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Finding the Truth

MA Gaston

Mary Alice Gaston is emeritus professor of dental hygiene at the University of Tennessee Health Science Center, a past president of the American Dental Hygienists' Association, and current editor of the Journal of Dental Hygiene.

Keywords: truth in advertising, dietary counseling, prescription drug safety, dental hygiene practice

Searching for the truth about health-related products, including prescription drugs, is like searching for the truth in presidential election-year rhetoric. Just as I am skeptical of election-year promises, I am skeptical about claims of product effectiveness and safety. Furthermore, I find some health-related television news reports, talk show advice, and product advertisements more confusing than helpful. I suppose the abundant, and often redundant, health-related information is widely transmitted because product manufacturers, marketing specialists, television news reporters and editors, and magazine publishers believe that Americans want up-to-date health news, even though such news may be incorrect, distorted, or distributed for commercial purposes. Perhaps they are right, and more news is preferred over no news. Despite the risk of information overload, I do want access to all health-related news just in case some of that news might help me to remain healthy.



As in political rhetoric, the truth in health-related news usually lies somewhere between reports of well-designed research projects, researchers' interpretation of data, and commercial sponsors' promotion and advertising. Unfortunately, the truth can be blurred by the way in which news reporters interpret and describe research results, and by the public's desire for immediate solutions to their personal health problems. Frankly, I find it hard to separate the truth from wishful thinking, half-truths, exaggerations, or outright false reports. The critical issue for me, and perhaps others, is finding enough truth within the available information to make good personal health decisions.

Recent reports about the harmful, and previously unknown, effects of some of the most often prescribed drugs have caused me to ask more questions whenever my physicians recommend a new drug or treatment option. Without doubt, I will in the future be a more discriminate consumer of health information in order to protect myself and my family from harm.

Like most people, I suspect, I rely on my health care providers to treat me appropriately and to prescribe only drugs that have been proven to be safe. Because I trust them, I follow their recommendations, often without questions. Even though my physicians stay informed about new drugs and treatment methods, they cannot see into the future and predict the harmful affects of previously assumed safe drugs. Therefore, I know that I must be an active, informed, and responsible partner in my personal health care.

A greater challenge to me and to other dental hygienists is verifying that the oral health care products we recommend and the treatment methods we use are safe for our clients and have been proven effective over time. For example, the American

Academy of Pediatrics has long recommended routine fluoride supplements for young children. Previously, fluoride supplements were thought to be safe for children beginning at two years of age. Because fluoride is now widely available to young children from numerous sources, the risk to children for ingesting too much fluoride has made it wise to delay fluoride supplementation. The Centers for Disease Control and Prevention currently recommends that fluoride supplements not be given to children younger than six years old. I hope pediatricians know about this change. Even more important, I hope dental hygienists are informing parents about the harmful effects of too much fluoride. Perhaps dental hygienists should pursue opportunities to collaborate with pediatricians and other health care specialists in providing safe and effective services.

Dietary counseling is another aspect of dental hygiene practice that requires a vigorous search for the truth, and regular knowledge updates. Since the United States Department of Agriculture's (USDA) Food Guide Pyramid was introduced in the United States a decade ago, most dental hygienists have accepted and used it as the foundation for counseling their clients regarding a health promoting diet, and when explaining the relationship between diet and good oral health. The Food Guide Pyramid was thought to provide the ultimate model for good nutrition and dietary habits. It didn't seem to matter that it was developed by the USDA with little input from public health experts. Moreover, lobbyists for the food industry were involved in shaping the Food Guide Pyramid and promoting it as the primary guide for good nutrition.

The USDA Food Guide Pyramid taught us that all fat was bad, and that carbohydrates were good, both of which have since been questioned by research. Given our country's increasing problem of obesity across all ages, experts are no longer recommending strict adherence to the Food Guide Pyramid. Instead, they are looking at a new and different model for fulfilling dietary requirements to meet health needs, while avoiding the extra calories that lead people to obesity.

The USDA's Dietary Guidelines for Americans offers more comprehensive advice than the Food Guide Pyramid because it must correspond to new research findings and is updated and revised every five years as required by law. The USDA Dietary Guidelines for Americans sets the standards for all federally funded nutrition programs, including the school lunch program. These guidelines are written jointly by the USDA and the United States Department of Health and Human Services. A 13-member panel made up of leaders in pediatrics, obesity, cardiovascular disease, and public health is currently revising these dietary guidelines and soliciting public input for the revised guidelines, scheduled to be published in 2005. While these 13 panelists also are subjected to intense lobbying by the food industry, the panel's goal is to create a dietary guide that is based on the best scientific evidence and is independent of business interests. Therefore, when providing dietary advice, dental hygienists would do well to select a guide that is based on sound research, rather than one that has been overly influenced by industry. Information about the Food Guide Pyramid and the USDA Dietary Guidelines for Americans is available on the USDA web site, www.usda.gov.

The truth about the value of another widely touted dietary practice, taking antioxidant supplements, vitamin A, C, and E, and selenium, has been challenged. The Cochrane Heptao-Billiary Group, a part of the Cochrane organization, has pooled the results of 20 years of research involving 170,000 people, and has published the results in the latest issue of *Lancet*. In short, this group of experts found vitamin A, C, and E supplements to be useless in preventing gastrointestinal cancers and did not recommend further studies to investigate their cancer-fighting effects. This report did add that selenium supplements taken to combat liver cancer need another look. As can be expected, not everyone accepts these recommendations, and we can expect to read and hear more research into the effects of antioxidants on health. The truth about the value of these and other dietary supplements is, indeed, hard to find.

Because of continuing confusion about the benefits and cancer-causing effects of hormone replacement therapy, the American College of Obstetricians and Gynecologists (ACOG) has issued new hormone therapy guidelines. The ACOG stresses that hormone replacement therapy is the best known treatment for menopause symptoms and recommends that doctors not withhold them from patients who might be helped by them. Now women must weigh the benefits against the possible harm of hormone replacements before beginning the therapy. Here again, available information is inconclusive and not very helpful to women who must decide whether or not to take hormones.

This issue of *JDH* includes a story in "Upfront" about the toxic effects of a well-known anti-inflammatory drug. The revelation of this drug's probable harmful effects makes me wonder about the toxicity of other prescription drugs. I wonder if enough clinical trials have been conducted and reported to assure us that other similar prescription drugs are safe. Millions of people will no doubt continue to search for conclusive information that will help them to decide whether to endure the

pain of degenerative diseases or to take other anti-inflammatory drugs believed to be safe. Unfortunately, the research into this matter is still inconclusive.

Other issues that are troubling include the rapidly rising number of cases of childhood asthma, tuberculosis, typhoid, and croup, a common childhood illness. Doctors are now recommending that elderly people retake the typhoid vaccination because their immunity to this infection may have expired. Many elderly people will find it hard to believe that typhoid is really a threat to them, since they've heard nothing about it for many years. In fact, some people are so unsure of the reliability of all health-related information that they doubt the safety of mass inoculation against any infection.

While I am interested in these examples of confusion and skepticism in today's health care delivery system, I am more interested in finding the truth about oral disease prevention and treatment. Recent reports about human gene-related research is providing potentially useful information about some of the most troubling oral health problems. In fact, the National Institutes of Health recently announced that it is possible to predict cleft lip and cleft palate in certain populations. In another promising development, scientists recently reported success in isolating human post-natal stem cells in the periodontal ligament, then implanting them into rodents where they differentiate into a mixture of periodontal ligament tissues. Also, the National Institute for Dental and Craniofacial Research (NIDCR) supports ORALGEN, a specialized database that contains molecular information pertaining to oral pathogens, including, *Actinobacillus actinomycetemcomitans*, *Fusobacillus nucleatum*, *Porphyromonas gingivalis*, *Prevotella intermedia*, *Streptococcus mutans*, and *Treponema denticola*. The ORALGEN database is available at www.oralgen.lanl.gov.

These major findings leave me wondering how and when the oral health care system will change to meet the oral health care needs of all Americans. A July 2004 report of NIDCR, "Assessment of the Dental Public Health Infrastructure in the United States," included some discussion of the role of dental hygienists in oral health care, but the executive summary of the report failed to mention dental hygienists. The full report does discuss the dental public health structure and its deficiencies, and it mentions dental hygienists as the logical practitioners to extend the reach of dental public health. This report pointedly discusses the deficiencies in dental hygiene education that will no doubt affect the extent to which dental hygienists can be used in existing public health programs. For example, dental public health officers are expected to have advanced degrees, while the majority of dental hygienists are educated at the two-year degree level. As for those with the baccalaureate degree in dental hygiene, the report describes them as receiving only minimal education in dental public health. The report calls attention to the fact that, in general, dental hygiene faculty have received very little formal instruction in public health. It also points out that dental hygienists with the baccalaureate degree may have a hard time pursuing a master of public health degree because of difficulty in transferring dental hygiene courses for credit. The report also discusses the limitations imposed on dental hygienists by the individual state dental practice acts. I found this report distressing because it failed to fully discuss the possibility of changing the conditions that tend to isolate dental hygienists in the private dental practice and discourage careers in public health. I was left wondering why this report left so many aspects of the dental health care system undisturbed. Most of all, I wondered what influenced writers of the report, and why they failed to discuss different practice models. The full report and summary of "Assessment of the Dental Public Health Infrastructure in the United States" are available at www.nidcr.nih.gov/NewsAndReports/ReportsPresentation/.

All of these instances and many others cry for honesty and truthfulness. Truth-telling is important in general health-related matters, but it is essential to finding effective ways of extending oral health care to those who need it the most. Without doubt, political rhetoric during election years will continue to distort the truth because of the influence of special interest groups. I hope that the rhetoric surrounding some of the most critical health care issues will be more truthful in the future than in the past. I must admit that whenever I read a major federal report and it fails to fully acknowledge and explore various options for future oral health care delivery, I'm not too hopeful. Yes indeed, finding the truth is an extremely difficult undertaking.

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Clarification/ Correction:

Sections of the following text were slated to appear in Table V of “Part 1: The Anatomy of Evidence-Based Publications: Article Summaries and Systematic Reviews,” in the Spring 2004 issue of *JDH*. The table, which originally appeared as an appendix in Volume 2, Number 1 of the *Journal of Evidence-Based Dental Practice*, is reproduced here as Table V.

ARTICLE ANALYSIS & EVALUATION

Air-abrasion treatment of questionable incipient pit-and-fissure caries lesions does not preserve more tooth structure

Original Article:	Hamilton JC, Dennison JB, Stoffers KW, Welch KB. A clinical evaluation of air-abrasion treatment of questionable carious lesions. A 12-month report. J Am Dent Assoc 2001;132(6):762-9.
• Level of Evidence:	4 (intermediate results of randomized trial; level of evidence may increase during planned follow-up)
• Purpose:	To assess the effect of air-abrasion of questionable incipient pit-and-fissure caries lesions when compared to delaying treatment until caries into the dentin are diagnosed
• Source of Funding:	Dental Fund of Michigan
• Type of Study/Design:	Split-mouth randomized controlled trial

SUMMARY

SUBJECTS

The study examined 223 teeth in 93 patients, aged 12 to 36 years. All patients originated from the general dentistry clinics at the University of Michigan School of Dentistry. All teeth had questionable incipient pit-and-fissure carious lesions (free of frank caries: softness at the base of a pit or fissure, decalcification).

EXPOSURE

The authors assessed immediate air-abrasion treatment (n = 113) versus delayed treatment when caries into the dentin was diagnosed (n = 110).

MAIN OUTCOME MEASURE

The study used the volume of the cavity preparation using weight as an approximation for

MAIN RESULTS

The study showed the weight of the immediate air abrasion treatment cavity preparation was on average 0.027 g versus 0.020 g in the control preparation group ($P = .279$).

COMMENTARY

CONCLUSIONS

The authors concluded that there was no benefit in early treatment of incipient pit-and-fissure caries with air-abrasion techniques. They found that the preparation volume was not statistically different if the treatment was early air-abrasion or control and subsequent treatment.

ANALYSIS

This article presents itself as a realistic and necessary approach to a common concern regarding the treatment of questionable pit-and-fissure lesions. Does the patient gain something when air-abrasion treatment is used? And when early intervention is used, is there a smaller preparation involved and is more tooth structure saved? The authors proposed to conduct a randomized clinical trial to demonstrate the value in treating questionable pit-and-fissure lesions early. Weaknesses of the study are

that it was not explained how the volume of the preparation was measured and how examiners were calibrated.

The most interesting finding of this study is the low progression rate of questionable initial pit-and-fissure caries lesions. The authors originally postulated that 25% of the untreated incipient pit-and-fissure caries lesions would progress. After they had completed the cavity preparations in the teeth in the group treated with immediate air-abrasion, and noted that 44% of the questionable pit-and-fissure lesions had caries into the dentin, the authors feared that even more than 25% would progress to caries into the dentin. Yet, after 12 months only 11% had progressed to a clinical diagnosis of caries-into-the-dentin. Long-term results in this sample will provide valuable data to further determine the dynamics of mineralization and demineralization of early caries lesions.

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Upfront

Kristen Romanowski and Daniel Bond

More women and teens needed for HIV vaccine clinical trials

More women and adolescents are needed to participate in HIV vaccine clinical trials, say 40 international experts brought together by the World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) to discuss gender, age, and race in HIV vaccine research and clinical trials.

At a late August meeting in Lausanne, Switzerland, experts agreed that women, particularly girls, are often excluded or unlikely to participate in HIV vaccine clinical trials, even though they would be major beneficiaries of a future vaccine for the virus that disproportionately affects women and girls. Studies show that, when exposed to the virus, women are at least twice as likely to become infected with HIV as are males.

“Clinical trial enrollment needs to be more inclusive, so the benefits of research are more fairly distributed,” meeting co-Chair Ruth Macklin said in a WHO press release.

The WHO-UNAIDS HIV Vaccine Initiative aims to develop licensed and effective vaccines that are accessible by all, regardless of gender, age, socioeconomic status, race, ethnicity, or country. The initiative stipulates that vulnerable groups, particularly women and girls, must benefit from an HIV vaccine.

Girls and young women aged 15 to 24 account for 62 percent of the young people living with HIV or AIDS in developing countries, and, in parts of sub-Saharan Africa, are up to six times more likely to be infected than their male peers. Youth in general are also at high risk for contracting the virus, with about half of the new HIV infections in the developing world occurring among 15- to 24-year-olds.

Despite these statistics, women and youth are not participating in clinical trials at the same level as adult men for many reasons, including lack of empowerment and education, social isolation, discrimination, cultural stigma, pregnancy, and issues of confidentiality and informed consent, according to the WHO.

Because vaccines for several infectious diseases have shown different levels of effectiveness among different gender, age, racial, and ethnic groups, a potential HIV vaccine must be tested in varied populations, experts at the meeting agreed. For example, a clinical trial from 1998 to 2003 of VaxGen's AIDSVAX found that although the vaccine was not effective overall, non-whites and women possibly had a degree of protection, a finding which calls for further study.

The number of AIDS vaccine candidates in small-scale human trials has doubled since 2000, and 30 new candidates are now being tested in clinical trials in 19 countries. A safe, effective, and affordable HIV vaccine would be a momentous achievement in the battle against the AIDS epidemic, which continues to infect five million adults and children and kill three million people each year. —**KR**

Vioxx withdrawal shakes pharmaceutical industry

One of the most widely prescribed arthritis and acute pain medications in the world has been pulled from the market, causing long-term implications for both the maker and users of the drug, as well as for the regulatory process used to guarantee drug safety. In late September, drug maker Merck set off a storm of public controversy when it announced a voluntary withdrawal of Vioxx from the worldwide market.

The withdrawal comes in response to Merck's own research, which linked the drug to an increased risk of coronary disease. Ironically, Merck's study was designed to discover if Vioxx could help prevent the recurrence of potentially cancerous polyps, a trait which could have significantly increased Vioxx's presence in the market. Instead, researchers discovered that, after 18 months, participants taking Vioxx regularly had double the risk of heart attack or stroke as those on a placebo. Prior to Merck's recall, numerous studies had suggested that Vioxx might be linked to high blood pressure and heart disease in chronic users.

"We are taking this action because we believe it best serves the interests of patients," Merck CEO Raymond V. Gilmartin said in a press release. Gilmartin stopped short of acknowledging suggestions that the drug could be a killer, maintaining that "it would have been possible to continue to market Vioxx with labeling that would incorporate these new data."

The withdrawal has led some to charge the Food and Drug Administration (FDA) with negligence for approving the drug in 1999. Thomas Moore, a health policy analyst for George Washington University, told Reuters that, in the face "of mounting evidence over five years that this drug had cardiovascular risks, [the FDA] settled for almost a minimal amount of action, a small change in the product labeling." The labeling change was not enough, Moore said. "The result of this is, literally, millions of people wake up one morning and discover they were taking a drug that did more harm than good," he said.

These developments have cast a shadow across all COX-2 inhibitors, the drug family to which Vioxx belongs. Since their introduction to the market, COX-2 inhibitors have been touted by many as "safer" pain relievers because, unlike ibuprofen or naproxen, they block inflammation while also protecting the stomach lining, meaning fewer users suffer from stomach irritation.

Pfizer, the makers of Celebrex, a COX-2 inhibitor prescribed widely as an alternative to Vioxx, recently told the Wall Street Journal that the company has been monitoring three studies on cardiovascular side effects and has found "none of the safety problems Merck found with Vioxx." The current Celebrex label states that cardiovascular side effects are "possible, but uncommon."

The withdrawal has also resulted in a spate of class action lawsuits against Merck. In Canada, one suit targets Merck and its Canadian subsidiaries, and another charges that Canada's attorney general and health minister were complicit in Merck's failure to heed early warnings about the risks associated with Vioxx.

In Illinois, a class action suit representing an estimated 300,000 state residents has been filed and awaits certification from local courts. Michael Moirano, one of the lawyers representing Illinois users, released a statement claiming that Merck "intentionally tried to downplay the findings" until the evidence against the drug "was so overwhelming they had no choice."

Despite major setbacks, including financial losses, Merck plans to continue clinical tests for Arcoxia, a new medication being developed to replace Vioxx. —*DB*

Mood disorders and their treatments may have oral side effects

Patients who suffer from mood disorders like major depression and bipolar disorders need special oral health care, according to the September/October 2004 issue of *General Dentistry*.

Because depressed patients often lose interest in oral hygiene, and patients with mania can cause tooth abrasion and gingival injury by brushing and flossing excessively, oral health care providers must be able to recognize the signs of various mood disorders and refer patients for evaluation and treatment.

Patients receiving treatment for mood disorders must also be carefully monitored. “An aggressive, effective oral hygiene program is important for patients with mood disorders because many of the drugs used to treat these disorders produce xerostomia, which increases the risk for dental caries, periodontal disease, and fungal infections,” author James W. Little, DMD, writes.

To combat the side effects of antidepressants and mood-stabilizing drugs, oral health care providers should advocate preventive measures like artificial salivary products, antiseptic mouthwash, and daily fluoride rinses. They must also be careful to avoid drug interactions when giving dental treatment.

Major depression affects up to 37 percent of American adults and is more common among women than among men. In adolescence, girls are twice as likely as boys to be diagnosed with depression. —**KR**

Lupus sufferers find relief in cancer drug

A drug now used to treat a form of cancer may be a blessing to those who suffer from lupus, according to research published in the August issue of *Arthritis and Rheumatism*. The results of a 12-month clinical study conducted by physicians at the University of Rochester Medical Center show that rituximab, a drug used to treat lymphoma, significantly improved the health of 11 of 17 lupus patients injected with the drug. Several patients were able to go off or reduce their traditional lupus medications.

Lupus is a chronic disease that causes the body’s immune system to lose the ability to tell the difference between foreign substances and its own cells and tissue. The immune system then attacks the body’s own tissue and major organs, causing a wide range of symptoms, the most common of which include achy and swollen joints, frequent fevers, extreme fatigue, and skin rashes.

Four out of 10 patients with lupus take six medications or more to control their symptoms. Commonly prescribed medications include non-steroidal anti-inflammatory drugs, acetaminophen, corticosteroids, antimalarials, and immunomodulating drugs.

Although lupus can affect any organ, including the heart, brain, lungs, and kidney, it is not necessarily life-threatening. According to the Web site of the Lupus Foundation of America, “the idea that lupus is generally a fatal disease is one of the gravest misconceptions about the illness.” The Foundation estimates that approximately 1.5 million Americans suffer from some form of the disease, 90 percent of whom are women. Lupus is also two to three times more common among African Americans, Hispanics, Asians, and Native Americans.

In lupus patients, B cells are found in the wrong proportions in blood and tissue, and they make antibodies that mistakenly attack the body itself. Because lupus involves the same immune B cells as lymphoma, the University of Rochester researchers suspected that rituximab would also be successful at treating lupus. The 11 patients who showed the most improvement in this study, in fact, also showed significant drops in their B cells.

Besides improvements in health, patients in the study experienced few side effects. Because the cancer drug precisely targets B cells, aiming to lower their numbers, rituximab carries fewer side effects than current lupus treatments, which can leave patients vulnerable to infection, heart disease, glaucoma, depression, thinning bones, weak muscles, and weight gain.

Researchers say that rituximab is the first new, targeted therapy to be discovered in a long time, and the team is now helping to design a larger study with multiple sites around the nation. —**KR**

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Review of: Atlas of Cosmetic Dentistry: A Patient's Guide

Anne Gwozdek

Reviewed by Anne Gwozdek, RDH, BA, private practice dental hygienist and adjunct clinical faculty member at the University of Michigan, Ann Arbor.

Landau MJ

Quintessence Publishing Co., Carol Stream, Illinois, 2004

34 pages, illustrated, indexed, hardcover

ISBN: 0-86715-428-4

\$198.00

Author Mark J. Landau, DDS, developed the *Atlas of Cosmetic Dentistry: A Patient's Guide* in response to his need to communicate more effectively with his patients. Landau found that patients better understood and accepted treatment when they had opportunities to view examples of proposed options.

For patients and professionals to get the most from this text, Landau includes an accompanying four-page guide, "How to Use This Atlas." He suggests that the *Atlas*, which can be displayed via a fold-out base, be placed in reception areas and treatment rooms to stimulate dialogue about available treatment possibilities. In addition to facilitating conversation, Landau planned this text to "educate, motivate, and inspire patients to accept treatment that can change their lives."

The *Atlas of Cosmetic Dentistry: A Patient's Guide* is divided into seven topic areas:

porcelain laminate veneers and crowns

composite bonding

tooth whitening

bridges

dental implants

periodontics

orthodontics

Each page addresses a specific area of oral health treatment. For example, page five covers the topic "Gap Between Front Teeth." Through photographs and text, the "problem" of a diastema is presented. The "solution" is also discussed through bulleted text and photos that identify the process of diagnostic wax-up and the fabrication of veneers. Both the problem and the solution are communicated succinctly. A patient would make optimal use of this guide if it were paired with discussion with an oral health care professional. Dental terminology is used throughout, and the patient will likely need assistance to digest the content.

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Review of: Oral Radiology: Principles and Interpretation

Jacqueline Brian

Reviewed by Jacqueline Brian, LDH, MSED, professor at Indiana University-Purdue University, Fort Wayne, Indiana.

White SC and Pharoah MJ

Mosby, 5th Edition.

St. Louis, Missouri, 2004

760 pages, illustrated, indexed, hardcover

ISBN: 0-323-02001-1

\$89.00

In the latest edition of *Oral Radiology: Principles and Interpretation*, the authors provide the most up-to-date information on diagnostic imaging, and they clearly describe the essential principles of image production and interpretation. The text is enhanced by more than 1,000 strategically placed radiographs and illustrations, including expansive imaging techniques like MRI and CT, and all-encompassing discussions of interpretation and pathology.

This text has 31 chapters, each of which includes sections that address clinical features, differential diagnosis, and clinical management. These chapters are grouped into five sections, with Parts IV and V being the most extensive.

Part I addresses the physics of ionizing radiation; Part II discusses the biologic effects of radiation, and Part III covers radiation safety and protection. Part IV has two chapters, “Panoramic Imaging” and “Extraoral Radiographic Interpretation,” that have been rewritten to emphasize interpretation. Special attention has been given to help the student discern normal anatomy on panoramic and skull abnormalities. Another chapter on digital imaging has been added to include the different types of imaging and the advantages and limitations of clinical use. Leading edge technology—cone-beam tomography—has been introduced in this section as well. The 17 chapters in Part V, *Radiographic Interpretation of Pathology*, feature conditions such as inflammatory benign and malignant diseases of the bone and jaw, TMJ dysfunction, paranasal sinuses, calcifications, and trauma.

Even though this text is written for oral health care students and practitioners, oral radiologists, and radiologists, this resource of oral radiology would be worthwhile to include in any dental hygiene library.

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Review of: Handbook of Nitrous Oxide and Oxygen Sedation

Ann E Spolarich

Reviewed by Ann Eshenaur Spolarich, RDH, PhD, a physiologist, practitioner, and independent research consultant in Cave Creek, Arizona.

Clark M and Brunick A

Mosby, 2nd edition

St. Louis, Missouri, 2003

236 pages, indexed, illustrated, paperback

ISBN: 0-323-01977-3

\$38.95

The Handbook of Nitrous Oxide and Oxygen Sedation, now in its second edition, is marketed as a chairside reference guide for oral health care and other health professionals to use in the delivery of nitrous oxide sedation. The book is written in a concise and bulleted format to facilitate reading and to locate information quickly and easily. This edition has been expanded from the original and now includes additional detailed information about the effects of nitrous oxide on various body systems and special multidisciplinary applications. A review of the American Society of Anesthesiologists (ASA) classification guidelines is included to assess patients with medical risk who may be candidates for sedation.

The book is divided into three main sections. Of special merit in the first section, *Introduction to Nitrous Oxide/Oxygen Sedation*, is chapter 7, "Economic Benefits Associated with N₂O/O₂ Administration," which details an actual breakdown of income potential and practice remuneration when providing nitrous oxide sedation services to patients. This is a unique attribute that very few other resources provide to readers. Section I as a whole, however, is perhaps the least useful section to dental hygienists, especially to those who may already be familiar with this type of sedation technique. While interesting, the historical overview of the discovery and early uses of nitrous oxide is extraneous and not practical to include in a chairside text. Discussions of the physical properties and characteristics of gases, as well as the chapters on manufacturing and distribution, are also too detailed and cumbersome to be useful to a clinician.

This is not to imply that the information is neither important nor useful. To be fair, health professionals, including anesthesiology students, who are unfamiliar with nitrous oxide may find the information described in these chapters to be highly relevant and necessary. However, most dental hygienists would benefit more from a summary section with bulleted key points discussed in each of these chapters to ease the burden of learning this material. It also seems that this amount of material would be best suited for a regular textbook devoted to sedation, with chapters 4, 5, and 6 streamlined into one chapter.

Section II: Anatomy, Physiology and Administration contains the most valuable and practical information for dental hygienists. The nine chapters found within this section are an excellent resource for dental hygiene educators who are teaching sedation techniques for the first time. These chapters are extremely well written and offer detailed, yet concise,

information that will ease the learning process for dental hygiene students. Chapters 8 and 9 offer an excellent review of the respiratory system and describe how nitrous oxide interacts with the body. Difficult physiologic concepts are simplified and easy to understand. Discussions about oxygen saturation in the body, recommendations to reduce risk for diffusion hypoxia, and the rationale for providing post-operative oxygenation are supported by the review of normal respiratory and blood gas physiology. Especially notable are the discussions related to system effects and patient selection criteria for sedation. Chapter 10 is a helpful guide for ASA risk assessment, improved history taking, and emergency preparedness.

The best chapters for use at chairside are chapter 12, "Signs and Symptoms of N₂O/O₂ Sedation," and chapter 13, "Technique for N₂O/O₂ Administration." These chapters provide step-by-step details about equipment set-up and evaluation, patient preparation, and nitrous oxide administration. Bulleted points include what patients may expect when receiving nitrous oxide, characteristics to observe in the sedated patient, and signs of overdose. Summary boxes list critical learning concepts, and photographs and illustrations supplement the text by visually depicting these key concepts. Dental hygiene students and practitioners alike will greatly appreciate this section of the book. Practitioners who work with children will find chapter 16, a new feature of this second edition, to be a very helpful guide for administering sedation to pediatric patients.

Section III: Issues of Special Consideration addresses ethical and legal considerations related to nitrous oxide administration, biohazards associated with chronic exposure, and substance abuse. Chapter 20, which students could use as a study guide, provides answers to commonly asked questions. Other noteworthy features of this book are found in the appendices, including a detailed resource list about manufacturers and organizations that regulate nitrous oxide production, distribution, and usage. This reviewer especially liked the sample forms that practitioners can photocopy and use for record-keeping in their offices. For further study, each book chapter contains a complete list of references, and many chapters include a list of suggested readings.

Overall, this text is an excellent resource for both dental hygiene students and practitioners. Educational institutions and private care settings should include this book in their reference libraries. The authors are to be commended for creating this practical and useful reference guide to improve the delivery of nitrous oxide sedation to patients in the oral health care setting.

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Review of: Spanish Terminology for the Dental Team (Terminologia En Espanol Para El Equipo Dental)

Cassandra Holder-Ballard

Reviewed by Cassandra Holder-Ballard, RDH, MPA, associate professor of dental hygiene at the University of Tennessee Health Science Center, Memphis.

Finkbeiner BL et al.

Mosby

St. Louis, Missouri, 2004

302 pages, indexed, paperback, CD-ROM

ISBN: 0-323-02536-6

\$29.95

Spanish Terminology for the Dental Team (Terminologia En Espanol Para El Equipo Dental), a self-paced instructional textbook, is an excellent resource for all oral health care professionals at any level of Spanish proficiency. This paperback text, which opens by providing readers with a foundation in the Spanish alphabet, pronunciations, and parts of speech, is organized for easy use by individuals with no skills or formal training in speaking Spanish. The text also provides professional terminology for fluent speakers who need help with specific, occupational vocabulary. An included audio CD-ROM provides an excellent resource for oral health care professionals who are pursuing fluency in Spanish.

The objective of this book is to assist oral health care professionals who desire to master the Spanish language as it relates to oral health, or who need a resource for interacting with Spanish-speaking clientele. The book is organized in a logical sequence of how oral health teams interact with patients, from the initial greeting to various types of oral health treatment to scheduling the next appointment. The text's 27 chapters are organized into subtopics written in English, followed by the Spanish translation. Examples of typical English dialogue that oral health care professionals are likely to have with patients are written in both English and Spanish. Therefore, if oral health office personnel are reluctant to speak in Spanish, they could use the text and simply point to phrases they are attempting to communicate to their patients.

The text is organized into three major sections. Part I covers general communication and administration. These five chapters concentrate on treating patients with courtesy, speaking to children, emergency protocol, office administration, and common patient questions and responses. Part II, which spans the next 13 chapters, addresses patient evaluation and planning. This section begins with various patient assessments, including patient history, overall health assessment, oral hygiene assessment, and exams (i.e. radiographic, dental, periodontal). These chapters also highlight typical dialogue likely to occur between practitioners and patients. The last nine chapters, Part III, deal with the delivery of specific types of oral health treatment, including preventive care, restorative treatment, periodontal therapy, endodontic treatment, orthodontic treatment, prostodontic treatment, tooth whitening, cosmetic restorations, extractions and oral surgery, and post-operative care.

The text's comprehensive glossary includes general topics, such as days of the week and months of the year, and specific health-related topics, such as health terms, medications, and dental terms. Following the glossary is an extensive, alphabetical, English-to-Spanish vocabulary list. This text is also supplemented with a CD-ROM that provides the English-to-Spanish translation of every phrase in the book. English phrases are spoken by an American, and Spanish phrases are delivered by a Colombian speaker. The audio requires QuickTime 6.1 or higher, which is available to download at no cost, and the CD-ROM is compatible with both Macintosh and Windows-based computers.

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Benefits of Sodium Hexametaphosphate-Containing Chewing Gum for Extrinsic Stain Inhibition

Patricia A Walters, Aaron R Biesbrock and Robert D Bartizek

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Purpose. This study was designed to examine the ability of sodium hexametaphosphate delivered from a chewing gum to prevent extrinsic tooth stain formation.

Methods. This study was a negative-controlled, randomized, two-period crossover design, with a 10-day washout period between treatments. The two treatments were a chewing gum containing 5.6% sodium hexametaphosphate and a negative control chewing gum. Eleven subjects who met study criteria were enrolled, and 10 completed the study over a two-week period. Each treatment period lasted approximately 48 hours and was separated by a washout period. After a dental prophylaxis, a digital image of the anterior teeth was taken to assess baseline stain. The three-day stain induction phase consisted of the patient using a 10 ml 0.2% chlorhexidine rinse for 60 seconds, followed by chewing two pellets/sticks of their assigned gum for five minutes and rinsing with 10 ml of cold tea solution for 60 seconds. No oral hygiene was permitted other than use of the test products. During both treatment periods, each subject followed the same regimen eight times, once per hour, throughout the day.

Results. On Days 2 and 3, the adjusted mean L* measurement was statistically significantly greater for the sodium hexametaphosphate gum than for the control gum. Moreover, nine of the 10 subjects had whiter teeth while on the experimental gum treatment at both Day 2 and Day 3.

Conclusion. The results of this study support that sodium hexametaphosphate delivered from a chewing gum prevents dental stain formation and leads to a patient-desired whitening benefit.

Keywords: tooth stain, chewing gum, sodium hexametaphosphate

Introduction

Stains on the teeth are not etiologic factors for any disease. Discoloration or extrinsic staining of the teeth caused mostly by food products containing tannins, such as tea, coffee, tobacco, red wine and colas, is very common.¹ Research has shown that, despite regular oral care such as tooth brushing and flossing, many individuals develop extrinsic stains on the surfaces of their teeth from using products that contain tannins or a product such as PeridexM-BM-. mouthrinse, used to treat gingivitis.²

Most individuals are concerned with the staining of their teeth for aesthetic, not health, reasons and look for an easy method to remove such stain. During a routine dental appointment, professionals remove extrinsic stains by polishing teeth with

an abrasive paste applied to a rubber cup and attached to a motorized handpiece.³ The aesthetic benefits of this procedure, however, last only a short time.

Chewing gum bases possess a number of therapeutic benefits, including increased saliva flow and the removal of food debris, plaque, and surface stains.⁴ The concept of using chewing gum to deliver agents within the oral cavity is well established. For example, in the past five years, chewing gum has been used as a means to deliver whitening and tartar prevention agents. One study comparing three chewing gums containing various levels of baking soda reported significant reductions, 65% to 72%, in mean stain score at both a two-week and four-week read relative to baseline.⁵ A second study reported a statistically significant ($p < 0.001$) 51% reduction in mean stain scores, relative to baseline, over a four-week use of chewing gum containing baking soda.⁶ Additionally, in one four-week study, subjects with natural stain chewed a baking soda-containing gum twice a day for 20 minutes and reduced the mean stain score from baseline by 29.7% (with $p = 0.004$).⁷ Importantly, the proof of efficacy in these two studies was based on change from baseline comparisons, as opposed to superiority testing versus a placebo gum. Thus, clinical effectiveness cannot be attributed to the presence of baking soda alone.

A new active ingredient, sodium hexametaphosphate, has been incorporated into dentifrices to deliver tartar and stain prevention and removal benefits.⁸ One of the potential advantages of high molecular weight-condensed phosphate analogues, such as sodium hexametaphosphate, is a greater inhibitory activity in preventing crystallization or stain chromogen adsorption.^{8,9} A six-week clinical study that examined the removal of extrinsic, natural tooth stain found that a dentifrice containing 7.0% sodium hexametaphosphate resulted in a statistically significant (29%) lower extrinsic stain score at six weeks, relative to a control fluoride dentifrice.¹⁰ Similar results were observed in a second six-week clinical study that tested the removal of induced chlorhexidine/tea extrinsic tooth stain with a sodium hexametaphosphate-containing dentifrice.¹¹

A chewing gum that contains sodium hexametaphosphate has been developed recently for the primary purpose of whitening teeth through extrinsic stain prevention and removal. Sodium hexametaphosphate can disrupt the *in vivo* salivary film at the tooth surface, creating a more hydrophilic tooth surface. This allows greater desorption and diffusion of surface chromogen into saliva, presumptively reducing overall extrinsic staining.¹² This current study was designed to examine the ability of sodium hexametaphosphate delivered from a chewing gum to prevent induced stain formation.

This study was a randomized, examiner-blind, two-period crossover, single-center study that compared the reduction in induced extrinsic stain formation, as measured by digital image analysis (DIA) of a chewing gum containing 5.6% sodium hexametaphosphate, compared to a commercially available "non-sodium hexametaphosphate" chewing gum, which served as a negative control.

Materials and Methods

This study was conducted in a suburb of London, United Kingdom. The study was a negative-controlled, examiner-blind, randomized, two-period crossover design (each subject used both treatment sequences), with a 10-day washout period between treatments. The two treatments were an experimental chewing gum containing 5.6% sodium hexametaphosphate and a negative control chewing gum containing no sodium hexametaphosphate (Wrigley's ExtraM-BM-.-peppermint flavor). Eleven volunteers who met the entrance criteria of being at least 18 years old and having a minimum of 16 natural teeth, including at least seven of the eight anterior incisor teeth, were enrolled. Subjects were excluded if they reported known hypersensitivity to chlorhexidine digluconate or polyphosphates. Additional exclusion criteria included the presence of anterior facial restorations, evidence of TMJ dysfunction, presence of oral ulcers, self-reported diabetes, or self-reported pregnancy. The treatment periods lasted three days and were separated by a minimum washout period of 10 days (Figure 1).

Figure 1: Study Design

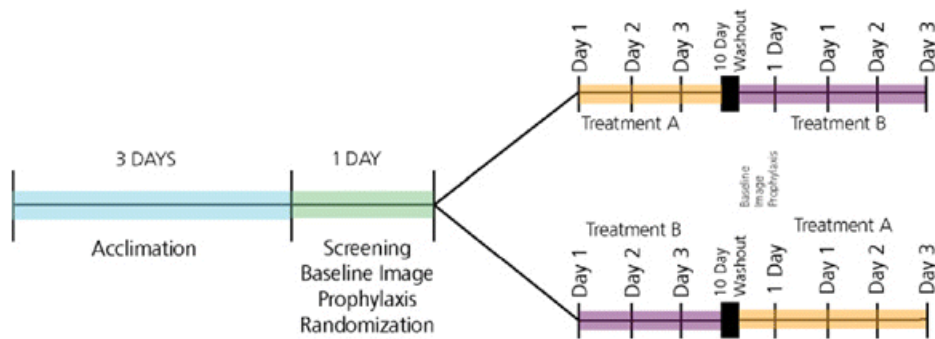


Figure 1. Study Design.

Three days prior to the screening visit, volunteers were given a manual toothbrush and a marketed sodium fluoride toothpaste and told to brush normally. At the screening/baseline visit for Period 1, subjects who met the entrance criteria signed an informed consent and provided demographic data. In addition, a baseline oral soft tissue examination was performed. Each subject received a thorough dental prophylaxis, which included scaling and polishing by a single dental hygienist in a single day. A digital image of the anterior teeth was taken to assess baseline stain for Period 1. Prior to dismissal, subjects were given instructions to cease all oral hygiene practices after 11:00 p.m. of the day that the baseline images were taken.

Subjects visited the study site the next day and started their supervised staining induction phase, which consisted of rinsing with 10 ml of 0.2% chlorhexidine for 60 seconds, followed by chewing two pellets/sticks of their assigned gum for five minutes and rinsing with 10 ml of cold tea solution for 60 seconds. Each subject followed the same regimen eight times, once per hour, throughout the day. The subjects repeated the regimen on Day 2 and Day 3. During the three-day stain induction phase, no oral hygiene was permitted other than use of the test products. Prior to the digital image being taken on Day 2 and Day 3, the subjects waited one minute after their final rinse with tea and then rinsed with 10 ml of water for 10 seconds.

After completing the first period, subjects entered a washout period and were again given a manual toothbrush and a marketed sodium fluoride toothpaste and told to brush normally for the next 10 days. Following the washout period, subjects returned for the baseline visit of Period 2 where they received a thorough dental prophylaxis and an oral soft tissue assessment. A baseline digital image of all anterior teeth was taken. Prior to dismissal, subjects were advised to cease all oral hygiene practices after 11:00 p.m. on the day their baseline images were taken. Again, during the three-day stain induction period, no oral hygiene was permitted other than the use of the test products. The second treatment period followed the same regimen outlined in Period 1, with the notable exception that subjects used the other chewing gum product.

The digital image analyses photographic system used in this study consisted of a high-resolution HC1000CCD digital camera manufactured by Fuji. Two 150-watt lights located on each side of the CCD camera provided lighting. The system was equipped with a Fujinon 7.5M-bM-^@M-^S30 motorized zoom lens and a linear polarizer to permit cross-polarized light. The unit was connected to a personal computer that recorded and analyzed the images. Prior to daily use, the system was calibrated to assure proper operation. Additionally, a color standard was centered and imaged every hour, prior to imaging subjects. For imaging the anterior teeth, each subject sat on a stool in front of a chin rest used to both reproducibly reposition the head and hold it still. The subject then used cheek retractors to retract lips and cheeks. The teeth were placed in an anterior incisal edge to incisal edge position and centered in the camera by the subject tilting their head per the DIA technician's instructions. Prior to exposure, subjects were instructed to position their tongues away from the linguals of the anterior teeth. The same technician was used throughout the study.

Tooth color change in L*, a*, and b* color space was assessed based on evaluation from the digital images. The difference in the color of digitally imaged teeth between two time periods can be measured by difference in lightness or white M-bM-^@M-^S black (delta L*), redness-greenness (delta a*), and yellowness-blueness (delta b*).¹³ The change from baseline (post-treatment minus baseline) in L* was calculated and defined as delta L* because of the nature of

chlorhexidine-tea stain, which is primarily brown to black. Higher L* values indicate whiter teeth. The efficacy variables were analyzed for treatment group differences using analysis of covariance (ANCOVA) (with the baseline L* score as the covariate) for a crossover design. The four maxillary incisors, four mandibular incisors, and two mandibular canines formed the basis of the analyses. All tests were two-sided with a 5% significance level.

Results

Eleven subjects were randomized into one of two treatment sequences in this examiner-blind, two-period crossover study. Ten subjects completed both treatment periods. Six male and four female subjects ranged in age from 22 to 58, with a mean age of 30.4 years. One subject in the experimental (chewing gum first/negative control gum second) sequence dropped from the study due to an adverse event, reported and diagnosed by the examiner as acute parotid swelling and described as non-serious, mild in severity, and possibly related to the use of the product. The adverse event was followed to positive resolution. In this study, subjects chewed a negative control gum during one period and, in the other period, a gum containing 5.6% sodium hexametaphosphate. A summary of the baseline mean L* scores are reported in Table I.

Table I: Day 2 L* Results

Chewing Gum Treatment	N	Baseline (BL) Value (Mean ± SD)	Day 2 Delta L* (Adj. Mean ^a ± s.e.)
Placebo	10	78.28 ± 1.57	-5.51 ± 0.34
Sodium Hexametaphosphate	10	78.52 ± 1.30	-3.26 ± 0.33

The difference in adjusted means between the two treatments is statistically significant (p=0.002)
 a-Adjusted means and standard errors from analysis of covariance with baseline L* as the covariate

Analysis of covariance, with baseline value as the covariate, determined that the stain intensity increased (L* has decreased) from baseline with both chewing gums. The accumulation of stain from baseline, however, was significantly lower for the sodium hexametaphosphate gum when compared to the negative control gum on both Days 2 and 3 (Table I, II). The change in mean L* from baseline was -5.51 for the placebo and -3.26 for the sodium hexametaphosphate gum on Day 2. A smaller change in mean L* indicates less stain. Day 3 delta L* results for the negative control gum and sodium hexametaphosphate gum were -7.27 and -4.67, respectively.

Table II: Day 3 L* Results

Chewing Gum Treatment	N	Day 3 Delta L* (Adj. Mean ^a ± s.e.)
Placebo	10	-7.27 ± 0.41
Sodium Hexametaphosphate	10	-4.67 ± 0.42

The difference in adjusted means between the two treatments is statistically significant (p=0.003)
 a-Adjusted means and standard errors from analysis of covariance with baseline L* as the covariate

Figures 2 and 3 show that nine of the 10 subjects had whiter teeth while on the sodium hexametaphosphate gum treatment at both Days 2 and 3. The majority of subjects demonstrated less change in L* measurements (teeth have less darkening through stain deposition) from baseline with the sodium hexametaphosphate chewing gum compared to the negative control chewing gum on both the second and third day of rinsing/dosing. One subject exhibited virtually no difference in stain

prevention between the two chewing gum treatments. Figure 4 shows a visual comparison of digital images at Day 3 of induced staining following dosing with either the negative control gum or the 5.6% sodium hexametaphosphate gum.

Figure 2: Change in L* Scores from Baseline to Day 2 for Each Subject
(negative changes indicate darker teeth)

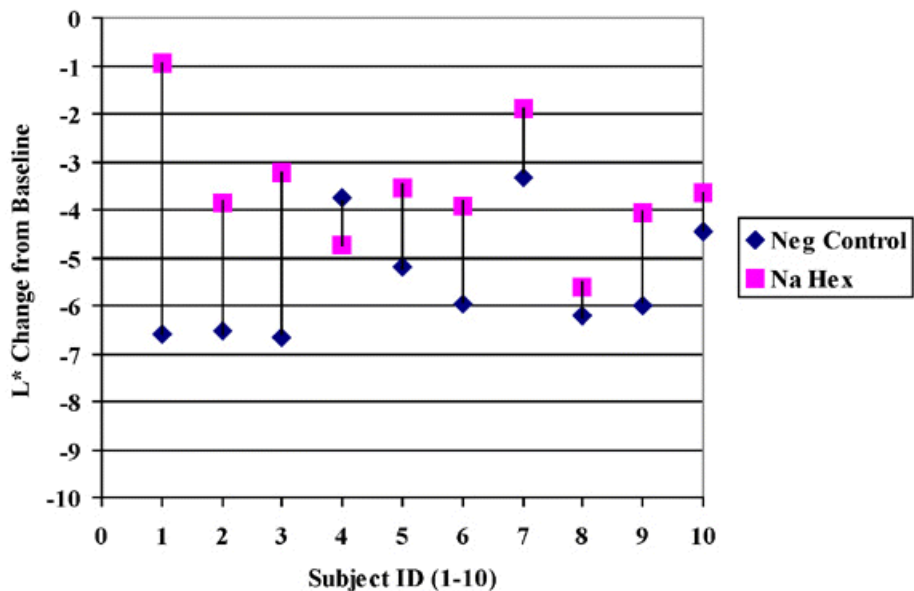


Figure 2. Change in L* Scores from Baseline to Day 2 for Each Subject.

Figure 3: Change in L* Scores from Baseline to Day 3 for Each Subject
(negative changes indicate darker teeth)

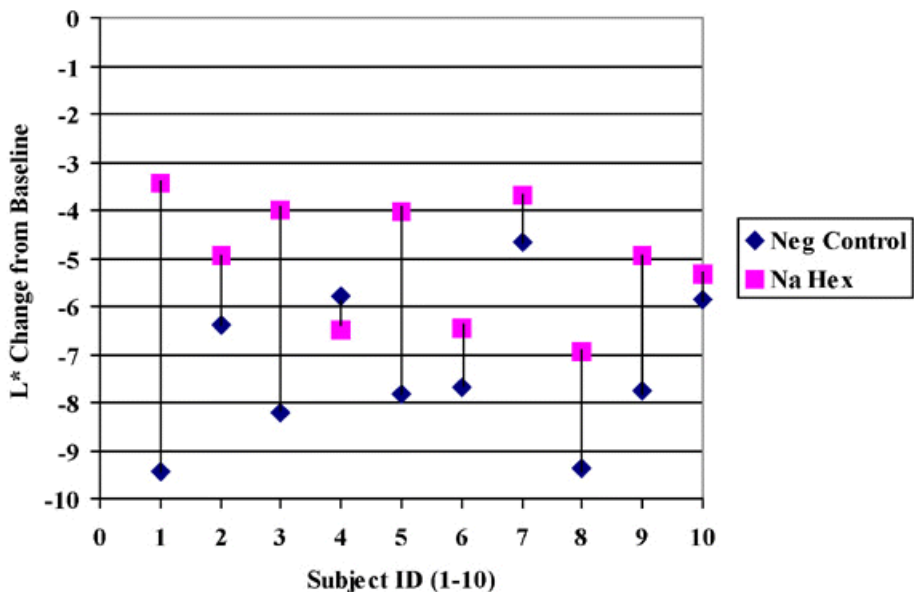


Figure 3. Change in L* Scores from Baseline to Day 3 for Each Subject.

Figure 4: Digital Images at Day 3 of Induced Staining



Figure 4. Digital Images at Day 3 of Induced Staining.

Discussion

The results of this study suggest that sodium hexametaphosphate delivered from a chewing gum may prevent dental stain formation, leading to a perceived whitening benefit. Sodium hexametaphosphate is a calcium-sequestering agent that has strong reactivity to enamel surfaces and produces significant anti-stain and anti-tartar effects in the teeth.⁸ The agent has been shown to interact directly with salivary film (pellicle) composition, displacing nitrogen from the salivary film by sodium hexametaphosphate adsorption to the tooth surface in a chewing gum vehicle.¹² The adsorption of sodium hexametaphosphate interferes with the adsorption of stain chromogen onto tooth surfaces and pellicle proteins, resulting in stain prevention.¹⁴

In this study, relatively low levels (5.6%) of sodium hexametaphosphate in a chewing gum prevented deposition of extrinsic dental stain better than a chewing gum without sodium hexametaphosphate. Statistical significance was shown after two and three days of rinsing/dosing, with $p=0.002$ and $p=0.003$, respectively. Potential limitations of this study regarding generalization include the low number of participants, the chlorhexidine-induced stain mechanism, and the short-term

nature of the study. These results are consistent, however, with several studies that have previously shown that sodium hexametaphosphate in a dentifrice reduces extrinsic stain by 29% to 33%, when compared to a standard control dentifrice over a period of six weeks.^{11,15} All of these studies utilized a well-developed clinical model of deliberate induction of dental stain induced by rinsing with chlorhexidine mouth rinse and tea repeatedly.¹⁶⁻¹⁸ The models allow the ability to more tightly control formation of both intensity and duration of stain. Extrinsic stain formation resulting from chlorhexidine and tea use has been reported to be consistent with natural stain formation.¹⁶ In both natural stain formation and chlorhexidine-mediated stain formation, the stain is caused by the precipitation of dietary chromogen.¹⁹ These similarities suggest that results from induced stain models are reasonable predictors of the outcomes of natural stain.

Consumer interest in improving oral aesthetics is evidenced by increased sales in tooth whitening products in recent years. Introducing a chewing gum that is effective in preventing and reducing stain may be beneficial to both the consumers and oral health care professionals by providing an alternative whitening treatment with portability advantages. Others have suggested that the perceived whitening of teeth can have an effect on patients' level of dental health awareness, resulting in improvement of overall oral health.²⁰ Based on the results of this study and others evaluating sodium hexametaphosphate as a new active ingredient added to both dentifrice and chewing gum, the dental hygienist can offer other options to patients expressing concern about the stain or color of their teeth. Aesthetics is playing an increasingly large part during in-office discussions between the patient and dental professionals.⁸ Some patients may not need tooth whitening products that are effective against intrinsic staining, but rather need an ongoing treatment to inhibit new extrinsic stain formation between office visits.

Conclusions

Analysis of the stain intensity data from this study suggests that the sodium hexametaphosphate-containing chewing gum can significantly reduce induced extrinsic dental stain formation, compared to a non-sodium hexametaphosphate chewing gum. This finding is directly linked to the presence of the sodium hexametaphosphate and its ability to modify the tooth surface to inhibit deposition of stain from tea and chlorhexidine rinses. In addition, both products were well tolerated by this population. A logical next step is a longer-term natural stain prevention study.

Acknowledgements

Notes

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Diversity, Cultural Sensitivity, Unequal Treatment, and Sexual Harassment in a School of Dental Hygiene

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Purpose. The purpose of this study was to assess the cultural environment in the School of Dental Hygiene at the University of Texas Dental Branch (UTDB) at Houston.

Methods. A 36-item questionnaire was developed and administered to first- (DH1; n=34) and second-year (DH2, n=33) dental hygiene students. Questions explored satisfaction with diversity and interactions with faculty, staff, patients, and other students relative to gender, ethnicity/race, age, and sexual orientation. Data were analyzed using 2x3 and 2x5 contingency tables to calculate the chi square test statistic.

Results. Ninety-one percent of the 67 DH students responded. While the majority of students reported satisfaction with the cultural diversity and their interactions at UTDB at Houston, 76% of the DH2 students and 62% of the DH1 students reported that the curriculum did not prepare them to work with patients whose primary language is not English. Eighty-two percent of DH1 students and 59% of DH2 students reported that the curriculum did not prepare them to work with patients with different sexual orientations and religious backgrounds. The DH2 students reported unequal treatment by faculty of another gender (24%) and ethnicity (21%), and sexual harassment by other students (6%). DH1 reported 6%, 12%, and 0%, respectively.

Conclusion. Data indicate that dental hygiene students in the UTDB at Houston dental hygiene program experienced unequal treatment and sexual harassment by either faculty, staff, patients, or other students. To create a more culturally sensitive environment, the students, faculty, and staff could benefit from training on diversity, cross-cultural competence and awareness, and sexual harassment prevention and management. The dental hygiene curriculum should be reviewed for the inclusion of topics related to diversity, cultural competence, and sexual harassment.

Keywords: Diversity, cultural competence, inclusion, unequal treatment, sexual harassment

Introduction

As racial and ethnic composition changes in the United States, dental and dental hygiene academic institutions must also make changes to graduate culturally competent oral health care practitioners.¹ *Cultural competence* has been defined as "a process that requires individuals and systems to develop and expand their ability to know about, be sensitive to, and to have respect for cultural diversity."² *Cultural groups* are individuals who share a common background, ethnic origin, and

"style of living with shared history and experience." ² Culturally competent practitioners have a racial and cultural understanding of their patients' belief systems, compliance issues, family structures, cultural biases, and ethnic practices.

3

The U.S. population is becoming more diverse, and minority populations are projected to comprise more than 48% of the total population by 2050.^{3,4} As the Surgeon General stated in a 2000 report on oral health in America, more diverse, culturally competent dental practitioners are important to increase access to care for minorities and to reduce cultural and socioeconomic disparities.⁵ Dental and dental hygiene schools must address issues of cultural competence and diversity in order for these needs to be addressed by future oral health care professionals.

The University of Texas Dental Branch (UTDB) at Houston has a culturally diverse population of students and faculty who provide oral health care to an equally diverse public population. According to the University of Texas Health Science Center at Houston *Fact Book* 2004, ethnic representation of the UTDB faculty is 71% Caucasian, 14% Asian, 10% Hispanic, and 4% African American. Of the 146 faculty members, 67% are male and 33% are female.

The ethnic composition of the UTDB dental hygiene student population is 18% Asian, 17% Hispanic, 1% African American, and 1% American Indian, as reported by the associate dean of student affairs. Ninety-eight percent of the dental hygiene students are female and 2% are male. UTDB at Houston employees are 49% ethnically diverse, and 40% are male and 51% are female.

With this diverse population in mind, the former dean formed the Ad Hoc Committee on Cultural Diversity in the late fall of 1999. The committee was composed of diverse members and was charged by the dean and the faculty senate to assess the current environment as it related to diversity issues, make recommendations for change and, ultimately, implement strategies to facilitate any needed changes. The committee's tasks were to review the literature, interview focus groups, and develop survey instruments to assess faculty, staff, and students. The University of Michigan School of Dentistry gave permission to broadly adapt a survey it had used to assess the culture at its institution. The committee worked in collaboration with the Office of Professional Development (OPD) at UTDB at Houston, which had established as one of its strategic goals the promotion of sensitivity among UTDB at Houston administration, faculty, and staff to cultural and gender differences.

This report focuses primarily on the survey of first- and second-year dental hygiene students enrolled in a certificate/baccalaureate degree program. The survey assessed the current cultural environment in an effort to determine the current status of the environment, make recommendations for change where necessary, and implement strategies for improvement.

Review of the Literature

The medical and nursing professions have been striving to enhance cultural competence and incorporate transcultural care education into their respective curricula in recent years.⁶⁻¹⁹ A review of the dental literature yielded few reports, however, on multiculturalism or diversity in dental education, and even fewer in dental hygiene education.²⁰⁻²⁹ Kalkwarf pointed out the challenge that dental schools face in developing practitioners capable of functioning within a multicultural community.

²⁹ He stressed that, to promote multiculturalism, social responsibility rested upon faculty, students, staff, alumni, and dental practitioners. When directed at dental faculty, students, and practitioners, workshops and educational programs that promote a better understanding of different ethnic cultures and values can help develop an environment that fosters respect and acceptance of all individuals.

Cavazos recommended that dentistry use programs directed by the Association of American Medical Colleges (AAMC) as models for restructuring dental curricula.²⁸ The AAMC report and other studies have reported that underrepresented minority (URM) physicians tend to practice medicine in areas where there are many minorities.³³⁻³⁶ The AAMC report also stated that URM students are more likely than non-minority students to recognize that minority populations have access to care problems.³³ Cavazos suggested that dentists would most likely tend to do the same. The trends in dentistry

have been rather dismal in terms of minority enrollment and faculty representation. According to the American Dental Education Association (ADEA), URM enrollment in dental schools has declined from a mere 12.7% in 1997 to only 10.5% in 1999. While dental school minority faculty increased from 6.9% in 1990 to 9.1% in 1998, the percentage does not mirror the diversity of the country's population. Dental schools must recognize that a problem exists and adopt strategies to decrease these disparities.²⁹

Rosella et al. point out that minority students possess a different set of cultural values, social attitudes, and environmental influences than non-minority students.⁶ Students, faculty, and patients of different backgrounds may have difficulty relating to one another in the academic environment. These differences need to be addressed in professional development workshops that include instructional methods such as role playing, guided discussion, and focus groups to help develop cultural competency among faculty, staff, and students. Sensitivity training should also include underrepresented and underserved socioeconomic groups, people with physical or mental illness or disabilities, children and adolescents, women, older adults, people at the end of life, people with different sexual orientations, and people affected by domestic violence, homelessness, and organ donation.⁹

The American Nurses Association urges nurses to include individual value systems and lifestyles in their plans for rendering healthcare. Leiniger, a registered nurse, coined the phrase "cultural imposition," means to impose ones own beliefs and values upon patients.¹⁰ Many nursing studies have found that patient responsiveness to treatment is enhanced when health care professionals incorporate knowledge of cultural beliefs and lifestyles in healthcare practices and professional recommendations.¹¹⁻²²

A study to determine if dental hygienists age, education, or amount of professional experience had an effect on their knowledge of the values, beliefs, lifestyles, or health practices of four different minority groups reported that dental hygienists tended to possess a low level of multicultural knowledge and that none of the factors studied increased this knowledge significantly.³⁰ The authors urged dental hygiene educators to collaborate with colleagues in nursing, psychology, sociology, and anthropology to plan curricula from a "transcultural perspective."³⁰

Many forms of discrimination and harassment exist, involving gender, age, race, and disability. *Gender discrimination*, defined as behaviors that affect women as a result of unequal treatment, disparate treatment, disparate impact, or creation of a hostile environment, has been illegal in the workplace since Congress passed the Civil Rights Act in 1964.³⁷

Sexual harassment, a form of gender discrimination, contributes negatively to the culture of any workplace and is defined as "unwelcome advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature."³⁸ Title IX of the Educational Act of 1972 prohibits any academic institution that receives federal funds from discrimination on the basis of sex. These institutions are required to have a formal mechanism in place and an individual responsible for coordinating activities related to investigating and resolving complaints.²⁹

A survey of graduating dental students revealed that 34% of the respondents had experienced at least one episode of sexual harassment, most often by clinical faculty.⁴⁰ A survey by Webster et al. reported that faculty were the most frequent harassers of dental students, and that female students were seven times more likely to be harassed than males.⁴¹ Their study confirmed what other studies had previously reported-that gender and number of years in dental education are predictors of sexual harassment of students.⁴¹⁻⁴⁷

Chicodo et al. looked at patient harassment of practicing dentists and dental hygienists and found that female dental hygienists reported twice (44%) as many experiences as did dentists (23%). While the mostly male dentists (91%) ranked the problem as insignificant, the all-female dental hygienists ranked it extremely important.⁴⁷ The authors suggest this is, in part, attributed to the fact that most dental hygienists practice in rooms where they are alone with patients. Interestingly, written comments on the returned questionnaires revealed that the harassment of dental hygienists more frequently involved a dentist than a patient.

As noted by the authors of a study that determined the effects of a sexual harassment workshop given to dental students, the workshop helped students to recognize harassment and the importance of stating boundaries to harassers, to understand that harassment can occur between students, and to understand that ignoring the problem is not an effective solution. In the pre- and post-questionnaires, female responses assessing the incidence of sexual harassment changed more dramatically after the workshops than did those of the males. This indicates that many students are unaware of what constitutes sexual harassment.⁴⁸

With these issues in mind, the UTDB at Houston launched an investigation of the cultural environment of the dental school.

Materials and Methods

A 36-item survey was administered separately to both first- (n=34) and second-year dental hygiene students (n=33) during class meetings in the spring of 2001 by the associate dean of professional development, who was also chair of the Ad Hoc Committee on Cultural Diversity. Questions explored satisfaction with diversity and interactions with faculty, staff, patients, and other students relative to gender, ethnicity/race, age, unequal treatment, and sexual orientation. The survey instruments developed were based upon one developed and validated by the University of Michigan School of Dentistry, which gave permission to use and/or modify its survey. The revised survey was reviewed by a group of content experts, including dental hygiene faculty, to establish face validity. Since the revisions made were not substantive, the instrument was not pilot tested. The proposed study and instruments were approved by the Committee for the Protection of Human Subjects at the University of Texas Health Science Center at Houston.

Although the assessment included all faculty, staff, and dental and dental hygiene students in the UTDB at Houston, this report focuses only on the assessment of the dental hygiene students. The survey was divided into seven sections in which respondents were queried about their

opinions regarding the university's and dental branch's interest in and concern for diversity on the campus;

ability to address cultural and social differences appropriately;

personal experiences with unequal treatment from faculty, administrators, staff, or patients;

beliefs that the curriculum does or does not prepare students to work with people with cultural and diversity differences;

thoughts on and experiences with diversity;

suggestions or recommendations to assist the UTDB at Houston in addressing diversity issues; and

demographic information.

Sample items of the questionnaire are shown in Tables I, Ib and II. Items that were statistically significant are shown in Table I and Ib; no other item has statistical significance. Data were analyzed using 2x3 and 2x5 contingency tables to calculate the chi square test statistic.

Table I: Questions Showing Notable, but Not Significantly Different, Results

I believe that most faculty, staff, and students are satisfied with the current state of diversity at the Dental Branch.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
DH1**	20.6% (7)	35.3% (12)	29.4% (10)	5.9% (2)	2.9% (1)	5.9% (2)
DH2***	21.2% (7)	39.4% (13)	27.3% (9)	6.1% (2)	3.0% (1)	3.0% (1)

Faculty equally encouraged students to pursue career development independent of their gender or ethnic background.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
DH1**	29.4% (10)	38.2% (13)	23.5% (8)	2.9% (1)	2.9% (1)	2.9% (1)
DH2***	33.3% (11)	27.3% (9)	21.2% (7)	9.1% (3)	9.1% (3)	0.0%

Faculty encouraged students to pursue career development independent of their sexual orientation.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
DH1**	29.4% (10)	38.2% (13)	26.5% (9)	0.0%	2.9% (1)	2.9% (1)
DH2***	33.3% (11)	33.3% (11)	27.3% (9)	0.0%	3.0% (1)	3.0% (1)

My academic advisor is able to address cultural and social differences appropriately:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
DH1**	26.5% (9)	17.7% (6)	23.5% (8)	0.0%	0.0%	32.4% (11)
DH2***	30.3% (10)	39.4% (13)	30.3% (10)	0.0%	0.0%	0.0%

** n=34, *** n = 33

Table I: (continued)

The curriculum prepared us to work with patients of different ethnic/racial groups.

	Always	Often	Sometimes	Rarely	Never	No Response
DH1**	35.3% (12)	23.5% (8)	17.7% (6)	8.8% (3)	5.9% (2)	8.8% (3)
DH2***	45.5% (15)	18.2% (6)	15.2% (5)	6.1% (2)	0.0%	15.2% (5)

The curriculum had not prepared us to work with patients whose primary language is not English.

	Always	Often	Sometimes	Rarely	Never	No Response
DH1**	17.7% (6)	26.5% (9)	17.7% (6)	14.7% (5)	14.7% (5)	8.8% (3)
DH2***	33.3% (11)	21.2% (7)	21.2% (7)	15.2% (5)	9.1% (3)	0.0%

The curriculum had not prepared us to work with patients of a different sexual orientation.

	Always	Often	Sometimes	Rarely	Never	No Response
DH1**	23.5% (8)	17.7% (6)	20.6% (7)	5.9% (2)	14.7% (5)	17.7% (6)
DH2***	39.4% (13)	33.3% (11)	9.1% (3)	9.1% (3)	6.1% (2)	3.0% (1)

The curriculum had not prepared us to work with patients from different religious backgrounds.

	Always	Often	Sometimes	Rarely	Never	No Response
DH1**	0.0%	0.0%	0.0%	2.9% (1)	88.2% (30)	8.8% (3)
DH2***	0.0%	0.0%	3.0% (1)	9.1% (3)	90.9% (30)	0.0%

** n=34, *** n = 33

Table II: Questions with significant* differences among DH1 students compared to DH2 students.

How often have you experienced unequal treatment from faculty of another gender?

	Never	Rarely	Sometimes	Often	Always	No Response
DH1**	58.8% (20)	29.4% (10)	5.9% (2)	0	0	5.9% (2)
DH2***	66.7% (22)	9.1% (3)	24.2 (8)	0	0	0

How often have you experienced unequal treatment from patients of another gender?

	Never	Rarely	Sometimes	Often	Always	No Response
DH1	85.3% (29)	8.8% (3)	0	0	0	5.9% (2)
DH2	69.7 (23)	12.1% (4)	18.2% (6)	0	0	0

How often have you experienced any form of sexual harassment from patients?

	Never	Rarely	Sometimes	Often	Always	No Response
DH1	88.2% (30)	0	2.9 (1)	0	0	8.8% (3)
DH2	60.6% (20)	27.3%(9)	0	0	0	12.1%(4)

The clinics provide an environment for patients that is sensitive to and affirming of differences in socioeconomic background.

	Never	Rarely	Sometimes	Often	Always	No Response
DH1	8.8% (3)	0	5.9% (2)	38.2% (13)	32.4% (11)	14.7% (5)
DH2	0	3% (1)	3% (1)	18.2% (6)	63.6% (21)	12.1% (4)

The University of Texas at Houston has an honest interest/concern for diversity on the campus.

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree	No Response
DH1	2.9% (1)	2.9% (1)	5.9% (2)	55.9% (19)	20.6% (7)	11.8% (4)
DH2	0	0	9.1% (3)	9.1% (3)	51.5% (17)	30.3%(10)

* p<0.05
 ** n=34
 ***n=33

Results

A total of 67 (34 DH1 and 33 DH2) out of 74, or 91%, of the dental hygiene students responded to the survey. Of those respondents, 87% were female, 3% were male, and 10% did not indicate gender. Sixty-one percent were Caucasian, 19% were Hispanic, 3% Pacific Islander/Asians, 1% Middle Eastern, 3% other, and the remaining 12% did not indicate ethnicity. Data were analyzed using 2x3 and 2x5 contingency tables to calculate the chi square test statistic. The 2x3 tables were used when the subject was asked to rate between "strongly disagree" and "strongly agree." The strongly disagree and disagree responses were grouped into one category, the "neutral" responses comprised the second category, and the combination of "strongly agree" and "agree" were grouped into the third category. For those questions where the subject was asked to respond "never," "rarely," "sometimes," "often," or "always," a 2x5 contingency table was used. These categories were not combined for analysis.

Regarding diversity in the academic environment, significantly more DH2 (81%) students than DH1 (71%) students strongly agreed or agreed that the UTDB at Houston had an honest interest in and concern for diversity (p=0.001). Additionally, DH2 students were more likely to believe that the UTDB at Houston clinical environment was sensitive for

patients from different socioeconomic backgrounds ($p=0.04$). While no significant differences (Table I, Ib) were found between the classes, the majority of DH1 and DH2 students were satisfied with the current state of diversity of the UTDB at Houston and reported that faculty equally encouraged students to pursue career development regardless of their gender, ethnic background, or sexual orientation. While DH2 students reported more often that their academic advisors were able to address cultural and social differences appropriately, both groups reported that the curriculum prepared them to work with patients of different ethnic/racial groups. DH1 students reported more frequently that the curriculum had not prepared them to work with patients whose primary language is not English, or who have different sexual orientations or religious backgrounds.

DH2 students reported significantly greater experience with unequal treatment by faculty, patients, and other students than did DH1 students (See Table II). One DH1 student reported sexual harassment by a patient, and two DH2 students reported sexual harassment by other students. Responses as to whether the sexual harassment had been resolved were not clear since more responded "yes" to resolution than had reported that harassment had occurred in the first place.

Discussion

On a very positive note, the students reported satisfaction with the diversity at UTDB at Houston. As mentioned previously in this article, the student body and faculty represent many different countries, religions, ethnic/racial groups, and cultures. Seven main languages are spoken in Houston, the most common of which are English, Spanish, and Vietnamese. Several student groups have developed, such as the Hispanic dental, Asian dental, and Christian dental societies. In fact, one Caucasian student noted that she did not "fit" into any of the sub-groups. However, students also expressed concern about their abilities to work with patients of a different sexual orientation or ethnicity, as well as with those patients whose first language is not English.

Overall, the findings of this study indicate that the majority of the dental hygiene students were satisfied with the cultural diversity of and their interactions at the UTDB at Houston. This satisfaction may be due to the fact that the student body is very diverse, enabling the students to informally exchange and share information of cultural differences.

The results of this assessment are similar to those reported in other studies that suggest that sexual harassment incidence increases over time as one remains in the academic environment.⁴²⁻⁴⁷ This may explain why second-year students reported a greater incidence than did first-year students. Additionally, there may have been an underreporting by DH1 students of harassment because the responses to the follow-up question regarding resolution of the harassment indicated that more cases had been resolved than had been originally reported. However, the discrepancy may simply indicate that the students were confused by the questionnaire or, perhaps, as evidenced in one study, they did not have a clear understanding of what constitutes sexual harassment.

To address these problems, the follow-up question regarding whether or not the harassment had been resolved could be re-worded to answer only if the student indicated previously that harassment had occurred in the first place. Additionally, the students could be given examples of sexual harassment. Lillich et al. reported that students often do not even realize that harassment can occur between or among students.⁴⁸

Chicodo et al. had surmised that the prevalence of sexual harassment was probably related to dental hygienists often working alone with, or in close proximity to, patients in the academic setting for extended time periods.⁴⁷ The students tend to be very concerned with the comfort of their patients, which may be misconstrued by patients as a personal interest. As recommended by others, students and faculty could be better prepared for dealing with these situations through role playing and guided discussion.⁸ In UTDB at Houston clinics, there are 12 students and at least two faculty in each treatment area. This may explain why only one of the three reported sexual harassment incidents was by a patient of another gender.

The other two sexual harassment incidents were by male students toward female students. Webster reported that sexual harassment is more likely to be directed at females.⁴¹ Additionally, in open-ended comments from the questionnaires, three students noted that there were problems with disrespect from dental faculty and dental students toward dental hygiene

students. This topic could be covered in sensitivity training as well to promote respect for one another's role in the oral health care setting.

Recommendations

Based on concerns reported by students, the ad hoc committee made several preliminary recommendations:

- 1) Compare the outcomes of the dental hygiene student surveys with the dental student, faculty and staff surveys to investigate general areas of concern among all who work or study at UTDB at Houston.
- 2) Develop workshops and seminars to enhance faculty, staff, and student cultural awareness.
- 3) Determine integration points for teaching topics related to cultural competency within the dental hygiene curriculum.
- 4) Devise a strategy to facilitate the communication needs of patients who do not speak English, but who interact with English-speaking students and faculty.

Conclusions

Sexual harassment and unequal treatment did occur in the UTDB at Houston dental hygiene program. Students, faculty, and staff could benefit from workshops on diversity, unequal treatment, sexual harassment, and cultural competence and awareness. Additionally, the dental hygiene curriculum should be revised to include these topics as well.

Acknowledgements

Notes

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Interactive Computer-Assisted Instruction vs. Lecture Format in Dental Education

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Purpose. *The purpose of this study was to compare computer-assisted instruction (CAI) with lecture format using recent hardware and software advances. A pre- and post-test was used to determine student performance and instructional preference. In addition, a post-instruction survey was used to determine student learning preferences.*

Methods. *Seventy-five first-year University of North Carolina (UNC) dental students who were registered for the introductory radiology course were asked to participate. All agreed and were randomly placed in one of three groups: interactive CD only, interactive CD and lecture, and lecture only. The content of the multimedia instruction focused on intraoral radiography. A pre- and post-test was administered to determine if there was a significant difference between interactive CD and lecture formats, and an evaluation instrument was used to determine if there was a student learning preference between CAI and lecture format. Analysis of covariance and the sign test were used to determine significance ($p < .05$).*

Results. *There was no significant difference between pre- and post-test outcomes, indicating that similar learning took place using the interactive CD and/or lecture format. However, students preferred CAI to lecture format.*

Keywords: Computer-assisted instruction, lecture, multimedia, intraoral radiography

Introduction

Lectures are the predominant means of delivering dental and dental hygiene instruction and are often complemented by handouts, notes, and assigned readings. Popular lecture aids include film or computer slide shows, overhead transparencies, blackboards, chalkboards, and video presentations. These teaching formats make it difficult for students to review and navigate material freely without having to search for specific content.

Electronic media, the World Wide Web, and computer-assisted instruction (CAI) have created more flexibility since they use a non-linear approach.^{1,2} Computers became influential in dental instruction in the mid-1980s,³ and since then, CAI has been used to teach all areas of dentistry.⁴⁻⁹ A 1997 survey of a dental school revealed that 85% of the faculty had access to and used a personal computer.¹⁰ For example, at the University of North Carolina (UNC) School of Dentistry, where an office of information technology has been established, all faculty, graduate, dental, dental assisting, and dental hygiene students own or have access to a personal computer. In fact, students are required to purchase laptop computers.

Instructional presentation software allows instructors to conveniently enhance and change content, and it provides opportunities for animation and placement of materials on a server. Once on the server, students have access to the material at all times. Ludlow and Platin found that while 71% of students preferred online instruction, the preference appeared to be related to the ease of using the technology and facilitation of flexible learning styles, rather than improved didactic performance.¹³ Plasschaert et. al found no significant difference between the performance of the students using multimedia for endodontic problem-solving.¹⁴ Presently, the ability to store large volumes of information on a CD-ROM disk, transmit large files over the Internet, and use authoring, imaging, and video software makes interactive instruction readily available to instructors.

Purpose

The purposes of the study were to determine if student performance varied whether students participated in a CAI learning activity using new software or a lecture supplemented with PowerPoint, and to determine student preference between these two delivery methods.

Methods and Materials

Approval of this study was obtained from the Committee on Research Involving Human Subjects (Institutional Review Board for the UNC School of Dentistry). Seventy-five first-year dental students (class of 2003) who were enrolled in the fundamentals of dental radiology course were asked to participate. All agreed and were randomly placed in one of three groups of instruction. The groups were identified as CAI (the group studying the multimedia-presented material only), CAI + lecture (the group studying the multimedia-presented material and the lecture material), and lecture (the group studying material presented by lecture only).

A 20-question pre-test was administered to determine which students had previous experience using the XCP (extension cone paralleling) instrument. The questions were formatted in a PowerPoint presentation, which emphasized beam-guiding device construction recognition, radiographic film nomenclature, and film placement in a full series mount. Ten students participating in the study were absent during the administration of the pre-test.

Director 8 authoring software (Macromedia Inc., San Francisco, CA) was used to create an interactive presentation. The content of the multimedia instruction focused on intraoral radiography emphasizing the use of the XCP instrument and the exposure, development, and mounting of intraoral radiographs. After introducing the advantages of beam-guiding devices for intraoral radiography, the presentation was divided into three sections: instrument armamentarium, exposure technique, and film mounting. Instrument armamentarium covered instrument assembly for posterior, anterior, and bitewing radiographs. Technique was divided into three sections—posterior, anterior, and bitewing radiographs—with each section covering anatomical landmarks, clinical use of the instrument, film processing, and nomenclature. Finally, a film mounting exercise tested the student's ability to correctly place a full series of radiographs into a film mount.

Video clips were created using QuickTime (Apple Computers, Inc., Cupertino, CA) with a JVC DVL 9500 digital camcorder (JVC Company of America, Wayne, NJ) and Adobe Premier 5.1 video editing software (Adobe Systems Incorporated, San Jose, CA) to capture, edit, and export digital video. Photographs were taken using a Kodak DC 120 digital camera (Eastman Kodak Company, Rochester, NY), and images were enhanced with Adobe Photoshop 5.5 and LivePix 2.0 (Roxio, Inc., Milpitas, CA). The multimedia program was constructed using a workstation or personal computer that met or exceeded the processor speed, RAM, and hard drive storage requirements of the software.

The authoring multimedia instruction consisted of 27 separate movies that incorporated techniques such as cursor rollover, cast member exchange, sprite tweening, onion skinning, and video clip insertion to allow the student to interact freely with the information. Three faculty members from the Oral and Maxillofacial Radiology Section, two graduate oral and maxillofacial radiology residents, and a second-year dental student who had completed the course the preceding year reviewed the completed multimedia program. Following the review process, suggestions for changes were incorporated, and the multimedia material was placed on CD-ROM disks. Equivalent information for the lecture format was incorporated

into a PowerPoint presentation. Care was taken to assure that the lecture content was similar to CAI. The video clips and film mounting exercise sections were not included in the PowerPoint presentation because insufficient time was allotted during the lecture presentation. The PowerPoint presentation was divided into three lectures and was provided by a senior radiology instructor.

To determine the difference in outcomes between CAI and lecture format, the CAI group was given a CD-ROM disk and asked to not attend the lectures. The CAI + lecture group received the CD-ROM disk and was asked to attend the lecture. The lecture group did not receive a CD-ROM disk and was specifically asked not to borrow the CD-ROM disk from their classmates. Students using the CD-ROM disk were instructed to review the instructional material as often as they wished, and e-mails were sent every three days to reinforce its use. All students used the same model laptop computer to play the CD-ROM. Therefore, those students in groups who received CAI only, or those who received the CD-ROM and attended lecture, were able to view the media on similar hardware.

Two weeks after the third and final lecture, a 20-question PowerPoint post-test was administered. The format was identical to the pre-test and was administered at one time to the entire class. The post-test score was factored in toward their final course grade. Before the post-test was administered, 33 of the 75 participating students reported having used the XCP instrument in a clinical setting. The post-test scores of those 33 students were analyzed to determine if there was a significant difference between their scores and the others who did not have previous experience using the XCP instrument. Following the post-test, an evaluation instrument using a five-point Likert scale was administered to students in Group 2—those who had received CAI and attended lecture—to determine if there was a preference for CAI compared to lecture format. The information recorded on the evaluation form was anonymous.

To determine the effectiveness of each intervention, (CAI only, CAI + lecture, and lecture only), the median scores for the pre-test and post-test were compared using the Wilcoxon signed rank test. Ten pre-test scores were missing, as listed in Table I. The level of significance was set at .05, and analysis of covariance (ANCOVA) was used to determine whether there was a significant difference in learning between the CAI format and the lecture format. The three groups (CAI only, CAI + lecture, and lecture only) were the categorical variables, and the dependant variables were the post-test scores.

Table I. Comparison of Pre-test and Post-test scores by Treatment Group

	Variable	N	Mean	Median	STD	P-Value
CAI only	Pre-test	*24	4.083	1	5.919	<0.0001
	Post-test	26	17.000	17	1.414	
CAI + lecture	Pre-test	*23	4.261	1	5.762	<0.0001
	Post-test	25	16.880	17	1.856	
Lecture only	Pre-test	*18	2.167	1	3.854	<0.0001
	Post-test	24	16.5	17	2.414	

Wilcoxon signed rank test was used to determine significance between pre-test and post-test scores in each group.

*Ten students in the study were absent for the pre-test.

Pre-test scores were divided into five categories indicating the range of correct answers and labeled 0, 1, 2, 3, and 4 (Table II). Five categories were chosen because 10 of the subjects had missing pre-test values and would have been excluded from the analysis. The number of correct questions answered out of 20 were: Category 0 = student absent; Category 1 = zero answers correct; Category 2 = one answer correct; Category 3 = two to nine answers correct; and Category 4 = greater than nine answers correct. The number of correct answers per category was designed to allow for at least 10 students per category, fulfilling the assumption that the data is parametric, or normal (i.e. representing a normal population).

Table II. Pretest Scores by Assigned Categories

Categories	Number correct, out of 20 questions	Number of students
0	student absent	10
1	score = 0	23
2	score = 1	16
3	score = 2 to 9	15
4	score = > 9	11

The pre-test scores co-vary with the dependent variable and are called the “covariate.” A is a statistical test, using means, which tests the effects of categorical groups by comparing a dependent variable after controlling for the covariate. In this study, ANCOVA tested the mean post-test scores of the three treatment groups after adjusting or controlling for pre-test groups. The null hypothesis was that there was no significant difference in post-test scores of the three treatment groups (after controlling for pre-test category). The level of significance for ANCOVA was set at = .05.

From the statements used to determine whether students preferred the use of CAI, Questions 4 and 5 were the most relevant. For each question there were five possible answers (strongly agree, agree, undecided, disagree, and strongly disagree). The sign test was used because of the possibility of a non-normal distribution of data. The sign test is a test of the probability of a median value above or below the expected value—in this case, 0. The p-value is an indication of the significance of the deviation of the group response median above or below a neutral (0) response. Again, the significance level was set at a = .05. In this test, each possible response was given a value as follows: strongly agree = - 2; agree = - 1; undecided = 0; disagree = 1; and strongly disagree = 2. The null hypothesis was that there was no difference in frequency for those who agree and those who disagree. In other words, the null hypothesis was that there would be an equal number of answers above and below zero.

Results

To determine whether each intervention—CAI only, CAI + lecture, and lecture only—improved scores, the level of significance comparing pre-test and post-test scores for each test group was less than 0.0001 (.). Therefore, the median pre-test and post-test scores for each group were different, suggesting that each intervention helped improve scores.

Mean post-test scores, 15.5 to 17.5, did not vary from pre-test scores. Post-test score means fell within two standard deviations of the pre-test categories 0, 1, 2, and 3. Therefore, regardless of group (CAI only, CAI + lecture, and lecture only) or pre-test category, post-test score means were not significantly different.

Group analysis: To determine whether post-test score means in the three treatment groups were significantly different after adjusting for pre-test category, $p = 0.9819$. There was no significant difference in post-test outcomes in the three treatment groups, regardless of their pre-test category.

Pre-test analysis: To determine whether post-test score means in the five pre-test categories were significantly different after adjusting for the three treatment groups, $p = 0.1371$. There was no significant difference in post-test outcomes among the five pre-test groups, regardless of the treatment group.

Confounder analysis: Thirty-three of the 75 students had prior experience using the XPC instrument before the post-test. ANCOVA revealed no difference in post-test outcomes among the three test groups when adjusting for pre-test category and prior experience in using the XCP instrument ($p = 0.9187$).

There was no difference in post-test outcomes among the five pre-test groups, adjusting for test group and prior experience with the XCP instrument ($p = 0.2427$). There was no difference in post-test means among those with prior experience with the XCP instrument, adjusting for test group and pre-test category ($p = 0.1092$). The p-values convey that post-test scores of students with prior experience with the XCP instrument were not significantly different, regardless of treatment group or pre-test category.

From the evaluation questions given to students in the second group, (CAI + lecture), Questions 4 and 5 inquired about students' preferences for the CAI or lecture format. Table III demonstrates the cumulative percentage responses and the signed test p-values for statements 4 and 5. For Question 4, students significantly agreed that it was advantageous to review the XCP instrumentation by CAI, as compared to the PowerPoint lecture format ($p < .0001$). Finally, for Question 5, students significantly agreed that they preferred learning the XCP content from the interactive CAI, compared to the PowerPoint lecture format ($p < .0001$).

Table III. Students' Preference for Teaching Methods

	Responses	Cumulative %
4.	It was advantageous to review the XCP Instrumentation on CD compared to the lecture format (PowerPoint lecture):	
	strongly agree	68%
	strongly agree + agree	92%
	strongly agree + agree + undecided	96%
Sign test p < .0001		
5.	I prefer learning the XCP content from the interactive CD media compared to lecture format:	
	strongly agree	52%
	strongly agree + agree	64%
	strongly agree + agree + undecided	92%
Sign test p < .0001		

Discussion

The use of a CD for CAI is a departure from traditional lecture format. An effort was made in this study to not only place the lecture material on a CD for CAI, but also to integrate content into a variety of interactive methods—animated diagrams, video clips, and full series mounting exercises, for example—which may accommodate a wider range of learning styles and promote greater learning satisfaction than lecture alone. The CAI content did not include student testing and feedback because these tasks required software skills that dental educators may not have acquired, such as data base construction and server input language.

Previous reports have found similar results of no significant difference in post-test outcomes using CAI compared to lecture format.¹¹⁻¹³ This study was different, however, in that it used recent advances in authoring software to which dental educators have been and will be exposed in the future. Guidelines for developing CAI should be instituted so that student learning preference is not biased by CAI quality. In this study, specific student learning styles or preferences were not taken into account and should be further studied.

A limitation in the design of this study was that students were not blinded to group assignment. Although students in each group were instructed not to communicate with each other regarding their assigned groups, crossover was not specifically monitored, and it is possible that students interacted with each other. While students receiving CAI were e-mailed several reminders, it was not determined how often they viewed the CD.

Creating interactive learning material for teaching purposes is not an endpoint. Guides for teaching, testing, and data analysis can also be used in distance learning. Guides created for distance learning would allow practitioners to earn credit for continuing education in their home locations. Further research regarding CAI and its role in distance learning should be initiated to determine the effectiveness of CAI when compared to traditional methods.

Conclusion

This study demonstrated no differences in student learning outcomes between lecture and CAI. However, study results indicate that students preferred the interactive instructional program because of its convenience and ease of navigation. Results of this study support the notion that, in dental education, CAI has the potential of being as equally successful a tool as linear instruction. Readily available tools were used to produce this program, indicating that the same approach can be used to include other content areas.

Acknowledgements

Notes

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Blood Pressure Screening Practices of a Group of Dental Hygienists: A Pilot Study

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Purpose. Recent research suggests that one in five Americans has hypertension, according to the American Heart Association. When hypertension is undiagnosed or uncontrolled, it places patients at risk for other cardiovascular diseases, contributing to an increase in mortality. Dental hygienists are in an ideal setting to screen for this silent disease. This study was designed to determine how frequently a group of practicing dental hygienists performs screenings for hypertension on their patients, and to determine the barriers that prevent this screening from occurring.

Methods. One hundred one dental hygienists were questioned with a written survey about their blood pressure screening practices and their reasons for not taking blood pressure readings, if applicable.

Results. Sixty-seven dental hygienists completed the survey. Survey results revealed that the majority of dental hygienists were not recording blood pressure readings, even though their dental hygiene school curriculum had emphasized doing so for all patients. The most frequently cited reasons for not performing a routine blood pressure screening were insufficient time in the appointment and the minimal value given to the procedure by their employers.

Conclusion. To work against obstacles that prevent the provision of this service, dental and dental hygiene faculty must increase their efforts to inculcate in their students the value of blood pressure screening. Further studies are needed to determine if the findings of this study are indicative of only one segment of dental hygiene practitioners, or if they represent the norm in the profession.

Keywords: hypertension, high blood pressure, dental hygienists, dentists

Introduction

Hypertension, or high blood pressure (HBP), is defined as having a systolic pressure of 140 mm Hg or higher and diastolic pressure of 90 mm Hg or higher.¹ If not properly controlled, hypertension can lead to stroke, heart attack, heart failure, or kidney failure. According to the American Heart Association, one in five Americans has hypertension, and 31.6% of these people are asymptomatic and unaware of their condition.¹ In addition, it is estimated that hypertension precedes the development of congestive heart failure in 91% of cases.^{1,2} Furthermore, high blood pressure is associated with a two to three times greater risk of developing congestive heart failure.²

In both 1999 and 2000, heart disease was the first cause of death in the United States, and stroke was the third.³ Although the number of deaths from heart disease and stroke decreased between 1999 and 2000, the number of deaths directly related to high blood pressure increased by 3.2%.³ Preliminary data for 2001 showed a further increase to 8.7 deaths per 100,000 from hypertensive heart disease and 6.7 deaths per 100,000 from stroke.³

The prevalence of HBP among people living in the Southeast is greater than in any other region of the United States.¹ Death rates from stroke are also higher in this area. One of the reasons that these statistics are significant is the large African American population in the southeastern United States. On average, African Americans develop high blood pressure earlier in life and have a higher average blood pressure than Caucasians.¹ As a result, African Americans have a higher rate of stroke, heart disease, and end-stage kidney disease.^{1,4}

According to the Framingham Heart Study conducted by the National Heart, Lung, and Blood Institute (NHLBI), there is a 90% likelihood that men and women between 55 and 65 years old will develop high blood pressure within 10 years.¹ Since the life expectancy of Americans is increasing, there is an increased likelihood of death from high blood pressure-related illnesses.⁵ In 2001, there were 2,064 deaths per 100,000 from heart and cerebrovascular diseases in people 65 years and older.⁶

In 1972, the NHLBI of the National Institutes of Health developed the National High Blood Pressure Education Program (NHBPEP). At that time, fewer than one-fourth of the United States population were aware of the connections between hypertension, heart disease, and stroke.⁷ The NHBPEP consists of a network of groups interested in the prevention and control of hypertension. Federal agencies, professional organizations, state health departments, and community-based programs join forces, as the NHBPEP, to provide both educational materials and screening opportunities for early diagnosis of high blood pressure.

Once hypertension has been diagnosed, the American Academy of Family Physicians reports that its treatment is "very effective." Treatment ranging from lifestyle changes, including a low-sodium diet, regular aerobic exercise, and weight loss, to the use of antihypertensive drugs resulted in a 57% decrease in stroke mortality and a 50% decrease in mortality from coronary artery disease from 1972 to 1994.⁸

A 2002 journal report by the American Heart Association stressed the need for additional measures to identify hypertensive patients. In this report, Daniel W. Jones, MD, Associate Dean of the School of Medicine at the University of Mississippi Medical Center, stated, "We need to renew our efforts together to make sure that more people have their blood pressure measured, and their hypertension recognized and treated."⁹

Children as well as adults need to be screened routinely for hypertension, as elevated blood pressure in children is not uncommon.^{1,10} Le Jeune and Gordy suggested that dentists may have better opportunities to screen children for hypertension than medical doctors. According to them, children from poor families may not use medical services except in emergencies, but they may visit a dentist as part of the Head Start program or other state or federal programs.¹⁰

Dental Involvement

American Dental Association (ADA) delegates voted in 1974 to become a part of the NHBPEP.¹¹ Procedures for medical referrals were developed by the ADA Council on Dental Health and Health Planning, and members were encouraged to conduct screenings for high blood pressure in their dental practices. A 1977 ADA survey of dentists indicated that only 6.7% routinely recorded blood pressure readings on all of their patients.¹² However, in 1985, the ADA Council on Dental Health and Health Planning reported that 25% of dentists were performing blood pressure screenings. Unfortunately, fewer than 7% of these dentists reported doing so on a routine basis.¹³

A 1981 survey of New Jersey dentists reported enthusiasm for continuing education training for high blood pressure screening, with 70% of the respondents reporting willingness to take such courses.¹² Of the 783 dentists in this study who reported owning equipment to record blood pressure, only 48.6% regularly conducted readings on their patients. Eleven percent of the respondents reported discontinuing blood pressure measurements because of time constraints, the potential for false positive results, and fear of intruding into areas of responsibilities belonging to physicians, thus damaging their existing professional relationships.¹²

In 1998, Glick urged dentists to take a primary role on the multidisciplinary team involved in treating and educating patients at risk for hypertension. He stated that professional duties should not be limited to the provision of dental care, as oral health care providers can have a significant impact on the prevention, detection, evaluation and treatment of patients with high blood pressure.¹⁴ He further challenged dentists to become proactive in the overall health care of their patients.

In order to prevent medical emergencies in the dental office, Nunn recommended monitoring each patient's vital signs, especially blood pressure.¹⁵ When Carlin and Rothenberger surveyed dental offices in Nebraska to assess attitudes concerning blood pressure screening in oral health care settings, 82% of the respondents agreed that it was appropriate to record blood pressure in the dental office. However, fewer than half of the respondents reported they actually provide this service.¹⁶ Paulsen and Toevs reported that only 15% of a patient population surveyed at Weber State University had ever had their blood pressure taken in a dental office.¹⁷

Dental Hygiene Involvement

In 1982, the American Dental Hygienists' Association (ADHA) endorsed the routine measurement of blood pressure for all patients. At that time, the standards developed included blood pressure readings as part of the general health assessment data.¹⁸

Cline and Springstead additionally encouraged dental hygienists to routinely monitor patients' blood pressure as a part of total patient care. These researchers identified dental hygienists as preventive specialists with the education and training necessary to "convey to the patient an appreciation of hypertension control as a life-long endeavor."¹⁹

While experts agree on the need for early detection of hypertension through routine blood pressure monitoring, not enough information exists regarding the utilization of this procedure by dental hygienists. The purposes of this study were to determine the blood pressure screening practices of a small group of practicing dental hygienists and to identify the barriers, if any, that prevent this screening from occurring.

Materials and Methods

A convenience sample of participants from the Medical College of Georgia (MCG) Department of Dental Hygiene Alumni Day continuing education program was utilized for the study. A written survey concerning the routine blood pressure screening of dental office patients (Figure 1) was included in each registration packet. The only instruction given to participants was the verbal directive by the program moderator to complete any course evaluations and surveys anonymously and to place them in the appropriate containers in the back of the meeting room. Sixty-seven of the 101 registrants, 66.3%, participated in the study by completing the survey. The responses of one hygienist who was no longer practicing, according to notes left on the survey, were disregarded. A regression analysis was utilized for data comparisons.²⁰

Figure 1: Blood Pressure Screening Survey of Dental Hygienists at the Department of Dental Hygiene, School of Allied Health Sciences, Medical College of Georgia

The literature suggests that approximately one in four U.S. adults has HBP, which is defined as taking antihypertensive medication or having either a systolic blood pressure (SBP) of > or = 140 mmHg or a diastolic blood pressure (DBP) of > or = 90 mmHg.¹

The purpose of this study is to investigate whether practicing dental hygienists routinely take blood pressure readings on their patients. Information from this survey will be utilized in the development of future educational modules.

By completing this questionnaire you are voluntarily providing consent to participate in this study. Your responses will be confidential.

Please answer the following questions as honestly as possible.

Do you take BP readings? <input type="checkbox"/> On all patients <input type="checkbox"/> Only on patients reporting a history of hypertension <input type="checkbox"/> Only if patient requests it <input type="checkbox"/> Rarely <input type="checkbox"/> Never	If you do not take BP, why not? Check all that apply. <input type="checkbox"/> Too little time in appointment <input type="checkbox"/> Procedure not valued by patient <input type="checkbox"/> Procedure not valued by dentist/employer <input type="checkbox"/> Uncomfortable with personal skill to perform this task <input type="checkbox"/> Equipment not available
Was this procedure emphasized in your DH curriculum? <input type="checkbox"/> For all patients <input type="checkbox"/> For some patients <input type="checkbox"/> No	Are you familiar with the medications used to control hypertension? <input type="checkbox"/> Very familiar <input type="checkbox"/> To some extent <input type="checkbox"/> Not at all
Your suggestions for providing updated BP information to dentists and hygienists include: Check all that apply. <input type="checkbox"/> CE Lecture <input type="checkbox"/> Informational pamphlets <input type="checkbox"/> Web-based CE course <input type="checkbox"/> None is needed <input type="checkbox"/> Other _____	Do you routinely review the patient's medical history? <input type="checkbox"/> Always <input type="checkbox"/> Only on new patients <input type="checkbox"/> Only when patients report changes to their health status <input type="checkbox"/> Rarely <input type="checkbox"/> Never
How long have you been practicing dental hygiene? <input type="checkbox"/> Between 0-5 years <input type="checkbox"/> Between 5-10 years <input type="checkbox"/> Between 10-20 years <input type="checkbox"/> More than 20 years	In what type of setting do you practice? <input type="checkbox"/> General dental practice <input type="checkbox"/> Periodontics <input type="checkbox"/> Oral surgery <input type="checkbox"/> Hospital based clinic <input type="checkbox"/> Public Health <input type="checkbox"/> Educational Institution <input type="checkbox"/> Other: _____
Are you an MCG alumnus? <input type="checkbox"/> Yes <input type="checkbox"/> No	In which state do you practice? <input type="checkbox"/> Georgia <input type="checkbox"/> Florida <input type="checkbox"/> South Carolina <input type="checkbox"/> Other:

1. State-specific trends in self-reported blood pressure screening and high blood pressure--United States, 1991-1999. MMWR - Morbidity & Mortality Weekly Report. 51(21):456-60, 2002 May 31.

Figure 1. Blood Pressure Screening Survey of Dental Hygienists at the Department of Dental Hygiene, School of Allied Health Sciences, Medical College of Georgia.

Results

While 60 of the dental hygienist participants in this study reported routinely reviewing their patients' medical histories, only five dental hygienists reported recording blood pressure readings for all patients (Figure 2). Ten participants reported taking blood pressure readings only on patients reporting a history of hypertension, and an additional seven reported taking readings only upon patient request. Of the five dental hygienists who reported taking blood pressure measurements on all

patients, three were graduates of the Medical College of Georgia dental hygiene program, and four had practiced for more than 20 years.

Figure 2: Survey Results

Numerals represent the number of responses per item. Some surveys listed multiple responses to the questions, thus the total responses for these questions exceed the number of actual participants.

<p>Do you take BP readings?</p> <p>5 On all patients 10 Only on patients reporting a history of hypertension 7 Only if patient requests it 21 Rarely 23 Never</p>	<p>If you do not take BP, why not? Check all that apply.</p> <p>33 Too little time in appointment 7 Procedure not valued by patient 21 Procedure not valued by dentist/employer 5 Uncomfortable with personal skill to perform this task 13 Equipment not available</p>
<p>Was this procedure emphasized in your DH curriculum?</p> <p>54 For all patients 7 For some patients 5 No</p>	<p>Are you familiar with the medications used to control hypertension?</p> <p>17 Very familiar 49 To some extent 0 Not at all</p>
<p>Your suggestions for providing updated BP information to dentists and hygienists include: Check all that apply.</p> <p>51 CE Lecture 24 Informational pamphlets 15 Web-based CE course 3 None is needed 1 Other _____</p>	<p>Do you routinely review the patient's medical history?</p> <p>60 Always 4 Only on new patients 7 Only when patients report changes to their health status 0 Rarely 0 Never</p>
<p>How long have you been practicing dental hygiene?</p> <p>12 Between 0-5 years 15 Between 5-10 years 19 Between 10-20 years 20 More than 20 years</p>	<p>In what type of setting do you practice?</p> <p>56 General dental practice 4 Periodontics 1 Oral surgery 0 Hospital based clinic 2 Public Health 3 Educational Institution 3 Other: pediatric practice</p>
<p>Are you an MCG alumnus?</p> <p>46 Yes 20 No</p>	<p>In which state do you practice?</p> <p>59 Georgia 0 Florida 10 South Carolina 1 Other</p>

Figure 2. Survey Results.

A positive, statistically significant association existed between those who had practiced dental hygiene for more than 20 years and those who routinely took blood pressure readings for all patients (Linear Logistic Regression; $p < 0.001$). Likewise, a negative association existed between those who had practiced for zero to five years or five to 10 years and those who routinely took blood pressure readings (Linear Logistic Regression; $p < 0.001$). These two groups were significantly less likely to take blood pressure readings on a routine basis.

Forty-four of the respondents, 66%, reported rarely or never taking blood pressure readings on their patients (Figure 3), although 81% (54 participants) reported that the procedure was emphasized in their dental hygiene curriculum. The reasons cited for not taking a blood pressure reading on all patients are listed in Figure 4. The most often cited reasons were insufficient time in the appointment (33 responses/ 50%) and a lack of value for the procedure by the dentist/employer (21 responses/ 31%). Thirteen study participants (19%) reported that blood pressure monitoring equipment was not available.

Figure 3: Blood Pressure Screening Practices

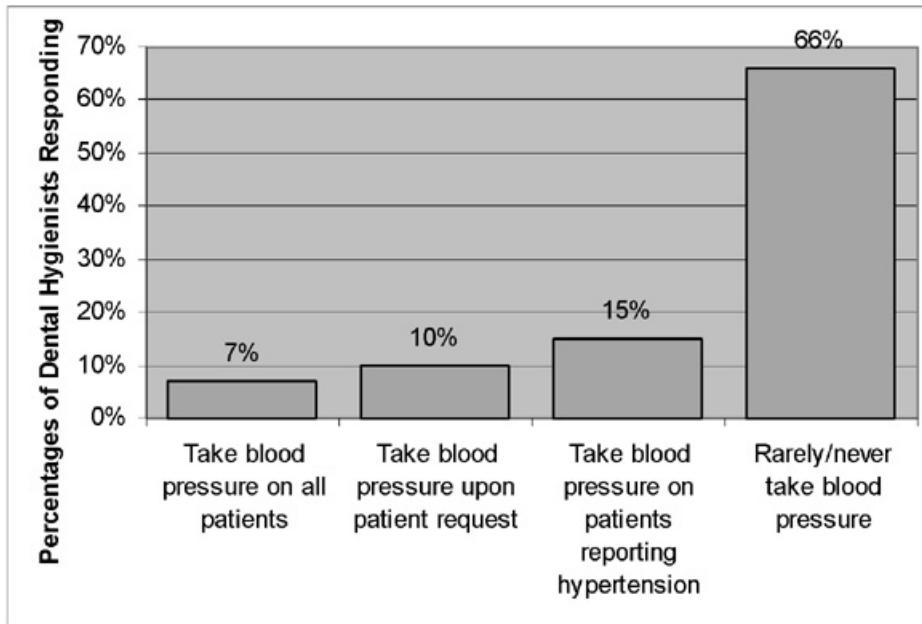


Figure 3. Blood Pressure Screening Practices.

Figure 4: Reasons For Not Taking Blood Pressure

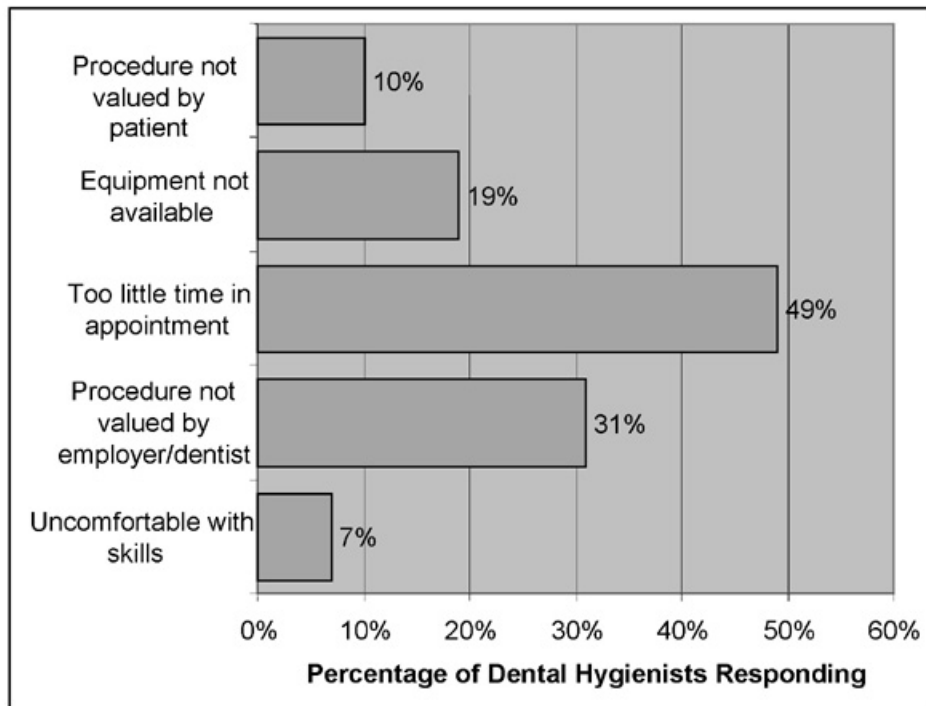


Figure 4. Reasons For Not Taking Blood Pressure.

All study participants reported familiarity with the medications used to treat hypertension. Twenty-six percent reported they are very familiar with anti-hypertensive medications, and 74% replied they are familiar to some extent with the medications.

The majority of study participants practice in general dental practices in Georgia or South Carolina. Periodontal, oral surgery, pediatric, public health, and educational institutions were other practice settings listed. Of the responding dental hygienists, 46 were graduates of the Medical College of Georgia dental hygiene program. Those dental hygienists who reported practice in an educational institution were significantly associated with the routine recording of blood pressure readings for all patients, while those who worked in periodontics, public health, and others were negatively associated with routine blood pressure measurements (Linear Logistic Regression; $p < 0.001$).

Continuing education lectures and informational pamphlets were the most frequently chosen responses for suggestions to provide updated blood pressure information. Three participants reported they need no additional information.

Discussion

Given the potential number of oral health care patients who might suffer high blood pressure and the severity of the disease, it is disturbing that only five of the 66 dental hygienists completing the survey reported recording blood pressure measurements on all patients. Study participants reported an emphasis on the procedure in their educational backgrounds (Figure 5), yet appear to be victims of two major barriers to this screening. Half of the responders reported insufficient time in the dental hygiene appointment to perform this task, and this same barrier was reported by dentists as early as 1981.¹³ Thirty-one percent of the dental hygienists reported the dentist/employer did not value measuring patients' blood pressures, a perception that, perhaps, is due to the limited amount of time allotted for each patient.

Figure 5: Comparison of Curriculum and Practice

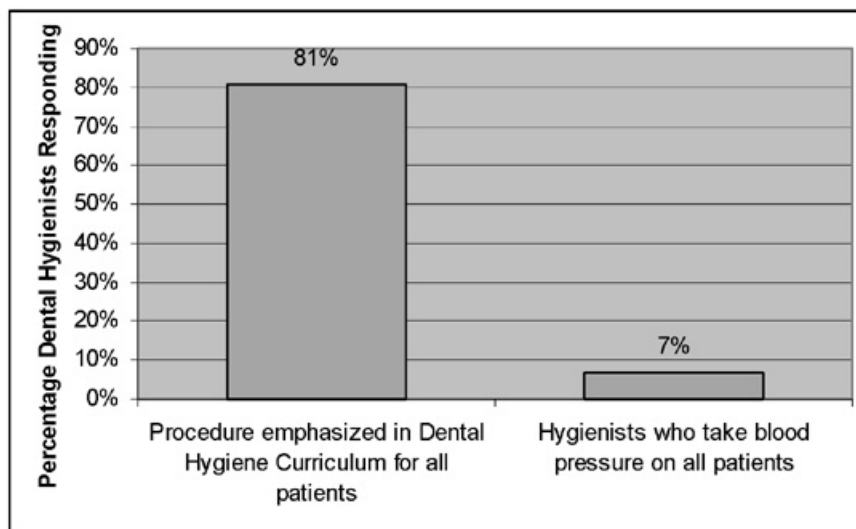


Figure 5. Comparison of Curriculum and Practice.

Ninety percent of the dental hygienists reported reviewing patients' medical histories, and all of the dental hygienists reported at least some knowledge of medications used to control hypertension. However, only 7% of the participants in this study reported providing a service endorsed by both the ADA and the ADHA.^{11, 18} Interestingly, those participants who practiced in educational settings were likely to report taking blood pressure readings, possibly because they have more time allotted for individual patient appointments or simply adhere to procedures being taught in the educational setting.

Responses were not usable to determine whether an association existed between dental hygienists who practice in a general dental practice setting and who routinely record blood pressure. However, since all but one of the dental hygienists reported working in Georgia and/or South Carolina-areas identified as having the highest prevalence of HBP in the nation¹-it is likely that these practitioners will encounter an increased number of patients suffering HBP and should diligently include this screening in the medical assessment phase of their treatments.

Limitations

While these results appear somewhat disturbing, there were several limitations to the study that possibly influenced the outcomes. First, the study utilized a convenient group of dental hygienists-attendees at an annual meeting-to survey. The group possibly included many dental hygienists who potentially have the same practice habits because they may practice in the same office or in the same geographic area. Therefore, this sample may not be a true reflection of the practices of all dental hygienists. Additionally, several questions resulted in too few combinations of responses to make any determination as to whether a positive association existed between the subjects' responses and whether they took blood pressure readings on all patients.

Conclusions

While the dental hygienists surveyed in this study reported knowledge of the medications used to treat hypertension and said that an ample emphasis was placed on the procedure during their clinical education, fewer than 8% reported that they actually record blood pressure readings on all patients. Participants who were MCG alumni did not routinely take blood pressure readings any more often than did graduates from the other dental hygiene schools represented at the continuing education seminar. Unfortunately, as seen in Figure 3, the most frequently cited reasons for not performing a routine blood pressure screening were "too little time in the appointment" and "procedure not valued by employer/dentist."

Recommendations

As the number of deaths from hypertensive heart disease, hypertension, and stroke continues to rise-along with an increase in the number of elderly people who may have high blood pressure-dental hygienists are in an ideal position to identify oral health care patients who are at risk. As valuable members of the healthcare team, it is imperative that dental hygienists make a concerted effort to incorporate this valuable screening into their daily treatment regimens. Ethical and legal responsibilities dictate that dental hygienists adhere to policies aimed at protecting not only the patients' oral health, but also their total health.

Both the American Dental Association and the American Dental Hygienists' Association have supported high blood pressure screening as an important aspect of patient care. A continued effort must be made by educators, both dental and dental hygiene, to reiterate the value of providing this service to patients. Time for this procedure should be allowed in each patient appointment. Clinicians should become comfortable with their skills in reading the patient's blood pressure and should stress the value of this service to their patients. Finally, the necessary equipment for blood pressure screening should be provided in all oral health care settings.

Continuing education courses with both didactic and hands-on components should address the further study of hypertension and blood pressure screening. Additional research may be necessary to determine if the findings of this project are indicative of only one segment of the dental hygiene population, or if these findings represent the norm among practicing dental hygienists.

Acknowledgements

Notes

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Treating Patients with Drug-Induced Gingival Overgrowth

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The purpose of this paper is to review the causes and describe the appearance of drug-induced gingival overgrowth, so that dental hygienists are better prepared to manage such patients. Gingival overgrowth is caused by three categories of drugs: anticonvulsants, immunosuppressants, and calcium channel blockers. Some authors suggest that the prevalence of gingival overgrowth induced by chronic medication with calcium channel blockers is uncertain. The clinical manifestation of gingival overgrowth can range in severity from minor variations to complete coverage of the teeth, creating subsequent functional and aesthetic problems for the patient. A clear understanding of the etiology and pathogenesis of drug-induced gingival overgrowth has not been confirmed, but scientists consider that factors such as age, gender, genetics, concomitant drugs, and periodontal variables might contribute to the expression of drug-induced gingival overgrowth.

When treating patients with gingival overgrowth, dental hygienists need to be prepared to offer maintenance and preventive therapy, emphasizing periodontal maintenance and patient education. The affected gingiva presents a bulbous and irregular appearance and requires special modifications in the delivery of dental hygiene care. Dental hygienists play a vital role in the prevention and control of this condition because of the significant correlation between plaque/gingivitis and gingival overgrowth.

Keywords: Gingival overgrowth, cyclosporine, calcium channel blockers, phenytoin, dental hygiene care, oral hygiene instructions, periodontal maintenance

Introduction

Patients affected by a variety of medical conditions may require modifications in dental care. One such example is when the patient's gingival tissues show signs of drug-induced overgrowth. Because the texture and appearance of the affected gingiva may be irregular and bulbous, patients with gingival overgrowth may require special modifications in the delivery of dental hygiene. Dental hygienists should be properly prepared to provide treatment and to suggest individualized oral hygiene instructions for these patients.

Dental hygienists play an important role during the review and update of the patient's medical history. A thorough review of the patient's medical history, including prescription and over-the-counter medications, provides critical information about conditions that may be observed during the oral examination. For instance, patients reporting a diagnosis of high blood pressure may have been prescribed a calcium channel blocker to control the hypertension. These medications can

produce a number of oral side effects such as xerostomia and gingival overgrowth. The prevalence of this occurrence has been reported as high as 38%.^{1,2}

The purpose of this paper is to review the causes of drug-induced gingival overgrowth and to describe the appearance of this condition so dental hygienists are prepared to readily identify it. Treatment modifications that may be necessary when treating patients with gingival overgrowth are presented, with major emphasis on prevention through patient education.

Clinical Appearance of Gingival Overgrowth

While performing an examination of the oral mucosa, dental hygienists may observe a granular and pebbly gingiva, as in the patient from Figure 1, who was taking cyclosporine. This unsightly appearance has been referred to as “resembling clusters of grapes,” as the outer surfaces appear dotted with numerous smaller papillations.^{3,4} Biopsies of affected tissue usually show lobules of fibrous connective tissue covered with stratified squamous epithelium. The appearance of gingival overgrowth can cause significant personal and psychosocial problems for patients who often feel uncomfortable when smiling. An example of the appearance of severe gingival overgrowth on a patient taking a combination of cyclosporine and amlodipine (Norvasc) is illustrated in Figure 2. Butterworth states that the clinical manifestation of gingival overgrowth can range in severity from minor variations to complete coverage of the teeth, and that drifting of the teeth can occur, creating subsequent functional and aesthetic problems for the patient.⁵

Figure 1.
Gingival overgrowth on a patient who has been taking cyclosporine for six months.



Figure 1. Gingival overgrowth on a patient who has been taking cyclosporine for six months.

Figure 2.

Severe enlargement of the interdental papillae on a patient taking the immunosuppressant cyclosporine and the calcium channel blocker amlodipine.



Figure 2. Severe enlargement of the interdental papillae on a patient taking the immunosuppressant cyclosporine and the calcium channel blocker amlodipine.

Etiology of Drug-Induced Gingival Overgrowth

Gingival overgrowth is caused by three categories of drugs: anticonvulsants, immunosuppressants, and calcium channel blockers. These drugs are sometimes taken for the remainder of a patient's life because of chronic health conditions being treated, such as organ transplantations. A clear understanding of the etiology and pathogenesis of drug-induced gingival overgrowth has not been established.⁶ The three different classes of drugs that produce gingival overgrowth might share some common metabolic pathway, or they could produce a similarly appearing clinical condition from totally different mechanisms. Some theories have focused on the direct effects of the drug or its metabolites on specific gingival cells of the periodontium, particularly on gingival fibroblasts. Spoildorio et al. reported that as the severity of overgrowth increases, there are parallel increases in collagen and fibroblasts and a decrease in blood vessel content, possibly explaining the light pink appearance of the enlarged gingival tissue.⁷

Seymour et al.⁴ concluded that the following factors might contribute to the expression of drug-induced gingival overgrowth:

Genetics

Age

Gender

Concomitant Medication

Drug Variables

Periodontal Variables

Genetics, gender, and age are factors that cannot be modified. Drug combinations, such as therapy with immunosuppressants and calcium channel blockers, are often necessary and can result in additive effects.⁷ Drug variables such as dose, serum, tissue, and salivary concentrations of the medication suggest that the effect could be dosage-dependent but that, in order for a drug to be effective, it must reach certain threshold levels. A reduction in the dose of medication is not warranted just to prevent the adverse side effects.

There appears to be a significant correlation between plaque/gingivitis and gingival overgrowth.⁶ However, Thomason et al. questioned whether the gingival overgrowth is the cause or the result of the increased inflammation and plaque levels.⁸ In a study of the prevalence and risk of gingival overgrowth in patients treated with anticonvulsant drugs, Brunet et al. found that gingival inflammation is a significant risk factor for gingival overgrowth in these patients.⁹ Periodontal variables, in contrast to the previously mentioned factors, may be modified and controlled. Therefore, oral health care professionals play an important role in the prevention and control of this condition because of the significant correlation noted between plaque/gingivitis and gingival overgrowth.^{4,6,10}

Medications That Cause Gingival Overgrowth

Calcium Channel Blockers

Calcium channel blockers are used for the treatment of many cardiovascular disorders, including angina, arrhythmias, hypertension, and acute myocardial infarction. They are considered first-choice anti-hypertensive drugs for patients who also exhibit problems with angina or peripheral vascular disease.¹¹ Table I lists the most frequently prescribed calcium channel blockers, the most common side effects of which include headache, dizziness, facial flushing, edema, and gingival overgrowth.^{12,13} A direct relationship between plasma concentration of the drug and the degree of gingival enlargement does not seem to exist, but the prevalence of gingival overgrowth with the use of calcium channel blockers has been reported as high as 38%.^{2,12}

Table I. Commonly used calcium channel blockers that cause gingival overgrowth.^{12, 13}

amlodipine	Norvasc ^a
diltiazem	Cardizem ^b
felodipine	Plendil ^c
isradipine	DynaCirc ^d
nicardipine	Cardene ^e
nifedipine	Procardia, ^f Adalat ^g
verapamil	Calan ^h
manidipine	Iperfen ⁱ

a. Pfizer Inc., Parsippany, NJ 07054

b. Marion Merrel Dow Inc., Kansas City, MO 64114-0480

c. Merck & Co., Inc., West Point, PA 19486

d. Sandoz Pharmaceuticals Corp., Dorsey Div., Sandoz Div., East Hanover, NJ 07936

e. Syntex Puerto Rico, Inc., Humacao, Puerto Rico 00791

f. Pratt Pharmaceuticals Div., Pfizer Inc., New York, NY 10017-5755

g. Miles Inc., Elkhart, IN 46515

h. G.D. Searle & Co., Chicago, IL 60680-5110

i. Takeda Pharmaceuticals North America, Inc., Lincolnshire, IL 60069

In calcium channel blocker-induced gingival overgrowth, the onset of gingival enlargement is commonly noticed between the first and second months of drug therapy. The severity of enlargement is usually greater in the anterior of the mouth, as in the patient in Figure 3 who is taking nifedipine (Procardia®, Adalat®). This severity is usually greater with nifedipine (20% to 30%) than with other calcium channel blockers.^{14,15} Several clinical studies show that patients taking nifedipine are at a high risk for gingival overgrowth, and that gingivitis acts as a factor that predisposes patients to develop gingival overgrowth when they are taking calcium channel blockers.^{10,14, 15}

Figure 3.
Gingival overgrowth aggravated by plaque accumulation
on a patient taking nifedipine.



Figure 3. Gingival overgrowth aggravated by plaque accumulation on a patient taking nifedipine.

Anticonvulsants

Phenytoin, known better by its brand name Dilantin® (Parke-Davis Company), has been widely used to control convulsive disorders since 1938, when it was first used as an anticonvulsant/antiepileptic drug. Scientists have developed other drugs for the treatment of seizures, but phenytoin is still the preferred drug for the treatment of epilepsy, particularly with grand mal, temporal lobe, and psychomotor seizures. It is also widely used in the treatment of some forms of neuralgia and cardiac arrhythmias. Phenytoin is usually prescribed for chronic use, and approximately 50% of those who take it develop gingival overgrowth.^{11,16}

Gingival changes resulting from phenytoin drug therapy usually begin within two weeks to three months. The marginal gingiva and the interdental papillae appear to be the areas predisposed to enlargement. The appearance of phenytoin-induced gingival overgrowth, in the absence of gingivitis, is usually firm, pink, and somewhat pebbly. In severe cases, teeth surfaces are completely covered with gingival overgrowth. Figure 4 illustrates gingival overgrowth on a patient who has been taking phenytoin for several years. Studies of patients taking this anticonvulsant drug suggest that bacterial plaque is an important determinant of the severity of phenytoin-induced gingival overgrowth and stress the importance of instituting preventive plaque control programs, principally in young patients taking this drug.¹⁷⁻¹⁹

Figure 4.
Gingival overgrowth partially covering the teeth of a patient taking phenytoin.



Figure 4. Gingival overgrowth partially covering the teeth of a patient taking phenytoin.

Immunosuppressants

Cyclosporine is a fungal derivative with immunosuppressive effects.³ This medication has a wide range of biological activities, showing antiparasitic, antifungal, anti-inflammatory, and antiproliferative action. In addition to its primary use to prevent organ rejection, cyclosporine's antiproliferative action has led to its use to treat severe psoriasis, ichthyosis vulgaris, and rheumatoid arthritis.¹³

While cyclosporine has been the drug of preference since the beginning of the transplant era, a number of longitudinal and crossover studies have reported an incidence of gingival problems associated with the drug in the range of 25% to 70%.²⁰ Other frequent side effects associated with cyclosporine are damage to the liver and kidneys, increased hair growth, and trembling of the hands. However, cyclosporine has been a revolutionary drug that enables patients to receive lifesaving organs without rejection.

Another major side effect associated with cyclosporine is increased blood pressure. Calcium channel blockers, such as nifedipine, are usually the drugs of choice to control this problem. As mentioned previously, calcium channel blockers have their own adverse effects on the gingival tissues.³ In combination, cyclosporine and calcium channel blockers produce an intensified effect, and the severity of the gingival enlargement is greater.^{7,13,21}

Fortunately, advances in pharmacology are providing new options to physicians for the immunosuppression of transplant patients. New drugs are being evaluated, and there is a possibility that, in the future, adequate immunosuppression will be achieved without such noxious side effects as gingival overgrowth.

Medical Treatment Options

Researchers have not yet determined how to prevent or eliminate drug-induced gingival overgrowth. The ideal approach would be the substitution of the causative drug. The vast array of cardiovascular drugs provides many options for the substitution of calcium channel blockers. Antihypertensive agents can be combined or switched until an optimal therapy to control hypertension is found.

Drug therapy for transplant patients can be changed to newer immunosuppressants such as tacrolimus (Prograf®), an alternative agent that has been widely used in recent months to prevent organ rejection and is much less likely to cause gingival overgrowth.²² New anticonvulsant drugs are also available, such as valproic acid, primidone, vigabatrin (Sabril®), gabapentin (Neurontin®), and topiramate (Topamax®).²³ There have been reports of gingival overgrowth with the use of vigabatrin, so clinicians should still be aware of similar findings in patients using new anticonvulsants.²⁴ Unfortunately, not all patients respond as well to the newer drugs and must tolerate undesirable side effects to obtain the more important therapeutic benefits. Although prescribing alternative drugs can lessen drug-induced gingival overgrowth, physicians are reluctant to substitute an alternative drug for a proven, effective medication for the sole purpose of reducing gingival overgrowth.

Dental Therapy Options

Research to find methods to prevent gingival overgrowth is underway. Some therapies may be effective in the immediate and short-term management of drug-induced gingival overgrowth.²⁵ Non-surgical (i.e. periodontal debridement, local/systemic antimicrobial delivery) and surgical treatment options may be used individually or in combination to control this problem. A study by O'Valle et al. reported that four of five patients showed recurrences of gingival overgrowth one year after undergoing gingivectomy. Of those four, three showed moderate overgrowth and one showed mild overgrowth. These findings suggest that surgery may only temporarily control gingival overgrowth, and that recurrence is common.¹³

If gingival overgrowth is severe and a gingivectomy is recommended, technological advances allow patients to undergo laser surgery, a simple procedure that produces an immediate, remarkable result. Compared to scalpel gingivectomy, laser surgery requires less effort, reduces the need for periodontal dressing, and lessens postoperative discomfort. It has been reported that tissue rebound also is minimal when lasers are used.²⁶

There are no conclusive recommendations in the literature for the complete elimination of gingival overgrowth. There is evidence that in some patients, however, excellent oral hygiene reduces the likelihood of developing gingival overgrowth. For example, Guelman et al. acknowledged the critical role of routine professional prophylaxis and good oral health maintenance for the healthy status of the gingival tissue of patients with gingival overgrowth.²⁷

Similarly, Ikawa suggested that conventional periodontal treatment can result in satisfactory clinical responses without changing drugs that induce gingival overgrowth. He made this conclusion after evaluating treatment that consisted of oral hygiene instructions, scaling and root planing under local anesthesia, surgical removal of remaining pockets, and placement of bridges to establish proper occlusion.²⁸

Lozada-Nur et al. also stated that there is substantial evidence indicating that gingival overgrowth caused by calcium channel blockers and phenytoin can be controlled effectively by meticulous professional and individual oral hygiene. Gingival overgrowth caused by cyclosporine, however, may not respond as favorably to aggressive plaque control.²⁹

Dental Hygienist's Approach

According to the 1999 reclassification of periodontal diseases, drug-influenced gingival enlargement is a dental plaque-induced gingival disease.³⁰ For that reason, dental hygiene care plans for treating patients with gingival overgrowth

should have the same goals as periodontal maintenance care plans. These common aims are to lessen the recurrence and progression of gingivitis and periodontitis, to reduce tooth loss, and to increase the probability that other conditions are detected and treated early.³¹ Dental hygienists should emphasize the importance of frequent periodontal maintenance at each appointment, spending quality time on patient education and reinforcing positive oral health habits.

Dental hygiene appointments for patients with gingival overgrowth should include an initial periodontal debridement and subsequent maintenance appointments every one to three months. Depending on the severity of the gingival enlargement, dental hygienists may encounter problems when probing, due to commonly seen pseudopockets, and when debriding, due to bleeding and vulnerability of the enlarged gingival lobes that form around the crowns of the teeth, as seen on the patient in Figure 5 who was taking amlodipine for hypertension and cyclosporine for a recent kidney transplant. Even for the experienced dental hygienist, it might be necessary to modify the debridement technique to facilitate the insertion of the instrument tip into the sulcus.

Figure 5.
Instrument insertion modification is necessary when scaling around affected areas, as in this patient taking amlodipine and cyclosporine.



Figure 5. Instrument insertion modification is necessary when scaling around affected areas, as in this patient taking amlodipine and cyclosporine.

To facilitate insertion and instrumentation around enlarged gingiva, modified curets and scalers should be used, such as those with miniature working ends and extended lower shanks. The smaller and thinner working ends of these instruments will reach farther subgingivally than will standard designs, and they will ensure complete removal of deposits. Power instrumentation should also be considered for these patients, as it is valued as equivalent or superior to hand scaling. The new design of periodontally modified inserts allows greater access to deep pockets and furcations, which are more difficult to reach on patients with gingival overgrowth when using manual scalers.

Oral Hygiene Instructions

Dental hygienists should carefully plan individualized oral hygiene instructions to minimize plaque accumulation, prevent gingival inflammation, and improve patient compliance. According to Hodges, when dental hygienist recommendations meet patient needs, patient compliance increases.³¹

Many dental practices have intraoral cameras or photographic cameras that can capture the progression of overgrowth at each appointment. Photographs can be used for careful planning of oral hygiene instructions, and they are helpful tools for patients to see the “real picture” of their oral cavity. Figure 6 shows a patient with early signs of gingival overgrowth three months after beginning cyclosporine therapy for a kidney transplant. Figure 7 shows the same patient six months later. Patients may be more aware of the condition and motivated to action by comparing before and after pictures.

Figure 6.
Kidney transplant patient one month after starting cyclosporine therapy.



Figure 6. Kidney transplant patient one month after starting cyclosporine therapy.

Figure 7.
Same patient, six months post-transplant, taking
cyclosporine and amlodipine.



Figure 7. Same patient, six months post-transplant, taking cyclosporine and amlodipine.

Brushing

Effective plaque removal is important for all patients, but individuals with gingival overgrowth may face unique challenges. A vibratory tooth brushing technique like the Bass method should be recommended to gingival overgrowth patients. This brushing technique needs to be explained to patients by demonstrating the position of the toothbrush bristles on a model or on the patient's own teeth. In this way, the patient will be able to observe and understand what the dental hygienist is describing.

Careful instruction should be given to patients with gingival overgrowth to ensure that they do not harm the gingiva. Placement, pressure, and vibration of the brush should be adjusted to individual tooth surfaces, depending on the amount of gingival overgrowth and on the presence or absence of inflammation. The brush should be repositioned as needed to adapt it to the morphology of the enlarged gingiva.

In some patients, if the gingival overgrowth has formed large lobes overlapping each other, plaque may accumulate inside the groove formed by the lobes. Patients should be instructed to carefully brush these areas by inserting the bristles in the groove and vibrating the toothbrush carefully to remove plaque. To prevent tissue laceration, an extra-soft toothbrush should be used.

Another option available for patients with gingival overgrowth is the use of electric or sonic toothbrushes, which have been shown to be highly effective in removing interproximal plaque. Power toothbrushes are safe and proven to be significantly more effective than manual toothbrushes, in relation to plaque removal and maintenance of gingival health. In addition, power toothbrushes are well accepted by patients and have the potential to improve compliance by requiring less effort from the patient.

Flossing

Patients with gingival overgrowth can benefit from flossing daily. Extra care needs to be taken when flossing in general, but if dental floss is moved from adjacent teeth without guiding it over interdental papillae, excision may occur and cause heavy bleeding. The floss holder is an option for patients unable to floss with their fingers, but extra care needs to be applied because the force of the floss may be difficult to control. Gingival lacerations or cuts may cause heavy bleeding and, as in organ transplant patients, the release of harmful bacteria into their blood stream. This bacteremia may compromise the well-being of the patient with a transplant.³²⁻³³

Floss cuts or clefts occur primarily on facial and lingual/palatal surfaces directly beside or in the middle of an interdental papilla. Gingival overgrowth patients are more prone to damage their enlarged gingiva if they do not floss correctly. The causes may be using a piece of floss that is too long, using excessive force to insert the floss through the contact, improperly adapting the floss to tooth curvatures, and failing to use a fulcrum to prevent excessive pressure. Dental hygienists should teach the patient how to move the floss around enlarged papillae to prevent unnecessary tissue trauma.

Other Oral Hygiene Adjuncts

Gingival stimulators, interdental brushes, and other devices can be recommended as needed. Oral irrigation devices can achieve removal of debris on patients who are not able to brush and floss correctly because of other impairments. As a preventive measure, chlorhexidine 12% once a day has been recommended and may be prescribed for patients at risk for gingivitis, as it has shown beneficial effects on patients with gingival overgrowth.^{6,34}

Conclusion

Dental hygienists have the responsibility to provide the best possible care to all patients. They should be able to transfer knowledge gained in the assessment phase of care to accurately diagnose and plan the appropriate therapy. Because the possibility of dental hygienists encountering patients with drug-induced gingival overgrowth exists, they should be prepared to offer maintenance and preventive therapies formulated specifically for the needs of these patients. They should also be familiar with additional instrumentation modifications to better adapt debridement techniques to the affected gingival structures.

All oral health care providers should have excellent rapport with these patients. They should listen carefully to their concerns and, if necessary, act as a point of referral for other specialized therapists or counselors. The dental hygienist can also play a significant role in the prevention of gingival overgrowth. As studies have suggested, plaque control is required to minimize the inflammatory component of the condition. For that reason, reinforcing good oral hygiene at each appointment should be routine. These steps to treating gingival overgrowth will be life-altering for patients and also rewarding to oral health care providers.

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Notes

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Sonrisa Clinic: Evaluation of Patient Satisfaction

Michelle Bishoff and Shari Bussey

Dental hygiene students at Central Community College, Hastings, Nebraska. Wanda Cloet, RDH, MS, faculty advisor.

Purpose. To assess the satisfaction of the families treated at the Sonrisa Clinic in Hastings, Nebraska.

Methods. A sample of 101 Hispanic children ranging from the ages of 3 to 16 was seen by the dental hygiene students at Central Community College in Hastings, Nebraska, for free dental services. This program included 15 dental hygiene students, two dentists, and three translators. The goal was to provide underprivileged minority families preventive and restorative care and instruction. Each family received a questionnaire at the end of their treatment to express their overall impression of the Sonrisa Clinic. A total of 27 surveys were received and analyzed.

Results. Of the families responding, 96% were satisfied with the times the clinics were held. Ninety-three percent of these responding families were satisfied with the location and did not have trouble with transportation to the clinic site, and 96% were satisfied with the study materials provided. One hundred percent of the responding families were satisfied with the explanation of procedures, availability of interpreters, educational videos, and solving all dental needs. Lastly, all families (100%) said they would recommend the program to their families and friends.

Conclusion. Overall, most families were satisfied with all aspects of the Sonrisa Clinic. Future clinics should continue to provide satisfaction questionnaires in order to evaluate the experiences of the families involved.

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Effects of Water Fluoridation in Communities

Megan Brown and Tara Werger

Dental hygiene students at Central Community College, Hastings, Nebraska. Wanda Cloet, RDH, MS, faculty advisor.

Purpose. *The purpose of this project was to determine if water fluoridation will help prevent tooth decay in residents of two Nebraska communities*

Methods. *Senior dental hygiene students from Central Community College in Hastings conducted oral screenings on second graders from two communities. The communities compared were Minden, Nebraska, a community with fluoridated water, and Hastings, Nebraska, where the water is non-fluoridated. Sixty-five Minden second graders and 54 second graders from Longfellow Elementary in Hastings were screened under the supervision of a registered dental hygienist. DMFT's and DEFT's were recorded, calculated, and added together for each school. Comparisons were made based on percent needing attention, decay per pupil overall, and decay per pupil needing attention.*

Results. *The percentage of students at the Minden school needing attention was 9.2%. In Minden, the decay per pupil overall was 0.138, and the decay per pupil needing attention was 1.5. The percentage of students at the Hastings school needing attention was 25.9%. The decay per pupil overall was 0.703, and the decay per pupil needing attention was 2.71 in Hastings.*

Limitations. *Limitations of the study were the lack of time to conduct a survey to assess diet, the amount of time each child had lived in a water-fluoridated community, and the amount of water consumed daily in the fluoridated community. Other contributing factors, such as level of education about oral health and daily oral care, were not determined.*

Conclusions. *Decay present in students was much higher in the non-fluoridated community, in comparison to the fluoridated community. Based on these results, it can be concluded that water fluoridation leads to a decrease in the amount of decay occurring in teeth.*

An Assessment of Oral Cancer Screening Methods Among Registered Dental Hygienists in West Virginia

Melissa Soriano and Shayna Williams

Graduates of West Virginia University School of Dentistry, Division of Dental Hygiene. Shari Austin, BSDH, MS, Carol Spear, BSDH, MS, and Erdogan Gunek, PhD, faculty advisors.

Purpose. The purpose of this study was to determine oral cancer screening methods among registered dental hygienists in West Virginia. The entire oral health care team is responsible for implementing oral cancer screenings, but recent literature suggests that dental hygienists do not regularly provide oral cancer screenings as a routine component of their patient assessment. Thorough intraoral and extraoral cancer screenings can drastically reduce the number of deaths resulting from oral cancer. Therefore, routine oral cancer screenings and thorough examinations are imperative components of each patient assessment.

Methods. Out of 687 registered dental hygienists in West Virginia, 300 were randomly selected to participate in the study. A 22-item survey was mailed to the participants' home addresses. The survey addressed demographics, attitudes, and beliefs regarding oral cancer, the frequency and thoroughness of oral cancer screenings, and overall knowledge of clinical characteristics and risk factors associated with oral cancer. Data analyses were conducted using frequencies, cumulative frequencies, and percentages. Fisher's two-tail exact test and chi square test were used to determine statistical significance, and the kappa coefficient was used to determine degrees of agreement.

Results. A response rate of 51% (n=152) was achieved. Within the dental offices of most respondents (n=93), oral cancer has been detected (p<0.01).

The majority (n=124) provide intraoral cancer screenings during each patient's recall appointment (p<0.01). Although 57% (n=81) provide extraoral cancer screenings during each patient's recall appointment, it is not a significant majority. Dental hygienist respondents are more likely to provide the extraoral cancer screening to patients if they provide the intraoral cancer screening (kappa=0.3) (p<0.0001).

The majority of responding dental hygienists feel they have adequate time, education, and confidence to provide patients with thorough oral cancer screenings (p<0.01). They are more likely to provide oral cancer screenings to patients if they feel they have adequate appointment time and confidence (kappa=0.2) (p<0.05).

The majority (n=136) feel it is important to provide patients who use tobacco with tobacco cessation counseling and education on their risks in developing oral cancer (p<0.01); however, most (n=102) only sometimes provide this service to their patients (p<0.01). The respondents are more likely to provide tobacco cessation counseling to their patients if they feel that it is important (kappa=0.4) (p=0.001).

Conclusions. It appears that more dental hygienists in West Virginia need to perform extraoral cancer screenings of the skin, lips, lymph nodes, and salivary glands. Most dental hygienist respondents feel they have adequate time, education, and confidence to provide intraoral cancer screenings. The majority feel that the provision of oral cancer screenings is a necessary standard of care for any dental office. Since tobacco use is the leading risk factor for oral cancer development, dental hygienists need to provide tobacco cessation counseling on a more regular basis.

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Comparison of Mask and Face Shield on the Prevention of Aerosol Exposure

Allison Harp, Stephanie Marks and Ninh Luong

Senior dental hygiene students at Loma Linda University School of Dentistry, Loma Linda, CA. Darlene Armstrong, BS, RDH, and William Keeler, BS, faculty advisors.

Purpose. The objective of this study was to investigate possible differences in barrier efficacy from aerosol exposure to clinicians during routine dental prophylaxis. The Occupational Safety and Health Administration (OSHA) requires that masks be worn in combination with eye protection devices (goggles, glasses with solid side shields, or chin-length face shields) during dental procedures. The Centers for Disease Control and Prevention (CDC) and the American Dental Association (ADA) recommend that dental professionals wear either a mask and goggles or a face shield alone. While there are limited published studies regarding the face shield, it is clearly an option offered to dental professionals under official guidelines.

Materials and Methods. The treatment cells were comprised of dental hygiene students who wore either 1) face shield with mask, using the ultrasonic scaler; 2) face shield with mask, using hand instruments; 3) mask and goggles only, using the ultrasonic scaler; and 4) mask and goggles only, using hand instruments. Each cell was tested 12 different times (12 replicates). For all tests, the operator was given a mask with a sterile, thin plastic covering attached. This plastic was swabbed in a standard manner for contaminating bacteria at the end of the treatment (30 minutes). The swab was added to 10 ml of sterile saline and mixed. Bacterial colonies were counted by removing 0.25 mls and spreading it on blood agar plates that were then incubated for 48 hours at 37M-BM-0C.

Results. For operators scaling by hand, 8% of the masks with face shield alone and 17% of the masks with goggles only had contaminating bacteria from aerosol. For those using the ultrasonic scaler, 33% of the masks with goggles only and 50% of the masks with face shield had detectable bacterial growth. With the two-sample binomial test, there was no statistically significant difference in bacterial contamination from aerosols between any of the test cell conditions.

Conclusion. This study demonstrated that more aerosol bacterial contamination occurs with ultrasonic scaler use than with hand instrumentation. However, when masks from face shields alone were compared to masks used with eye goggles only, no significant differences were found in the numbers of masks contaminated by aerosol bacteria.

Clinical Significance. If a face shield is chosen for barrier protection, a clinician may practice safely without using a separate face mask.

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Hand Hygiene: The Efficacy of an Alcohol-based Hand Sanitizer vs. an Antimicrobial Soap and Water

Ann Lee, Corrie Long and Rebecca Phillips

Senior dental hygiene students at Loma Linda University School of Dentistry, Loma Linda, CA. James D. Kettering, PhD, and Carlos A. Munoz, DDS, MS, faculty advisors.

Purpose. Because dental literature regarding the efficacy of alcohol-based gel is controversial, this study compared the effectiveness of an alcohol-based hand sanitizer versus an antiseptic hand soap for bacterial removal.

Methods and Materials. Product A (1.0% chloroxylenol) and Product B (62% ethyl alcohol hand sanitizer) were compared. Three subjects, the dental hygiene students completing this study, tested each product 25 times, totaling 75 trials. *Staphylococcus epidermis* was the indicator organism. Subjects marked a two-inch circle on a palm as an invariable testing zone. Each zone was inoculated with a swab dipped in a microbial solution of 1.6×10^7 colony forming units (CFU). After 15 seconds, for Product A, subjects followed Centers for Disease Control (CDC) handwashing guidelines, using a controlled amount of antimicrobial soap in wetted palms, rubbing them together for 15 seconds, rinsing the product off completely with warm water, and towel-drying their hands. For Product B, the subjects placed the same amount of product in their palm and rubbed them together for 15 seconds until dry. Five consecutive samples were collected before the palms were reinoculated by rubbing sterile swabs across the testing zone with even, firm pressure for 15 seconds. The swabs were then placed into 1 ml of broth and mixed. One hundred microliters of the resulting mix were placed on a TSA plate and spread with a glass rod. Plates were incubated for 24 hours at 37M-BM-0C and the bacterial colonies were counted.

Results. The Kruskal-Wallis Ranks Test demonstrated a highly significant decrease for both antimicrobial soap with water and alcohol-based gel ($p < .0001$). The Mann-Whitney U-Test showed that alcohol-gel significantly reduced bacterial counts compared to soap and water ($p < .0001$).

Conclusions. The alcohol-based gel was more effective in reducing bacterial counts than the antimicrobial soap after one application. It required four handwashings with the antimicrobial soap to be equally effective.

Clinical Significance. Because alcohol-based hand gels are highly effective, health care professionals should feel confident in replacing soap and water with an alcohol-based gel.

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Effect of Herbal Medication on Amoxicillin Activity

Truc Nguyen and Aubrey Yost

Dental hygiene students at Loma Linda University School of Dentistry, Loma Linda, CA. James D. Kettering, PhD, and Rhonda Hammerslough, RDH, MA, EdS, faculty advisors

Purpose. *This study investigated whether three herbal medicaments had any effects on amoxicillin activity.*

Methods and Materials. *Streptococcus mitis was the indicator microorganism. The following were placed on 10mm filter paper discs using a pipette:*

T1) St. John's Wort extract (15 M-BM-5l) and amoxicillin solution (15 M-BM-5l)

T2) Echinacea extract (15 M-BM-5l) and amoxicillin solution (15 M-BM-5l)

T3) Ginkgo Biloba extract (15 M-BM-5l) and amoxicillin solution (15 M-BM-5l)

T4) Amoxicillin, positive control (15 M-BM-5l prepared solution at concentration of 125 mg/5 ml)

T5) Sterile water, negative control (30 M-BM-5l)

The series was repeated 5 times (25 times). Plates were incubated for 24 hours at 37M-BM-:C. Zones of inhibition (mm) were measured and analyzed using the Kruskal-Wallis Ranks and Mann-Whitney U-Tests. Zones of inhibition, areas of no microbial growth, are produced on bacteria-inoculated agar whenever an antimicrobial is diffused into the medium from the paper disc. The effect of the antimicrobial is negative if no zone of inhibition develops, while a moderate or large zone indicates that the bacterium would not grow in the presence of that medication. This test is used routinely to determine clinical microbial sensitivity or resistance to many antimicrobials.

Results. *The mean inhibition zone was determined for each treatment. For T1, the value was 74.40 mm (SD=6.82). T2 averaged 55.3 mm (SD=15.49), while T3 measured 60.67 mm (SD=1.84). T4 value was 73.87 (SD=6.49), and T5 measured 0 (SD=0). T1 was greater than both T2 and T3 (p=0.008), but T1 showed no significant difference from T4 (p=0.841). T2 showed no significant difference from T3 (p=0.841), and T2 and T3 was less than T4 (p=0.008). All treatments were greater than T5 (p<0.0001).*

Conclusion. *Results showed that echinacea extract and ginkgo biloba extract reduced the zone of inhibition of amoxicillin at a significant level. St. John's wort appeared to increase amoxicillin zone of inhibition.*

Clinical Significance. *It is imperative that patients disclose use of all medications and herbal supplements because antibiotic efficacy may be negatively affected.*

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The Effect of Toothbrush Covers on Bacterial Retention

Heather Borso, Rebecca Crump and Melissa Schelling

Senior dental hygiene students at Loma Linda University School of Dentistry, Loma Linda, CA. James D. Kettering, PhD, faculty mentor

Purpose. Studies have established that toothbrushes harbor pathogenic microorganisms. This study's purpose was to investigate how covers on three powered toothbrushes affected bacterial retention.

Materials and Methods. The retention of *Streptococcus mutans* was evaluated on the Oral-B Cross Action Power, the Sonicare Advance 4100, and the Crest SpinBrush Pro. The brushes were first sterilized with ethylene oxide. Brush heads from each brand were then submerged in a *Streptococcus mutans* solution for two minutes. Ten toothbrushes from each brand were covered, while 10 from each brand were allowed to air dry and were stored at room temperature. After 12 hours, five of each covered and aerated were vortexed in 10 ml sterile saline. Dilution was made (1/10), and 40 ml was placed on Mitis salivarius agar and counted after 72 hours at 37M-BM-0C. The identical procedure was carried out with the replicate 30 toothbrushes. A negative control was included.

Results. Findings from the Mann-Whitney test showed that the covered brushes at 12 hours had a statistically higher number of colony forming units (CFU) than at 24 hours ($p < 0.0001$), but uncovered toothbrushes had no significant differences at 12 and 24 hours ($p = 0.3620$). At 12 hours, the covered brushes had significantly higher CFU than the uncovered brushes ($p < 0.0001$), and at 24 hours no significant difference existed between the two brush types ($p = 0.2120$).

Conclusions. Toothbrush head covers affected retention of *Streptococcus mutans*. The longer the toothbrushes dried, bacteria levels decreased regardless of whether the brushes were covered or uncovered.

Clinical Significance. All patients should be encouraged to leave toothbrushes uncovered after use to minimize bacteria survival. If patients do cover their toothbrushes, they should wait 12 hours before reuse to allow time for decreasing the bacterial load.

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Preventive Services at the University of Nebraska Medical Center Dental Day

Liza Bumgarner, Mary Fuchuck and Jenny Mollner

Dental hygiene students at Central Community College, Hastings, Nebraska. Wanda Cloet, RDH, MS, faculty advisor.

Purpose. *The University of Nebraska Medical College (UNMC) Dental Day is an event that provides free oral health care and education to underserved Nebraska children. Held annually since 2001, the one-day event is an occasion for dental and dental hygiene students and faculty to provide care for about 130 children per day. Children from low-income, uninsured, and homeless families receive cleanings, fluoride treatments, sealants, cavity fillings, education, and emergency care. The UNMC Dental day has received the ADA's Community Preventive Dentistry Award.*

Methods. *In 2000, Dental Day began to target children of different populations. Between 2000 and 2004, a sample of 178 children between the ages of three and 16 were seen in a clinical setting at the dental hygiene department at Central Community College in Hastings, Nebraska. Children were selected from the Hastings area and surrounding communities including Sutton, Harvard, and Grand Island. Central Community College dental hygiene students provided x-rays, prophylaxis procedures, fluoride treatments, and sealants to prepare the children for further restorative and preventive care at the dental school at University of Nebraska Medical Center at Lincoln. Clinical examinations and radiographs were completed to detect caries, and restored surfaces were documented. In this process, 87 pit and fissure sealants were placed. Each child was evaluated by a dental hygiene instructor and a dentist.*

Results. *Several children presented with moderate to severe decay. Along with the sealants that were placed, many prophylaxes were completed to shorten the appointment time in Lincoln. The remaining restorations and sealants were completed at the University of Nebraska Medical Center Dental School on Dental Day.*

Conclusions. *With the preventive services at Central Community College, a full day of treatment was divided in half, making the children's experiences more positive. There was great success in seeing a wide range of children at the many dental days. The Central Community College dental hygiene program will continue to provide this service in the future.*

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Evaluation of a Method to Access Preventive Treatment at Sonrisa Clinic

Kelly Nathan and Tori Thompson

Dental hygiene students at Central Community College, Hastings, Nebraska. Wanda Cloet, RDH, MS, faculty advisor.

Purpose. *The Sonrisa Clinic provides dental care for Hispanic children who are not covered by the state of Nebraska's children's health insurance program or Medicaid. This clinic was funded by a grant and was held at the dental hygiene clinic at Central Community College in Hastings, Nebraska. The purpose of this study was to assess the preventive treatment provided to children at the Sonrisa Clinic.*

Methods. *The treatment was provided by volunteer dentists, dental hygienists, dental assistants, dental hygiene students, faculty from the college, and translators. One hundred one children were seen at the clinic, all of whom received a prophylaxis and an exam. The children all received x-rays, both bitewings and occlusal, to check for decay and the status of unerupted permanent teeth. The children also received fluoride treatments and instructions on how to brush their teeth. They were then examined by licensed dental hygienists and licensed dentists.*

Results. *Oral needs for each patient were identified. A total of 213 permanent teeth were sealed to prevent decay. The children who had decay went to another Sonrisa Clinic at Central Community College in Hastings that provided restorative care. The restorative care was completed by dental students from the University of Nebraska Medical Center dental school.*

Conclusions. *The clinic has benefited 100 children from the surrounding areas of Hastings and Grand Island. This clinic provided needed oral health preventive services for this specific population of children.*

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A Report of Oral Screenings of Residents of Two Nebraska Nursing Homes

Teddi Wilson and Amanda Gembica

Dental hygiene students at Central Community College, Hastings, Nebraska. Wanda Cloet, RDH, MS, faculty advisor.

Purpose. *The purpose of this paper is to provide a report of the oral health screenings of the residents of two nursing homes.*

Methods. *Since 1990, dental hygiene students have performed oral screenings for residents of two nursing homes in Grand Island and Hastings, Nebraska. Beginning in the fall of 2003, a dentist contracted to provide services with the nursing home. Dental hygiene students were then able to work under general supervision of the dentist, provide prophylactic procedures for those in need, and refer the residents to a dentist or physician if their screenings revealed anything abnormal.*

Results. *In the fall of 2003, 104 nursing home residents were screened to determine the need for cleanings. Twenty-nine residents were screened in the Grand Island nursing home, and nine received prophylactic procedures by dental hygiene students. In the Hastings nursing home, 75 residents were screened and 10 received prophylactic procedures by dental hygiene students.*

Conclusion. *No attempt was made to evaluate the effectiveness of this screening activity. However, these oral screenings were likely beneficial to the residents who were screened because they were provided preventive services and additional oral care needs were identified.*

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Notices

12th Annual Academy of Laser Dentistry Conference and Exhibition

The Academy of Laser Dentistry will host its 12th annual conference and exhibition in New Orleans, LA, from April 6-9, 2005. Abstracts are now being accepted.

Conference highlights include hands-on introductory and advanced laser clinics, workshops, and seminars on the correct, ethical practice of lasers in dentistry.

The conference is open to dentists, dental hygienists, dental assistants, business staff, researchers, educators, and industry representatives. Continuing education credit is available for eligible participants.

To find out more, check out the conference Web site at www.source2005.org. A detailed conference prospectus is available from www.laserdentistry.org, and you may contact the academy at (954) 346-3776.

Database of federal audience research now online

A database of federally sponsored audience research on prevention topics is now available online at www.health.gov/communication.

The Prevention Communication Research Database is a searchable collection of research conducted or sponsored by the U.S. Department of Health and Human Services agencies. The database is designed to provide access to research that may not be widely known or published in peer-reviewed journals.

The available research explores the attitudes, beliefs, interests, preferences, and behaviors of specific audiences, with respect to prevention issues. Database topics include asthma, arthritis, cancer, diabetes, nutrition, heart disease and stroke, obesity, substance abuse, exercise, and tobacco use.

Health professionals, researchers, and anyone interested in prevention topics can use the database to find recent studies, shape audience research design and proposals, and improve understanding of intended audiences.