (e-cigarette) use is rising rapidly. Differences in perceived risks associated with cigarettes and e-cigarettes may contribute to adolescent use.

Purpose: To explore the association between perceived social risks (SRs) and health risks (HRs) and use of cigarettes and e-cigarettes among high school males.

Methods: A convenience sample of urban high school males completed a survey in this cross-sectional pilot study, in preparation for a larger prospective study. After obtaining IRB approval, permission from school officials, and parent/student consent, data were collected on-site via an anonymous, web-based survey. For cigarettes

and e-cigarettes, the survey assessed ever-use (lifetime) and participants' perceived probability (0 to 100%) that 6 specific SRs and 5 specific HRs would happen to them from using each product. Mean ranked perceived HRs and SRs were compared (Krusal-Wallis test) across 4 groups: (a) never users (b) ever-users of cigarettes only; (c) ever-users of e-cigarettes only; and (d) ever-users of both.

Results: Among 104 participants, 71% reported never-use, 9% only e-cigarette use, 8% only cigarette use, and 13% used both. Across all participants, perceived SRs and HRs were greater for cigarettes than for e-cigarettes. Perceived SRs and HRs of cigarettes were lowest among those reporting ever-use, but did not significantly differ across the 4 groups ($p=0.33$ for SRs, $p=0.12$ for HRs). For e-cigarettes, perceived SRs and HRs were lowest among self-reported ever-users and highest among never-users, with statistically significant differences detected across the 4 groups ($p<0.001$ for SRs and HRs).

Conclusions: In this population, cigarettes were perceived to have greater SRs and HRs than e-cigarettes. For e-cigarettes, lower perceived SRs and HRs were associated with use.

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Brush Off! Promoting Oral Hygiene Behaviors with a Game

Joyce M. Flores, RDH, MS; Traci Leong, PhD; Stella Lourenco, PhD; Dov Jacobson; Jesse Jacobson; Stephanie Chergi; R.L. Jacobson, DDS

Problem Statement: The magnitude and severity of dental caries exists globally and is a pending public health crisis. World-wide epide-

miological data indicates a marked increase in the prevalence of childhood dental caries over the past decade. This trend is very close in prevalence to childhood obesity and shares similar influence from behaviors associated with both diseases. Moreover, a lack in behaviors such as brushing and exercise also attribute to these disease processes. Interactive gaming should be recognized as a tool to improve toothbrushing behaviors among children.

Purpose: The purpose of this study was to investigate effects of a collaboratively-designed interactive game on toothbrushing behaviors for 5-6 year old children.

Methods: This randomized, double-blinded study examined a convenience sample of 32 children who were asked to play a game with a rhythmic toothbrushing song. Game play included animated guidance and feedback from a toothbrush sensor in the form of a haptic controller, similar to the popular Wii® game platform. 7 and 14-day dose-effects were measured by calibrated examiners using pre and post-test data quantifying Time-on-Tooth Surface (TOTS) and metrics to evaluate toothbrushing techniques. IRB approval was obtained from Morehouse School of Medicine. Parametric tests were used to analyze the data.

Results: TOTS ($p=.003$) and sulcular brush position ($p=.014$) were toothbrushing behaviors most strongly affected by game play of 14-days.

Conclusions: A game using song, sensors and science should be considered as an intervention tool aimed at improving toothbrushing behaviors in children.

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