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Outward and Onward

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Keywords: dental hygiene, advanced dental hygiene practitioner, dental hygiene education, dental hygiene research, access to care, change

I am writing this just after returning from the American Dental Hygienists' Association's (ADHA) 81st annual session. As always, I was inspired and energized by being with my friends and colleagues from across the country. The special interest sessions, student activities, and continuing education courses were outstanding. The ADHA House of Delegates (HOD) actions and reports from ADHA officers and senior staff indicate that association leaders are united in their goal of securing a strong future for dental hygiene. Given the increasing national interest in addressing the country's long-standing access to oral health care issues, it is logical to assume that dental hygiene will have a prominent role in future oral health care delivery systems designed to reduce these inequities. However, it would be unwise for ADHA to act based on assumptions. Fortunately for all dental hygienists, ADHA is methodically building the infrastructure to base actions on facts rather than assumptions in order to create a bright future for dental hygiene.



In a bold move to secure a broader role for dental hygienists in future oral health care delivery, the 2004 HOD almost unanimously adopted policy advocating the creation of a new category of professionals within dental hygiene, the advanced dental hygiene practitioner. The HOD adopted two other related resolutions to define the advanced dental hygiene practitioner by the services they would be prepared to provide, and to stipulate that dental hygienists wishing to gain the advanced dental hygiene practitioner credential would complete an ADHA approved advanced education curriculum. Work toward implementing this policy is already underway.

The matter of specialties within dental hygiene has been discussed from time to time over many years. It is likely that previous discussions did not lead to specific actions because of other more pressing issues, such as student recruitment,

and preceptor ship threats that were launched simultaneously in states throughout the country. With new documentation of the extent of the unmet oral health care needs in certain vulnerable populations, national and state policy makers are more open to discussions about broader roles for providers other than dentists to address that need. Because of these external conditions and dental hygiene's willingness to pursue change, this is an ideal time to develop and launch the program to educate advanced dental hygiene practitioners. To take advantage of this opportunity, dental hygiene needs to adopt a fast-forward posture in planning to meet the challenges that most surely lie ahead.

In thinking about how we might best respond to the obvious and immediate challenges to the future of dental hygiene, the Outward Bound program came to my mind. Many of you will remember this program that was begun in Great Britain in the early days of World War II to prepare young seamen for the task ahead, and then introduced in our country in 1961 in Colorado. The Outward Bound program has changed over the years but is still active in helping people build self-esteem, internal fortitude, and confidence through personal achievement.

Recalling Outward Bound, at least for me, brings mental images of firm, muscular young people dressed and outfitted for outdoor activities and setting off to attain some extraordinary goal while overcoming obstacles that would stop ordinary people in their tracks. I also visualize these outdoor enthusiasts resting in camps at the end of the day, sharing their experiences and, all in all, having a great time. There are no slackers in this picture, for while some may have bruises and blistered feet, all remain committed to following through with a dream. While my mental image is a pretty picture, it fails to portray the extensive preparation young people must undergo as a requirement for participating in this program. Without doubt, the Outward Bound program created conditions through which hundreds of young people gained the confidence and self-esteem that enabled them to lead extraordinarily diverse and meaningful lives.

In a similar fashion, the almost unanimous vote of the 81st ADHA HOD to create the advanced dental hygiene practitioner set the stage for dental hygiene to move ahead. Moving ahead means changing in ways that promise to bring personal satisfaction and build self-esteem while bringing oral health services to multitudes of powerless people who have been previously, for the most part, unnoticed. Now that this stage is set, I suggest that certain follow-through activities must be undertaken to safeguard our current status and support future dental hygiene practice.

Obviously, ADHA will develop a standardized curriculum for the advanced dental hygiene practitioner and develop a process to approve and monitor educational programs as they develop. It is also obvious that ADHA must prepare to assist dental hygiene educational programs wishing to gain institutional approval to offer this advanced education. Clearly, a system to regulate advanced dental hygiene practice must be established and institutionalized. Because advanced dental hygiene practitioners will be prepared for practice in settings outside the traditional private dental office, reimbursement for dental hygiene care must be clarified in all states. There are many other steps along the way to creating a fully functioning advanced dental hygiene practitioner, and ADHA has already identified most of them. However, one activity is so critical to our future that it deserves special emphasis.

Although ADHA supports research conducted by dental hygienists in a number of ways, primarily through the work of the association's research council and the ADHA Institute for Oral Health research grants, stimulating new dental hygiene research continues to be challenging. I was encouraged by the number of really good dental hygiene research posters presented at this year's annual session. Most were the work of undergraduate dental hygiene students, and that's exciting. The truth is that only a few of these talented students will ever again engage in research once they are graduated. Is it possible that our entry-level dental hygiene curriculum is structured to only funnel graduates into the traditional role? Is it possible to persuade talented students that they can have a rewarding future in research? Are dental hygiene faculty good role models for students who are extraordinarily effective critical thinkers, and therefore, might be promising researchers? How can we influence dental hygiene students who are blessed with natural curiosity to continue their formal education and gain the advanced degrees that are necessary to pursue research careers? Is it possible that, over all, dental hygienists fail to see the need to strengthen our profession's research base?

All of these and many other questions must be addressed for dental hygiene to move out of its static, fifty year old practice mode. Dental hygiene education, regulation and practice, and research must simultaneously change in order for our profession to advance. We hobble our profession when we minimize the importance of research, as it provides the foundation for all professional education and practice. It is most certainly necessary to bring about essential regulatory changes. Perhaps evidence that we are making headway with respect to research will come in the form of more research reports that contribute to the dental hygiene knowledge base being published in the *Journal of Dental Hygiene*.

This is an exciting time for our profession. Our leadership has asked us to envision a future in which dental hygiene education, regulation and practice, and research will adapt to the environment and change to meet the oral health care needs of all Americans. I predict that in bringing this vision to reality, dental hygienists everywhere will gain the professional self-esteem, confidence, and fortitude to participate in establishing dental hygienists as essential health care providers. I am truly privileged to have the opportunity to encourage my dental hygiene colleagues everywhere to think of the possibilities that lie ahead. I believe its time to put on hiking boots, pack a bag, and prepare to move outward and onward for a future filled with limitless possibilities. I look forward to the experiences we will share along the way.

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UpFront

Heather Shirley

Asthma Rates Increase in Urban Youth

Researchers from the Center for Health and Global Environment (CHGE) at Harvard Medical School released a report this April stating that U.S. children, particularly minority and low-income urban children, are being diagnosed with asthma at "epidemic" proportions. The study attributes the increase in asthma development to high levels of pollen and mold combined with polluted urban air masses caused by fossil fuels emitted from motor vehicles and industrial facilities.

Under-diagnosed Mental Illness Sweeps Nations

Ronald Kessler, PhD, a researcher at Harvard University Medical School, led a research project from 2001 to 2003, that studied the prevalence of mental disorders among people in varying nations. The countries included in the study were Belgium, China, Colombia, France, Germany, Italy, Japan, Lebanon, Mexico, the Netherlands, Nigeria, Spain, Ukraine, and the United States.

Kessler's cross-national comparison used face-to-face surveys conducted in the homes of 60,463 adults. The study, recently published in the *Journal of the American Medical Association*, concluded that, in more than half of the countries surveyed, more than 10% of the population are affected by mental illness.

Of the countries included in Kessler's study, Nigeria showed the least number (4.7%) of people with mental illness; however, researchers note that West Africans are less likely to confide in strangers due to violence and cultural concerns. The United States showed a very high rate of depression at 26.4%.

Common conditions found among all 14 countries were predominantly anxiety disorders, including panic attacks, phobias, and post-traumatic stress disorder. An exception was found in Ukraine, where depression topped the list. According to Kessler, the prevalence of mood disorders in Ukraine could be due to the struggle with westernization and rampant unemployment.

T. Bedirhan Ustun, MD, Kessler's colleague and researcher at the World Health Organization, believes that many people could have been untruthful on their surveys. According to Ustun, many countries have certain stigmas with mental illness, and they are reluctant to admit having a problem.

Ustun notes that, in the U.S., mental illness is highly publicized, and, therefore, people are more open about disclosing such disorders. Taking this into consideration, mental illness might not be that much higher in the U.S. than in other countries.

However, Kessler says that it is also possible that the U.S. population is under the pressure of higher expectations, thereby causing more anxiety issues.

The unwillingness to admit mental illness adds to the numbers of populations remaining untreated. In a 2003 research article by Kessler, published in *Health Affairs*, he reports that across all countries studied, young, poorly educated males are the least likely to be treated for serious mental disorders.

Lack of access to transportation, inadequate insurance coverage for mental health care, and doctors who fail to detect mental disorders, are also reasons for under-treatment, according to both researchers. Ustun iterates that "better health care systems and training" are imperative.

Light Therapy Used to Treat Depressed Pregnant Women

Depression during pregnancy and post-partum depression are common, but treating the condition can be challenging, according to Katherine L. Wisner, M.D., psychiatrist at the University of Pittsburgh School of Medicine. Particularly in pregnant women, the use of antidepressants can pose a risk, so Wisner and colleagues from Yale University and Columbia University are conducting a research study on the power of light therapy and its use to fight depression.

Light therapy provides a safe alternative to chemical treatments for depression, according to Wisner. "I've become absolutely excited about the possibility of showing that it's an effective treatment for depression in pregnancy and that we might spare many women medication treatments during pregnancy."

Thus far, patients who have reported using light therapy, have showed favorable results. One patient participating in Wisner's study reports that she noticed a difference in her moods in as little as three weeks of light therapy use.

The lights used for such therapy are special lights, and not just any type of light will work, according to Wisner. For best results, the patient must expose herself to the lights within 10 minutes of waking up in the morning, and the therapy is not recommended without the guidance of a doctor trained in light therapy administration.

For more information, or to enroll in the ongoing study, visit <http://www.pregnancylight.org/>.

Possible Explanation for Early Morning Heart Attacks

According to the American Heart Association (AHA), "a heart attack occurs when the blood supply to part of the heart muscle itself-the myocardium-is severely reduced or stopped." Most heart attacks and strokes occur in the early morning, and Mayo Clinic researchers have found a possible explanation for this occurrence.

Virend Somers, MD, PhD, a cardiologist at the Mayo Clinic and the leader of a study published in the June 1, 2004 issue of *Circulation: Journal of the American Heart Association*, reports that heart attacks and stroke are 30-50% more likely to occur in the early morning than later in the day. Somers and colleagues believe that a decrease in flexibility of blood vessels may be a key factor in the incidence of early morning heart attacks. The study recorded the blood vessel expansion in 30 healthy, non-smoking adults.

"The human body maintains a balance of blood pressure and blood flow by expanding or contracting blood vessels," says Somers. "Much of this expansion is directed by a layer of cells called the endothelium, which lines the blood vessels."

After taking measurements of blood vessel expansion caused by the endothelium in the 30 study participants, researchers found that endothelial function was reduced by more than 40% in the early morning, but by late morning, its function returned to normal.

While Somers and colleagues are not yet positive how these observations relate to people with cardiovascular disease, they have determined that reduced early morning function of the endothelium is a possible cause of attacks. Somers intends to continue this research.

Dental Anxiety, Dental Health Attitudes, and Bodily Symptoms as Correlates of Asthma Symptoms in Adult Dental Patients with Asthma

Linda Russell

Linda Russell, RDH, PhD, CHES, practices part-time clinical dental hygiene and is an independent researcher and a certified health education specialist.

Purpose. *The purpose of this study was to examine the relationship between asthma symptoms and dental anxiety, dental health attitudes, and physical symptoms and sensations such as watery eyes, upset stomach, headaches, and nausea in a group of adult dental patients with asthma. These variables are believed to be highly related to stress levels, which can exacerbate asthma symptoms during dental treatment.*

Methods. *Four self-report questionnaires and a demographic information form were completed by 60 adults with asthma in a waiting room of a private dental practice prior to receiving treatment. These instruments assessed dental anxiety, dental health attitudes, bodily symptoms, and asthma symptoms. Bivariate correlations were computed and tested for significance. They were followed by multiple regression analysis to analyze the relationship between the predictor variables-dental anxiety, dental health attitudes, and bodily symptoms, to the dependent variable-asthma symptoms.*

Results. *Pearson product correlations between the study variables revealed a statistically significant relationship between dental anxiety and bodily symptoms ($r = 0.23, p < 0.05$), and asthma symptoms and bodily symptoms ($r = .54, p < 0.01$).*

The analysis of variance indicated that the overall regression model ($R^2 = .30$) was statistically significant ($F(3, 56) = 7.92, p < 0.01$). Bodily symptoms was the only significant variable in the model.

Conclusion. *Dentists and dental hygienist should be attuned to adult patients who have asthma and exhibit signs of anxiety and/or other physical symptoms, or indicators of stress that can exacerbate asthma during or prior to dental treatment.*

Keywords: Dental anxiety, dental health attitudes, stress, asthma symptoms

Introduction

Undergoing dental treatment may create little anticipatory stress for some people; however, other individuals may inadvertently exacerbate existing chronic health conditions by becoming overly apprehensive prior to their appointments. Numerous theories have been postulated regarding anxiety and fear of dentistry, with a prominent one being previous unfavorable dental experiences.¹ Unfavorable past experiences are likely to affect a patient's dental health attitudes and, ultimately, their body's stress response to dental treatment. Being aware of anticipatory stress may aid the dentist and

dental hygienist in gaining a better understanding of the predisposing conditions that can be responsible for a susceptible patient's somatic response.

A variety of chronic health conditions can become medical risk factors if not properly managed. Not only are medical emergencies dangerous, but, at the very least, they may subsequently interfere with dental treatment.

Respiratory emergencies are among the most common problems encountered during oral healthcare treatment and can be the most devastating.² Such problems should be recognized as soon as they occur and treated promptly. Asthma, which has become more prevalent in the last few decades, is a condition in which anxiety can act as a precursor in the body's response to stress. Although the mechanism by which stress worsens asthma is not clear, stressful states have been found to precede asthmatic symptoms.³ If not managed properly, even mild cases of asthma can be life-threatening; therefore, all health care professionals should be attuned to an asthmatic patient's self-management programs and health status to prevent complications. The purpose of this study was to examine the relationship between asthma symptoms and three predictor variables-dental anxiety, dental health attitudes, and bodily symptoms-in a group of adult dental patients with asthma.

Review of Literature

The etiology, pathogenesis, and treatment of asthma has not been adequately addressed in recent dental literature.⁴ Dentists and dental hygienists should be sensitive to the health risks of patients in order to take necessary precautions and avoid emergent episodes [from occurring] during oral health care. Since many dental procedures are stressful, and because oral health care professionals operate in the oral cavity, the origin of the upper airway, patients with chronic respiratory diseases such as asthma are at special risk.⁵

In the last few decades, asthma has become a relatively common condition in both children and adults. The current status of asthma in the United States is paradoxical because, while the mortality rate of most other treatable diseases has declined, asthma fatalities have not.⁶ Asthma prevalence, morbidity, and mortality have increased all over the world, and more than 5,000 people die from asthma-related complications annually.⁷ In the U.S., asthma affects more than 15 million individuals, most of whom will require and seek dental treatment at some point in life.⁷ Interestingly, people with asthma have been noted as having a greater prevalence of tooth decay than their counterparts without asthma.⁸ In addition, certain oral conditions, such as reduced salivary flow, increased changes in oral mucosa, increased levels of gingivitis, and oral facial abnormalities, which are associated with asthma, may present oral health challenges in these individuals.⁹⁻¹³

Currently, there is no known cure for asthma, but, if addressed properly, it can be managed. The various types of asthma are classified by stimuli that incite asthmatic episodes; however, some classification systems divide the condition into two basic groups-extrinsic and intrinsic asthma.¹⁴ Extrinsic, also known as allergic asthma, is associated with a history of atopy and seasonal allergies, whereas intrinsic asthma is usually associated with specific triggers such as food preservatives, specific medications like aspirin, exercise, cold air, or stress.^{15,16}

The link between emotional stress and asthma exacerbation is not clearly understood, but there are several theories regarding the mechanism by which stress affects the disease. One theory regarding allergic asthma and stress postulates that, during a stressful incident, there is a reduction in serum cortisol concentrations, which has anti-inflammatory properties and thus, consequently, triggers asthma.³ Others have indicated that the psychopathophysiological mechanism that encompasses emotional arousal, such as anxiety in intrinsic asthma, involves the stimulation of the central nervous system through parasympathetic preganglionic efferent fibers to the tracheobronchial tree contained in the vagus nerve. Parasympathetic impulses produce smooth muscle contraction, glandular secretion, and vasodilation, reactions that are all associated with asthma.¹⁷

The dentist is ethically and legally responsible for any emergency situation that occurs in the dental office. All oral health care professionals should be knowledgeable in the prevention of medical emergencies and prepared to manage any

emergency that might occur while a patient is undergoing care. Even if a patient with asthma is asymptomatic, an asthmatic episode is a medical emergency that is likely to occur in a dental office.¹⁸ Therefore, oral health care professionals need to be aware of each patient's existing health status, medications, and anxiety levels prior to treatment.

Materials and Methods

Design

This research utilized a cross-sectional, pre-experimental design with a convenience sample of 60 adult dental patients with asthma. The dependent variable was asthma symptoms, and the independent variables were dental anxiety, dental health attitudes, and bodily symptoms. These measures were obtained from self-report questionnaires given to adult patients who came in for dental treatment at a private dental practice.

Sample

A convenience sample of 60 male and female adult dental patients between the ages of 18 and 81 [years old] was recruited for this study. All of the patients were previously diagnosed with bronchial asthma by their medical primary care physicians or allergist. All participants were recruited from a private family dental practice located near the University of Texas at Austin (UT). Adherence to federal and state regulations concerning the welfare of human subjects was maintained throughout the study. The participants' rights, privacy, health, and well-being were safeguarded through informed consent forms that they were asked to read and sign if they agreed to participate in the study. They were informed about the study by an announcement posted in the waiting room. Participants completed the surveys in the waiting room and were offered a fee discount for participating. Study data were collected within a twelve-month period.

Demographic Information Form

The demographic information form that accompanied the questionnaire consisted of seven questions related to the characteristics of the participants. The questions asked the participants' gender, age, marital status, and occupation, which included six categories ranging from unemployed to professional. Labor jobs were defined as on-the-job training jobs and included such jobs as construction work, dental assisting, or custodial work. Semi-skilled jobs were defined as jobs that required a specialty or trade school education, such as cosmetology or acting. Skilled jobs required a two- to four-year college degree. These included banking (loan officers) or computer programming. Professional jobs were defined as requiring a graduate or doctorate degree. College professors, medical doctors, dentists, lawyers, and engineers fell in this category. Occupational categories were derived from a local school district guide. Other demographic characteristics that were assessed included ethnic background, yearly income, and education levels.

Dental Anxiety Scale

The Dental Anxiety Scale (DAS), one of the most widely used instruments for measuring dental anxiety, was used for this study. The DAS is a short, pencil and paper instrument that contains four multiple-choice items dealing with a patient's subjective reactions about going to the dentist, waiting in the dentist's office for the procedure, and anticipation of drilling and scaling.¹⁹ Although other dental anxiety/fear scales were reviewed for this study, the DAS was the most feasible one for this research.^{20,21} Each question on the DAS had five alternative responses ranging in value from 1 to 5, with 1 representing the calmest choice and 5 the most anxious. The DAS scores could range from 4 to 20. A score of 4 is indicative of a dental patient who is calm, a dental patient with a score of 9 is considered moderately anxious, and a score of 13 or higher is reflective of a highly anxious dental patient. Previously reported psychometric properties support the validity and reliability of this scale with the internal consistency reliability estimated to be 0.86.¹⁹

Dental Health Attitude Scale

The Dental Health Attitude Scale (DHAS), a pencil and paper questionnaire, that consisted of 20 Likert-type statements and utilized a five-category rating scale for favorable and unfavorable statements that ranged from strongly agree to strongly disagree was used. The choices offered included: (1) strongly agree, (2) mildly agree, (3) undecided, (4) mildly disagree, and (5) strongly disagree. The favorable statements were scored: (1) strongly agree-5 points, (2) mildly agree-4 points, (3) undecided-3 points, (4) mildly disagree-2 points, and (5) strongly disagree-1 point. The unfavorable statements were scored: (1) strongly agree-1 point, (2) mildly agree-2 points, (3) undecided-3 points, (4) mildly disagree-4 points, and (5) strongly disagree-5 points. The DHAS included 10 favorable and 10 unfavorable statements. These statements were designed to obtain the patients' personal concepts about oral health. The DHAS scores were determined by summing all item values with a score of 100 representing the highest, 63 representing an average or medium score, and 24 representing the lowest. This scale, which has been used to assess dental health attitudes in other studies, possesses content validity that was established through a panel of judges.²² Previous research studies have reported the reliability coefficient to range from 70 to 78.^{22 23}

Pennnebaker Inventory of Limbic Languidness

Pennnebaker Inventory of Limbic Languidness (PILL) was a 54-item symptom inventory used to assess adults. This scale rated common symptoms or bodily sensations that most adults experience at one time or another. Construct validity studies have indicated that individuals who score high in comparison to others on this scale engage in more health-related behaviors, use aspirin more often, and show more autonomic changes in the laboratory setting.^{24,25} This scale tapped the frequency of occurrence of a large number of common physical symptoms and sensations ranging from watery eyes, to heartburn, abdominal pain, and sore throat. It was scaled along five points (from (a) 1 = have never experienced the symptom to (e) 5 = more than once every week.) This scale was scored by summing items 1-54, totaling the number of points for items C, D, or E (every month or so or more frequently). The total score, on the 54 items, could range from a low score of 0 to a maximum of 54. A score of 27 would be considered a moderate score. Internal consistency of the PILL has ranged from 0.88 (Cronbach's alpha) to 0.91.²⁴

Asthma Symptom Scale

The Asthma Symptom Scale is a scale developed to assess the incidence of respiratory symptoms in individuals with asthma.²⁵ Lung function measures were not feasible in this study, so this scale was chosen over others. It is specific and brief and possesses sound psychometric properties.²⁵ Participants were asked if they had experienced any asthma symptoms in the past seven days due to the possibility of anxiety exacerbating asthma or resulting from it.¹⁶ The symptoms examined in this scale included "coughing," "wheezing," "shortness of breath," "increased sputum," "thick sputum," "green or yellow sputum," and "decreased exercise tolerance." Participants who answered "yes" to questions were asked to describe the symptom as slight, moderate, or severe. Participants were also asked about the incidence of symptoms in the previous 24 hours. Scores of 0 were assigned to participants who did not experience symptoms, 2 to those experienced "moderate" symptoms, and 3 to those who experienced "severe" symptoms. An overall score was computed by summing the scores for each time period for the individual symptoms. Scores on this scale could range from a low of 0 to a high of 42. A score of 21 was indicative of someone with moderate asthma symptoms. Previously reported psychometric properties support the validity and reliability of this scale, with the internal consistency reliability estimated to be 0.85 and 0.84, respectively.²⁵

Data Analysis

Data analysis procedures included descriptive and multivariate statistical techniques. Descriptive statistics on all demographic variables were performed. Multivariate statistical techniques were utilized to assess the relationships between continuous variables. Multiple linear regression was used to study the relationship between asthma symptoms, treated as the dependent variable, and continuous data, the independent variables from the DAS, the DHAS, and PILL. Data were analyzed by using Statistical Package for Social Sciences (SPSS). A 0.05 significance level was set for this research.

Results

Analysis of the samples' demographic variables revealed that there were more females ($n = 40$, 67%) than males ($n = 20$, 33%) in the study. Fifty (83%) of the participants were Caucasian, three (5%) were African American, three (5%) were Hispanic, three were (5%) Asian American and one (2%) was of unspecified ethnic origin. Twenty-seven (45%) of the participants were married, 29 (48%) were single and never married, two (3%) were single and divorced, and one (2%) was single and widowed. Seventeen (28%) of the participants made less than \$20,000 a year, nine (15%) made \$20,000 to \$30,000 a year, nine (15%) made \$30,000 to \$40,000 a year, and 23 (38%) made more than \$50,000 a year. Seventeen (28%) of the participants had a grammar school education, nine (15%) had a high school education, nine (15%) had completed four years of college, and 23 (38%) had completed graduate school. The greatest number of participants were 23 years old (13%, $n = 8$), with ages ranging from 18 to 81 years. Thirty-three percent ($n = 20$) of the participants were not employed, 7% ($n = 4$) had on-the-job training occupations, and 18% ($n = 11$) were in semi-skilled occupations. Eight participants (13%) were skilled professionals, eight (13%) were semi-professionals, and eight (13%) were professionals. Table I presents the frequency distribution of participants according to sex, ethnicity, marital status, yearly income, education level, age, and occupation.

Table I: Frequency Distribution of Participants According to Gender, Ethnicity, Marital Status, Income, and Education Level (N = 58-60)

	N	%
Gender		
Female	40	67
Male	20	33
Ethnicity		
Caucasian	50	83
African-American	3	5
Hispanic	3	5
Asian-American	3	5
Other	1	2
Marital Status		
Married	27	45
Single, Never Married	29	48
Single, Divorced	2	3
Single, Widowed	1	2
Income*		
Under 20,000	17	28
20,000-30,000	9	15
30,000-40,000	9	15
Over 50,000	23	38
Education*		
Grammar School	17	28
High School	9	15
College	9	15
Graduate School	23	38
Age (Years)		
18	1	1.7
19	1	1.7
20	2	3.3
21	5	8.3
22	3	5.0
23	8	13.3
24	4	6.7
25	3	5.0
26	1	1.7
27	3	5.0
28	2	3.3
29	1	1.7
30	1	1.7
31	3	5.0
32	2	3.3
33	3	5.0
37	1	1.7
39	1	1.7
40	2	3.3
42	1	1.7
44	1	1.7
46	1	1.7
47	1	1.7
50	1	1.7
53	1	1.7
55	1	1.7
57	1	1.7
58	1	1.7
60	1	1.7
70	1	1.7
71	1	1.7
81	1	1.7
Occupation**		
Unemployed	20	33.3
On-the-job-training	4	6.7
Semi-skilled	11	18.3
Skilled	8	13.3
Semi-professional	8	13.3
Professional	8	13.3

*Two subjects did not answer this question
 **One subject did not answer this question

Variables' Group Mean Scores

Analysis of the groups' overall independent variables revealed mean scores ranging from 8 to 86. The group's dental anxiety scores ranged from 4 to 17 (*SD* = 3.23); dental health attitude scores ranged from 58 to 100 (*SD* = 8.52); and scores on

the PILL ranged from 0 to 44 ($SD = 9.87$). Asthma symptom scores ranged from 0 to 34 ($SD = 8.02$). Table II reveals the variables' group mean scores.

Table II Group Mean Scores for Variables (N = 60)

Variable	Mean	Std Dev	Minimum	Maximum	n
ASYMPTOM	7.95	8.02	.00	34.00	60
DAS	8.25	3.23	4.00	17.00	60
PILL	15.53	9.87	.00	44.00	60
DHAS	85.72	8.52	58.00	100.00	60

Note. ASYMPTOM = Asthma Symptoms; DAS = Dental Anxiety; PILL = Bodily Symptoms; DHAS = Dental Health Attitudes.

Inferential Statistics

The Pearson product correlations between the study variables revealed a statistically significant relationship between dental anxiety and bodily symptoms ($r = 0.23, p < 0.05$) and asthma symptoms and bodily symptoms ($r = 0.54, p < 0.01$). Table III depicts the Pearson correlations between the study variables.

Table III Pearson Correlations Between Study Variables (N = 60)

	DAS	ASYMPTOM	DHAS	PILL
DAS	1.00			
ASYMPTOM	0.06	1.00		
DHAS	-0.05	-0.05	1.00	
PILL	0.23**	0.54***	0.01	1.00

Note. DAS = Dental Anxiety; ASYMPTOM = Asthma Symptoms; DHAS = Dental Health Attitudes; PILL = Bodily Symptoms.

** $p < 0.05$ *** $p < 0.01$, one-tailed tests

A multiple regression analysis was conducted to evaluate the effects of dental anxiety, dental health attitudes, and bodily symptoms on asthma symptoms. Dental anxiety was correlated with bodily symptoms ($r = 0.23, p < 0.05$) and asthma symptoms was moderately correlated with bodily symptoms ($r = 0.54, p < 0.01$). None of the other variables were correlated with each other.

The low correlations between the four variables indicated that multicollinearity was not a problem among the predictor variables. To further ensure the stability of the prediction equation and to diagnose multicollinearity among the variables, the variance inflation factors for the predictors were examined. All factors were under 10; therefore, strong linear relationships among the predictors were not of concern.

The analysis of variance indicated that the overall regression model ($R^2 = 0.30$) was statistically significant ($F(3, 56) = 7.92, p < 0.01$). Bodily symptoms was the only significant variable in the model. Table IV presents the summary multiple regression statistics for the variables in the equation.

Table IV Variables in Multiple Regression Equation

Variable	B	SE B	Beta	T	VIF	T	Sig T
DAS	-0.18	0.29	-0.07	0.94	1.06	-0.635	0.53
DHAS	-0.06	0.11	-0.06	1.00	1.00	-0.55	0.58
PILL	0.45	0.09	0.56	0.94	1.05	4.82	0.00
(Constant)	7.41	9.53				0.78	0.44

Note. DAS = Dental Anxiety; DHAS = Dental Health Attitudes; PILL = Bodily Symptoms.

Discussion

Because this study was conducted in a dental practice located close to a major university, it was not unlikely that 23 year olds comprised 13% ($n = 8$) of the group and that there were more 23 year olds in the study than any other age. The fact that almost 30% ($n = 29$) of the participants were single and had never been married, and that at least 20 ($n = 33\%$) of the participants reported being unemployed, was probably, reflective of the fact that many of the participants were full-time college students.

The group's dental anxiety scores ranged from 4 to 17 ($M = 8.25$, $SD = 3.23$). Normative data suggests that private dental practice patients have the lowest mean values ($M = 6.40$, $SD = 2.80$), college students have moderate values ($M = 9.33$, $SD 3.17$), and dental phobics have the highest values ($M = 17.18$, $SD = 1.80$).¹⁹ Any score over 13 on the DAS is considered to indicate a highly anxious person. Only three participants (5%) scored low on the DAS, 50 (83%) had medium scores, and seven (12%) of the participants reported high DAS scores prior to their dental appointments. Nearly one-half ($n = 48$) scored under 13. Females had higher DAS scores, with a group mean score of 8.7 ($SD = 3.4$), and males had a group mean score of 7.3 ($SD = 2.3$). These findings replicate other studies that have found females to have higher dental anxiety scores than males.²⁶⁻²⁸ Some researchers attribute this gender-related finding to the belief that females experience emotions of greater intensity than men.²⁹⁻³¹

Dental Health Attitude Scale scores ranged from 58 to 100, with a group score mean of 86 ($SD = 8.5$). Only one participant (2%) scored below average on the DHAS. Fifty-seven (95%) of the participants in the study group scored above 69, which is considered above average, Two (3%) of the participants scored 100, which is considered a high score on the DHAS. Others have found group score means of 85.73 ($SD = 10.30$) in rural adult dental patients and group mean scores of 96.61 ($SD = 7.33$) in adult suburban dental patients, in addition to significant findings between education levels and dental health knowledge in these groups.²²

Bodily symptoms scores on the PILL ranged from 0 to 44, with a group mean score of 15.53 ($SD = 9.87$). Over one-half (65%, $n = 39$) of the participants reported a lower number of health-related behaviors, 12 participants (20%) had medium scores, and nine participants (15%) scored high on bodily symptoms on the PILL. There was a statistically significant relation between dental anxiety and bodily symptoms ($r = .23$, $p < 0.05$). Three questions on this scale were closely related to asthma symptoms. They inquired about asthma and wheezing, coughing, and troubled breathing. More than one-half of the participants ($n = 34$, 57%) reported having asthma and wheezing, 52% ($n = 31$) reported coughing, and 60% ($n = 36$) reported having trouble breathing every month or so, or more frequently. Subsequently, Pennebaker noted that anxiety may be a major constituent of the underlying persona of a typical symptom reporter.²⁴

Asthma symptoms scores ranged from 0 to 34, with a group mean score of 8. Forty-eight participants (80%) exhibited low asthma symptoms. Twelve (20%) reported medium scores, and only one (0.01%) had a high score on the Asthma Symptom Scale.

Results of the correlational and analysis of variance indicated that the overall multiple regression model ($R^2 = 30$) was statistically significant ($F(3, 56) = 7.92$, $p < 0.01$). However, the correlation between dental anxiety and bodily symptoms ($r = 0.23$, $p < 0.05$) indicated that some physical symptoms do accompany dental anxiety, in spite of the small number ($n = 7$, 12%) of participants who reported high dental anxiety scores. On the contrary, others have found anxiety not to be related to bodily symptoms.³² Because the dental anxiety levels in this group were within a normal range, it is possible that anxiety in these individuals did not reach the threshold to affect their asthma. Bodily symptoms was the only significant predictor of asthma symptoms ($r = 0.54$, $p < 0.01$). In light of the fact that asthma symptoms are related to bodily symptoms, oral health care professionals should become attuned to bodily signs and sensations exhibited by an asthmatic patient, as such signs could be critical factors in assessing impending asthma episodes. In this study, it is possible that bodily symptoms was a mediator between dental anxiety and asthma symptoms.

Despite the expectations that dental anxiety and dental health attitudes might be significantly correlated to asthma symptoms, this study's findings did not reveal such relationships between the aforementioned predictor variables and asthma symptoms. Some explanations may account for the study's findings. The patient population in this study may not have needed much current or past dental treatment, which could have influenced the outcome. In addition to small sample size, other limitations also should be acknowledged when generalizing findings of this group of participants to other groups, as many of the participants were single, Caucasian, female, and had attended graduate school. In addition, all findings were based on self-reported data, which increased the potential for respondent bias. Future studies should assess the same variables with larger and more diverse samples. Similar measures as the ones in this study should also be assessed and broken down into high, medium, and low asthma symptom scores and correlated with dental anxiety and dental health attitude scores in order to determine any possible trends that could support future studies. Future studies also should consider assessing asthma severity and frequency of asthma symptoms in order to better prepare oral health care professionals to treat patients with asthma. Because of the growing national prevalence of bronchial asthma and because dentists and dental hygienists are in an ideal position to inform asthmatic patients about their oral health status, more studies regarding oral health, caries prevalence, and asthma medication side-effects that affect the oral cavity should be conducted.^{6,7}

Conclusion

It is not uncommon to experience some level of anxiety when seeking dental treatment. Consequently, the bivariate correlations indicated a slight statistically significant relationship between dental anxiety and bodily symptoms ($r = 0.23$, $p < 0.05$). Not only does dental anxiety interfere with regular dental exams by possibly increasing the number of restorative procedures that go undetected and posing management problems for the oral health care staff, it also may activate underlying physiological activity and trigger certain bodily symptoms, which can interfere with treatment. Oral health care professionals should take the necessary steps to ameliorate stress levels in anxious patients, especially those with asthma. Being more tactful and empathetic with the patient and thoroughly explaining each procedure using the appropriate terminology could help put the patient more at ease.

Because bodily symptoms were moderately correlated with asthma symptoms ($r = 0.54$, $p < 0.01$), it is possible that participants who were experiencing certain bodily symptoms were more attuned to asthma symptoms prior to their dental appointments. Pennebaker noted that high symptom reporters tend to have a more prevalent trait of public self-consciousness.²⁴ However, because asthma can become a life-threatening condition in a matter of minutes if not properly managed, it should not be taken lightly if a patient with asthma reports respiratory problems. Subsequently, bodily symptoms was the only significant predictor of asthma symptoms in the multiple regression model ($r = 0.54$, $p < 0.01$), with the analysis of variance results indicating that the overall model ($R^2 = 30$) was statistically significant ($F(3, 56) = 7.92$, $p < 0.01$). In light of this, this study highlights the importance of understanding asthma's role in the manifestation of various bodily symptoms that asthmatic patients can exhibit prior to dental treatment. Because more than one-half of the participants reported frequent coughing, wheezing, or difficulty breathing several days prior to their dental appointments, using short-acting asthma inhalers before and/or during oral health care appointments should be recommended in order to alleviate asthma symptoms.

Every dental office should be equipped with medical emergency kits containing medications such as epinephrine and albuterol. The dentist and the dental hygienist should always take sufficient time to evaluate the patient's health history,

medications being taken, and any previous asthma emergencies. Any medical risk factors involved should be determined, including determining if the patient is emotionally stable to undergo treatment. Certain vital signs that are closely related to asthma symptom onset, such as a rapid respiratory rate (20-45 breaths per minute), tachycardia (100-150 beats per minute), or a fall in the systolic blood pressure (greater than 15 mm/Hg), should be monitored and mitigated whenever possible.³³ If extreme anxiety, which has been noted as being the most common psychological cause of asthma, is a factor, premedicating the patient should be considered.³⁴ If the patient has moderate to persistent or severe to persistent asthma, general anesthetic should not be administered due to possible decreased lung function. In this case, a hospital setting is the most feasible place to provide treatment that requires general anesthesia.³⁵

Allergens are another potential source of asthma triggers. Latex gloves may pose threats to lung function in asthmatic patients; therefore, inquiries should always be made about possible allergies to latex so that non-latex gloves may be substituted. Another postulated theory that has been considered in decreased lung function in asthmatic dental patients is the colonization of numerous species of bacteria in dental equipment waterlines.

In-depth discussion regarding the various methods to address this issue is beyond the scope of this article, but the possibility of underlying waterline contamination should be recognized, investigated, and eliminated if present.

This study found that bodily symptoms were predictors of asthma symptoms in adult patients prior to dental treatment. These results suggest heightened awareness among dentists and dental hygienists when treating asthmatic dental patients, as there are a variety of extrinsic and intrinsic factors that can trigger an asthma emergency. Because asthma is such a multifocal disease that may be triggered by various physical and/or psychological elements, oral health care professionals should be able to effectively identify patients who are at risk of having an asthma episode in the dental office. Some general principles in the prevention and management of asthma emergencies should be applied, especially when treating patients with tenuous health conditions which can be fatal if not evaluated and managed properly.

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Notes

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Practice Trends of Dental Hygiene Students Completing Specialty Tracks

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Purpose: *The purpose of this research was to determine the practice trends of dental hygiene baccalaureate degree recipients who participated in a specialty track.*

Methods: *A survey was developed, pilot tested, revised, and mailed to a sample of 265 dental hygienists who graduated from the baccalaureate degree dental hygiene program at University of North Carolina (UNC)-Chapel Hill School of Dentistry between 1987 and 1998. Analysis included descriptive statistics, a non-parametric analysis of variance for the ordinal-scaled responses, and a chi-square to compare nominal responses.*

Results: *Survey responses along with telephone interviews yielded a response rate of 68% (n=181). Seventy percent of the respondents had been practicing dental hygiene for six or more years. Ninety-six percent had worked in general private dental practice, 29% in a periodontal dental practice, and 18% in a pediatric dental setting. The top three specialty tracks completed were hospital dentistry (24%), periodontology (20%), and pediatric dentistry (19%). Fifty-six percent of respondents would like to obtain a specialty track position if given the opportunity. Forty-four percent (n=16) of those who experienced the periodontal specialty track have worked in a periodontal setting, and 36% (n=12) of those who participated in the pediatric specialty track have worked in a pediatric office. Eighty-eight percent agreed or strongly agreed that the specialty track was an important part of their dental hygiene education.*

Conclusion: *The results imply that the specialty track is a positive learning experience for students and should be continued. Data from this survey has implications to other dental hygiene programs offering or planning to offer specialty tracks.*

Keywords: Dental hygiene education, specialization, practice trends

Introduction

The United States population is greatly diverse in culture, race, and ethnicity. This diversity leads to many patients with specialized oral health care needs. The *Healthy People 2010* report verifies that there is an increasing need for clinicians who can work with specialized populations.¹ Many oral health care problems are found in specific population groups. For example, dental caries is prominent in children, with 75% of adolescents having experienced dental decay.¹ The Surgeon General's report on oral health iterates the importance of health care workers providing care to a variety of groups of the

United States population. The report also suggests that curriculum changes and multidisciplinary training may be needed to better prepare health care providers for practice.² Dental hygienists may be better prepared to work with specialized patient populations by completing specialty tracks in dental hygiene education programs.

Within the guidelines of the Commission on Dental Accreditation (CODA), basic dental hygiene curricula are uniform and consistent. In addition to the basics, the University of North Carolina at Chapel Hill (UNC-Chapel Hill) School of Dentistry (SOD) dental hygiene program offers a specialty track program for baccalaureate degree dental hygiene students. The specialty track introduces students to various dental hygiene specialties through extra didactic studies and extramural rotations.

Each student may select one of the following dental hygiene specialty areas: pediatric dentistry, dental public health, hospital dentistry, research/oral biology, periodontology, or gerontology. The number of students allowed in each track is limited; therefore, not all students participate in their first choices of tracks. The students enroll in a five credit hour course during the final semester of the program. The faculty member responsible for each specialty organizes the didactic component, which includes guest lecturers, and activities that are specific to the specialty area. Students participate in these classes each week until clinical rotations begin. Clinical rotations consist of a three-week, full-time experience in a dental hygiene environment specific to the specialty track. Some of the rotation sites are hospital dental clinics, pediatric dental practices, periodontal dental practices, and clinics in local and state health departments. The students participate in 60% clinical and 40% non-clinical activities at the site during the three-week rotation. Some examples of non-clinical activities include attending administrative meetings, observing dental procedures, and community service projects. The research track students conduct a small research project under the supervision of a professor. Students must choose a topic relating to their specialties and complete a literature review paper. The goals of specialty tracks in the UNC-Chapel Hill dental hygiene curriculum are to introduce students to specialty dental hygiene career options and potentially influence or enhance their career choices.

In 1983, Rigolizzo, et al, reported that there were no data available on the implementation of specialty tracks in baccalaureate degree dental hygiene programs.⁴ A recent review of the literature revealed no published studies. There are no data to show practicing trends in graduates who completed a specialty track. These data may help other dental hygiene programs by providing specialty track information that currently does not exist. Results will also provide other dental hygiene programs with data to utilize when considering the inclusion or revision of specialty track systems.

The purpose of the current study was to determine the practice trends of graduates from a baccalaureate degree dental hygiene program who participated in a specialty track.

Review of the Literature

The increased number of inhabitants and highly diversified groups in the United States population require new and specialized skills in the oral health field. The continuous growth of oral health needs may make it necessary for oral health care providers to have advanced education in special areas. In order to provide students with experience in dental specialty areas, dental hygiene curricula must adapt to meet evolving needs. The Surgeon General's report on oral health suggests that curriculum and multidisciplinary changes are necessary to better prepare health care providers.² Continued education that includes nontraditional classes and extramural rotations in addition to standard dental hygiene education is needed.³

To provide students with a more diversified and broadened education, dental hygiene programs may offer specialty tracks. The initial design of the specialty tracks in dental hygiene programs were to provide students advanced education that would allow for alternative career roles.⁴ The UNC-Chapel Hill SOD dental hygiene program housed the first documented specialty track in a dental hygiene curriculum.⁵ This dental hygiene program initiated specialty courses to better prepare dental hygiene students for professional challenges and changes. Goals included educating students to meet workforce demands in the state and in surrounding areas, guiding students in preparing for alternative career options, and helping change the oral health care delivery systems.

Specialty practice areas for allied health disciplines play a dominant role in health care. Specialized areas in nursing have existed since the early days of the professional nurse.⁶ Specialty nursing practice began because of the increased knowledge and skills needed in patient care. Nursing specialty training has continued to emerge to meet health care needs and is leading the way for other allied health care fields. Most undergraduate registered nursing programs include rotations such as obstetrics, pediatrics, and geriatrics to provide nursing students with a broad overview of specialty education and practice.⁷

Public health was the first area of specialization in dental hygiene. When Alfred E. Fones founded the first dental hygiene school in 1913, he realized there was a need for "auxiliary personnel to assist the dental profession in educating the public about proper dental health practices in order to maintain children's mouths in a state of cleanliness and good oral health."⁸ While dental hygiene has been an integral part of public health over the years, it has been projected that the need for public health dental hygienists will increase as the health care system changes.⁹ There are additional specialized responsibilities and duties in public health beyond career entry-level education. Therefore, it has been suggested that public health dental hygienists have at least residency-type training.⁹

Pediatric dental hygienists are required to work with children and diseases specific to that population. Although dental hygienists are not required to complete advanced education for working with pediatric patients, there may be significant benefits to having prior training because specific diseases and birth defects affect children's oral health.²

Geriatric oral health care is an area that is growing in importance for dental hygienists. It is estimated that 23% of 65 to 74 year-olds have severe periodontal disease and 30% of adults over 65 are edentulous.² Over the past 20 years, there has been a continuing increase in the number of older adults in the United States who are retaining their natural dentition.² Dental hygienists may benefit from additional education and training in caring for elderly patients. A study in 1996 surveyed dental hygiene program directors to assess geriatric education in dental hygiene curricula.¹⁰ Results showed that 89% of the responding programs had a didactic geriatric component and 54.2% included a clinical component. The didactic portion was shown to be lacking with only 18.8% having specific geriatric courses and 81.2% presenting the geriatric curriculum as a part of other courses. Dental hygiene faculty members were responsible for presenting the information, with 77.8% relying on general dental hygiene textbooks. The average clinical time providing geriatric care was 27.7 hours, and 49.5% of the respondents felt that the geriatric curriculum in their program was less than in the past. Aspects such as the clinical needs of geriatric patients, pharmacological considerations, cognitive functions in the elderly, geriatric oncology, disorders arising from old age, functional psychiatric disorders, learned helplessness, communication, nutritional needs, and stereotypes of aging must be included in educational programs to understand the population. These needs may not be included in the professional entry level dental hygiene curricula.^{2,11}

Dental departments in hospital settings have increased in number and patient demand, offering new challenges for dental hygienists.¹² Hospital dental hygienists have responsibilities that include patient care, instructing and directing staff, organizing student internships, scheduling doctors, and developing treatment guidelines for patients with infectious diseases.¹³ A study published in 1990 surveyed hospital dental clinics to assess the status of dental hygienists practicing in the clinics. Out of the 1,755 hospitals that responded, 33.9% (n= 594) stated that they had a separate dental department within the hospital that employed at least one dental hygienist.¹² The study revealed that dental hygienists were employed in the hospital clinics to contribute to delivery of care, patient population treatment needs, teaching and research projects, and cost-effectiveness of treatment.

Specialty practice is more than adaptation to a new environment; it involves learning about the clinician's patients in order to give the best, most knowledgeable care. Through specialty educational tracks, students learn about caring for specific populations, different ways to promote oral care, and independence through clinical rotations. Active learning is facilitated by students gaining knowledge and experience through diverse clinical rotations outside the college setting. Students must also learn how to obtain and critique published research reports in the process of writing a literature review paper. These activities facilitate students' development as critical thinkers by presenting them with challenging environments and experiences beyond the basic curriculum.¹⁴ Developers of a specialty-nursing program in Australia suggest that formal

specialty education must be created using the basic curriculum that includes aspects for building life-long learning skills.¹⁵ Including activities inside and outside the classroom, creating challenging goals for students, and providing feedback are all shown to teach students to become critical thinkers.¹⁴ The specialty track has the potential for utilizing all of these tools to produce graduates who are life-long learners.

Previous studies in dental hygiene show that a vast majority of clinicians work in private practice.¹⁶⁻¹⁸ The American Dental Hygienists' Association (ADHA) conducted a national membership census survey in 2001. Results showed that 83% of respondents worked in private clinical practice as their primary employment setting, 6% in a college or university setting, 3% in business, 2% in dental specialty practice, and 1% in government.¹⁷ In 1991, the ADHA conducted a survey assessing the retention of dental hygienists in the workforce. Eighty-eight percent of the dental hygienists who responded were currently employed.¹⁸ Ninety-two percent were employed by a dentist in a private dental practice, 1.7% in a governmental agency, 2.3% in an educational institution, and 4.3 % reported other work environments.¹⁸

In 1984, the ADHA published results of a dental health initiative that aimed to provide suggestions for better access to dental care for populations with special needs. Recommendations based on initiative results included developing a practice model for dental hygienists to provide oral health care to special populations, increasing utilization of dental hygienists in federal health care programs, creating new guidelines for the dental hygiene curriculum to prepare dental hygienists to provide primary preventive services, and research into finding more effective ways to use dental hygienists to deliver preventive oral health care.¹⁹

Specializations in health care careers are highly utilized in order to provide patients the most effective care. Because there are no studies analyzing specialty tracks in dental hygiene education, there are no existing data regarding the number of programs that include specialty tracks in the undergraduate curricula. There also are no published studies reporting results of research or the outcomes of offering specialty tracks to dental hygiene students. There is a need to know whether or not providing specialty tracks in undergraduate dental hygiene for future dental hygienists. This study assessed a current specialty track program and determined the outcomes. Results of this study may assist other dental hygiene programs in evaluating their current policies and deciding if integrating specialty tracks into their curricula would result in better preparing students for alternative career roles in dental hygiene.

Methods and Materials

In June 2002, dental hygienists, who graduated between 1987 and 1998 (n=265) from the baccalaureate degree dental hygiene program at UNC-Chapel Hill, were surveyed using a mailed questionnaire. The questionnaire was specifically designed to evaluate the specialty track aspect of the curriculum. Prior to the mailing, a convenience sample of four dental hygiene professors at UNC-Chapel Hill and six UNC-Chapel Hill dental hygiene alumni pilot tested the survey instrument. The recommendations from the pilot test were reviewed, and the survey instrument was completed with necessary revisions.

Stamped, pre-addressed survey packets were mailed, including a cover letter explaining the purpose of the research study and the importance of participation. Identification numbers were placed on the individual questionnaires to ensure subject confidentiality while permitting a second mailing to non-respondents to the first mailing. Subjects were asked to return the completed questionnaires three weeks after it was mailed. Telephone calls were made to non-respondents to the two mailings of the survey. Participants were surveyed by telephone. The telephone interviews were included in the research design because the mail response rate was lower than desired.

The survey questionnaire contained three sections: Section I- Demographics; Section II- Specialty tracks at UNC-Chapel Hill SOD; Section III- Future of specialty tracks.

The types of questions included: demographic questions; closed-ended questions to assess specialty tracks at UNC-Chapel Hill SOD including career opportunities, career selection, and satisfaction levels; and open-ended items to determine the future educational recommendations for the specialty track systems at UNC-Chapel Hill.

Data from the completed questionnaires were entered into an Excel database. The data were transferred to SAS for Windows for complete analysis. Responses were compiled using descriptive statistics. A non-parametric analysis of variance was used for the ordinal-scaled responses. For nominal responses, specialty tracks were compared using chi-square analysis.

The UNC-Chapel Hill Institutional Review Board, Human Subjects committee, reviewed and approved the research project. There was no consent form because consent was assumed when participants completed and returned the survey.

Results

Surveys were received from 181 (n=265) respondents after two complete mailings and telephone calls to non-respondents for a response rate of 68%. One hundred fifty-nine responses (60%) were from mailed surveys and 22 responses (8%) were telephone interviews. The statistical analysis revealed no significant differences between the responses from telephone interviews and mailed surveys. Table I displays the distribution of graduation dates for the respondents. All of the respondents (n=181) were female. The sample included four males, none of whom responded. Thirteen (7%) of the respondents were in the baccalaureate degree completion program. Five percent of the respondents had a master's degree, and 8% had completed dental school. Forty-five percent (n=82) of the respondents had worked as a dental hygienist for at least nine years. The distribution of the remaining 55% is as follows: 0-2 years, 9%; 3-5 years, 21%; 6-8 years, 25%.

TABLE I Year of Graduation from Baccalaureate Degree Dental Hygiene Program

Year of Graduation	Percent	N
1987	6%	11
1988	11%	20
1989	7%	12
1990	7%	13
1991	7%	13
1992	5%	9
1993	8%	14
1994	9%	16
1995	9%	16
1996	9%	17
1997	11%	20
1998	11%	20
Total	100%	181

When asked about work setting, 96% reported having worked in a general private dental practice, 29% in a periodontal dental practice, and 18% in a pediatric dental practice (Table II). Thirteen percent of the respondents stated that they had worked in "other" office environments, including prosthodontics, dental hygiene education, prison dental clinics, and dental software company.

TABLE II Respondents' Past and Present Office Setting

Office Environment	Percent	N
General Private Dental Practice	96%	174
Dental Public Health	14%	25
Pediatric Dental Practice	18%	33
Periodontal Dental Practice	29%	53
Geriatric Dental Practice	4%	8
Dental Research	4%	7
Hospital Dentistry	7%	13
Other	13%	23

The specialty tracks most experienced by respondents were hospital dentistry, periodontology, and pediatric dentistry. Table III shows the distribution of specialty track experience by respondents. Eighty-eight percent were assigned to their requested specialty track, 10% were assigned to their second or third choice, and 2% could not remember. Of those who experienced the specialty track they requested (n=158), 92% agreed or strongly agreed that the specialty track was an important part of dental hygiene education. Conversely, 70% of those who did not get the specialty track they requested (n=17) agreed or strongly agreed that the specialty track was an important part of the dental hygiene education. No statistically significant differences existed between the responses from individuals who experienced the first choice of specialty track and those who did not receive their first choice.

TABLE III Specialty Track Participated in While in Baccalaureate Degree Program

Specialty Track	Percent	N
Pediatric Dentistry	19%	35
Dental Public Health	17%	31
Hospital Dentistry	24%	42
Research/Oral Biology	3%	6
Periodontology	20%	36
Gerontology	17%	31

Table IV lists questions and responses related to specialty track satisfaction. Eighty-eight percent of respondents agreed that the specialty track was an important part of their dental hygiene education. Eighty percent stated that the specialty track provided important content that has been valuable in their dental hygiene career. Although 90% agreed that the specialty track should be continued, only 10% stated that the ability to participate in a specialty track program factored into their reason for attending the UNC-Chapel Hill baccalaureate degree program. Thirteen percent agreed that the specialty track prepared them for alternative careers and also felt that it prepared them for general clinical dental hygiene practice.

TABLE V Specialty Area Participation in Dental Hygiene Program Compared to Employment in Specialty Area

Specialty Track Experience in Dental Hygiene Program	Specialty Area Employment	
	Percent	N
Pediatric Dentistry	36%	12
Dental Public Health	19%	6
Hospital Dentistry	14%	6
Research	50%	3
Periodontology	44%	16
Gerontology	13%	4

Respondents with education beyond a baccalaureate dental hygiene degree (N= 23) had a high percentage of work experience in alternative settings. For respondents that earned master's degrees (N=9), six reported working in a periodontal practice at some point, two in public health, and two in a pediatric dental setting. For respondents who earned a DDS/DMD (N=14), five reported ever having worked in public health, five in a periodontal practice, and two had worked in a pediatric dental practice.

Fifty-six percent of respondents stated that they would like to work in a specialty track position if given the opportunity. Respondents were asked an open-ended question regarding the reason for not working in the specialty area. Table VI gives narratives from responses to this question from selected surveys. An open-ended question asked respondents to include suggestions for adding specialties offered in the specialty track program at UNC-Chapel Hill. Table VII shows some of the ideas for additional specialty offerings.

TABLE VI. Respondents' Reasons for Not Working in a Specialty Area

Availability	<p>"Availability is limited."</p> <p>"I found that there are very few opportunities in hospital dentistry and the salary is much lower than private practice."</p>
Prefers General Practice Setting	<p>"I have found that I enjoy working with all age patients. By working in a general dentistry office I can maintain the skills learned in my perio track as well as work with children. I do feel that of all the tracks offered perio helped me most clinically."</p> <p>"I enjoy general dentistry because I continuously see something different everyday I work."</p> <p>"Initially, it was due to the fact that there were not public health openings available in my area. Now, I would not pursue a public health position due to the fact that I enjoy a part-time position in a general dentistry practice."</p>
Other	<p>"I received my DDS degree in 1997 and have been in public health dentistry since graduation. I only treat children and feel the specialty track was very beneficial in preparing me for the population I work with."</p>

TABLE VII. Respondents' Suggestions for Additional Specialties Offered

Prosthodontics	“Prosthodontics is an important area to know about, including implants. I've also found that my expertise was limited in crown and bridgework. Having more real life experiences related to these areas would be beneficial.”
Product Sales	“Dental product knowledge, research, or sales. General health, nutrition, specialized health for women, pregnant women, compromised health patients, i.e. cancer.” “I would like a track in dental hygiene product sales with Hu-Friedy, Oral-B, etc.”
Orthodontics	“I feel an orthodontic specialty track would be very useful in a general dental practice for hygienists. At the time I attended UNC, the hygiene program offered very little information regarding orthodontics.”
Cosmetic Dentistry	“ I hope the dental school progresses toward teaching more esthetic (cosmetic) dentistry, this area may be appropriate for a track experience.”

Finally, the survey included an open-ended question asking for suggested modifications to the specialty tracks in undergraduate dental hygiene education to more appropriately prepare graduates for the future. Sixty-five respondents completed this section of the questionnaire. Thirty-two percent (n=21) responded with the common theme of allowing students to experience more than one specialty track. Other suggestions included lengthening rotations and adding more clinical experience during internships.

Discussion

This survey was created in an attempt to find out if there is a relationship between baccalaureate degree dental hygiene students who complete undergraduate specialty tracks and their choice of working environment. Comparing the results with a control group who did not complete a specialty track would have been ideal for this research project. However, funding and time did not permit this comparison. Therefore, the results must be assessed by frequencies and comparisons to past studies indicating the locations and trends of working dental hygienists. While a larger response rate was anticipated, the response rate of 68% is sufficient to assess attitudes and opinions about the specialty track, and to try to evaluate working trends within the group. The response rate was lower due to individuals moving without notifying the alumni association of their new addresses, low interest in participation in the study, or inability to recall the specialty track in their dental hygiene curricula.

The gender response of 100% female is not the optimal sample to show true representation of the population. In the sample, there were four males; all were unresponsive to first and second mailings and phone calls. However, the response is similar to the gender distribution in the 2001 ADHA National Membership Census Survey, where 99.2% of the respondents were women.¹⁷

In assessing the work settings as reported by respondents, it is important to note outside factors that may have influenced the outcome. For example, 13% of the respondents have furthered their education by earning master's degrees or completing dental school. These individuals may no longer be practicing dental hygiene. Also, there are respondents to the survey who are no longer working in dental hygiene for other reasons such as pursuing different careers or for family reasons. The fact that a percentage of the sample no longer works in dental hygiene, may limit the number of individuals practicing in alternative specialty settings.

Trends in dental hygiene practice show that a vast majority of clinicians work in private practice.¹⁶⁻¹⁸ The 2001 ADHA National Membership Census report showed 83% of respondents worked in private clinical practice as their primary employment setting, 6% in a college or university setting, 3% in business, 1% in government, and 2% in specialty practice.¹⁷ The 1991 ADHA study reported only 4.3% as ever working in office environments other than a general dental practice, whereas results from this sample show that 29% reported working in a periodontal dental practice, 18% in pediatric dental practice, 14% public health, 13% other dental hygiene environments, 7% in hospital dentistry, 4% geriatric dentistry, and 4% in dental research.¹⁸ In comparison with the 1991 ADHA study and 2001 ADHA report, there was a stronger trend for the UNC specialty track graduates to have worked in a setting other than a general dental practice. Even though 96% of the specialty track graduates had worked in general private dental practice, many had explored other aspects of dental hygiene and had worked in specialty dental practice environments.

There was no correlation between the number of years employed in dental hygiene and the level of experience in different work environments. An assumption that more time in dental hygiene practice would produce more experience in alternative environments was not true in this sample.

The tendency for those who participated in a specialty track and sought work in that field may have been influenced by the specialty track education. With 44% of respondents in periodontal practices and 36% of respondents in pediatric dental practices participating in those specific tracks, it is evident that individuals may have chosen an alternative dental hygiene environment because of specialty track experience.

Respondents included various reasons for not working in a specialty practice. Dental hygienists' employment depends on the dental practices in their vicinity, and specialty practices are not in abundance in all locations. In rural locations, there may not be opportunities other than general private dental practices. Respondents also noted that, many times, pay is significantly higher in general dental practice than in some specialty areas. For example, public health dental hygienists' salary is generally notably lower than that in private dental practice.²⁰ Having more responsibilities and additional stress from the job, yet with pay that does not reflect the increase in challenges may play a significant role in job decisions.²⁰

Although students did not feel the specialty track program was a reason to attend the UNC-Chapel Hill dental hygiene program, the responses and attitudes were positive. At least 70% agreed or strongly agreed that the specialty track was important, provided valuable dental hygiene content, and improved overall patient care. This demonstrates that graduates, regardless of practicing environment, feel the specialty track is an exceptional experience giving students innovative learning practices.

Students positively responded and expressed that the literature review project was an important aspect to their education. Sixty percent of the respondents agreed that the literature review enhanced their knowledge in the specialty area. The literature review assignment was designed to give students a more in-depth relationship with the information available in published research literature. Ironically, much educational research now shows the importance of combining dental hygiene education and research for evidence-based learning.¹⁴ Some dental hygiene educators believe that awareness of research and ability to critique and appraise literature are necessary objectives in all accredited dental hygiene education programs.¹⁴ Possessing the skills to critique published reports may aid dental hygienists in providing appropriate and timely patient care in all situations. Graduates between 1997 and 1998 had access to computer databases, such as Medline, to perform literature searches. This may have allowed students easier access to literature, giving them a more positive experience when researching topics.

Respondents included helpful and creative suggestions that may influence changes in current or new specialty track programs. Some suggestions for other specialty tracks included prosthodontics and orthodontics. The most common

modification suggested was the opportunity to participate in more than one specialty track. This would allow students a chance to explore more than one area that may interest them. If students were able to experience areas of specialization in undergraduate training, they may feel more confident to explore these areas after graduation.

This study would have been enhanced if a control group that had not participated in the specialty track was included. By not including a control group, it was difficult to compare this sample population with current trends nationally.

Conclusion

A large majority of the respondents (88%) felt that the specialty track curriculum was a beneficial and significant part of their dental hygiene education. Regardless of the outcome results' measurement of practice trends, results of this study show the program to be popular among graduates. The specialty track program is unique in the UNC-Chapel Hill dental hygiene curriculum in that it offers students various learning experiences and opportunities that they might not receive in other dental hygiene programs. Many extrinsic factors may influence the practice trends of dental hygienists. With such positive feedback in regards to the specialty track program, a track experience for students should be continued or included in the dental hygiene curriculum.

Additional studies need to be conducted with greater numbers of students and schools in order to verify if undergraduate specialty track experience positively correlates to dental hygienists working in alternative oral health care settings.

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Notes

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Barriers to Tobacco Cessation Counseling and Effectiveness of Training

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The oral health care appointment provides a unique opportunity for tobacco cessation counseling (TCC). This literature review examines the effectiveness of training oral health care professionals for TCC, including the barriers to providing counseling. Undergraduate education and continuing education are both effective methods for training health care professionals in TCC. Identifying barriers to TCC may enhance its effectiveness, and should be addressed in the American Dental Hygienists' Association's "Ask, Advise, Refer" initiative.

Keywords: tobacco cessation, counseling, tobacco cessation counseling barriers, smoking prevention

Introduction

In 1900, the annual consumption of cigarettes in the United States was 2.5 billion.¹ The estimate for annual consumption of cigarettes in the United States in 2001 was 422 billion.¹ The 2000 National Health Interview Survey concluded that in 2000, an estimated 46.5 million adults were current smokers.² According to Spangler and associates, although the prevalence of cigarette smoking has declined in the last two decades, the rate of decline is slowing.³ The decline rate at the current level is not sufficient to meet national health objectives for 2010.² Although smoking rates overall have dropped somewhat from 1999, 35.2% of senior high school students continued to smoke cigarettes in 2001.⁴ The senior high school student percentage of 35.2 was significantly higher than the adult smoker percentage of 23.5 in 1999.⁴

Although 70% of smokers report they would like to stop smoking and 34% attempt to quit each year, only 2.5% are successful.^{1,5} Efforts must be intensified to promote tobacco cessation and discourage initiation of smoking.¹

Gould, Eickhoff-Shemek, Stacy and Mecklenburg cite that the dental health care provider's role in tobacco use cessation is critical because more than 50% of current smokers visit a dentist at least once a year.⁶ According to recent research, patients expect oral health care providers to inquire about tobacco usage.⁷ On the American Dental Hygienists' Association (ADHA) website, Immediate Past President Tammi O. Byrd states "Oral health screenings provide a unique opportunity to give patients information that could save their lives and to place dental hygiene on the front line of smoking cessation intervention. The advice of a dental hygienist can be a major motivation for a quit attempt by a patient who smokes."⁸

Effectiveness of Tobacco Cessation Counseling Education

Literature regarding the effectiveness of training health care providers to provide TCC abounds.^{3,6-30} Silagy, Lancaster, Gray and Fowler report that programs designed to train health care providers in smoking cessation counseling were effective in increasing the number of patients who received counseling.⁹ They further assert that effective programs increase the number of quit dates set, self-help materials given, and nicotine replacement products prescribed.⁹ A search of the Cochrane Tobacco Addiction Group trials register concludes that training health care professionals to provide smoking cessation counseling favorably impacts professional performance.¹⁰ In this paper, studies examining the effectiveness of training health care providers will be organized into two categories: in-service (graduate and continuing education), and pre-service (undergraduate) settings.

Training Health Care Providers in Practice

Dolan, McGorray, Grinstead-Skigen and Mecklenburg surveyed 1,746 dentists and 723 dental hygienists regarding tobacco cessation activities.¹¹ These researchers found 14% of all dentists and 23% of all dental hygienists completed formal tobacco cessation training.¹¹ Oral health care providers with tobacco cessation training provided more tobacco use cessation services and advised more patients to stop using tobacco than those without training.¹¹

Gould, et al. surveyed health care providers in a National Cancer Institute (NCI) training program whose purpose was to teach participants to provide brief tobacco cessation services to patients.⁶ The authors found no significant change in advice given by participating health care providers as a result of training.⁶ Conversely, NCI training was found to significantly increase the number of health care providers undertaking efforts to assist patients with tobacco cessation.⁶ Additionally, health care providers, following NCI training, used more educational materials when providing TCC.⁶

Wood, Cecchini, Nathason and Hiroshige examined pre- and post- treatment survey scores of 293 dental professionals trained in TCC.¹² Training entailed a 90 minute on-site training session provided by a dentist and a tobacco cessation educator.¹² Following training, professionals who were trained in tobacco cessation counseling showed significant increases in asking patients about tobacco use, advising patients about stopping, recording tobacco use, using assessment forms, assisting patients to quit, providing self-help materials, and referring patients to cessation programs.¹²

Gordon and Severson¹³ compared the effectiveness of a workshop versus self-study materials in training dental hygienists regarding TCC. Authors found that dental hygienists who received training in either form were more likely to increase the extent of cessation advice and less likely to perceive barriers to counseling than dental hygienists without training.¹³ Furthermore, dental hygienists who attended the workshop training were more likely to increase the extent of their cessation advice than those who received the self-help materials.¹³

Velasquez, Hecht, et al. examined effectiveness of providing motivational interviewing tobacco cessation techniques to public health nurses and social work case managers.¹⁴ They concluded that health care providers with adequate time, practice, and communication skills more readily incorporated new tobacco cessation skills such as motivational interviewing into daily routines.¹⁴ Accordingly, the authors suggested there may be more cost effectiveness in training only health care providers who are interested in and, therefore, more likely to learn and apply the new TCC techniques.¹⁴

Training Health Care Students

Seim and Verhoye compared the smoking cessation counseling skills of fourth-year medical students trained in a 2.5 hour workshop with colleagues exposed to a brief five minute training session.¹⁵ Although neither group performed very well,

students with longer formal training were significantly more skilled in assisting patients with smoking cessation than were those trained in a brief session.¹⁵

Yip, Hay, et al. surveyed 244 fourth-year dental students assessing attitudes towards tobacco use counseling according to NCI guidelines.¹⁶ Authors found students who received formal training in smoking cessation provided more counseling than did students without formal training.¹⁶ Findings from this study revealed oral health care workers with tobacco cessation training and adequate preparation were more likely to adhere to NCI guidelines than those who were not.¹⁶

Hepburn, Johnson, Ward, and Longfield examined the effect of tobacco cessation training averaging 2.5 hours on practice habits of United States army general medical officers.¹⁷ Results indicated brief training did not significantly improve officers' scores on objective knowledge tests, but did improve certain practitioner habits involving assisting patients to quit.¹⁷ Hepburn and associates' finding of an increase in assisting patients after training was consistent with the results of Gould, et al.¹⁷

While examining the efficacy of resident tobacco cessation training, Cornuz, et al. found training significantly increased the overall quality of smoking cessation counseling.¹⁸ Increase in overall quality was evidenced by a higher mean score in the intervention group than the control group.¹⁸ Additionally, trained residents expressed higher self-confidence and self-perceived effectiveness in smoking cessation counseling than did non-trained residents.¹⁸

Gelskey used a chart audit to determine if a comprehensive, dental school based tobacco use cessation program increased the extent to which tobacco using patients received counseling from dental and dental hygiene students.¹⁹ Tobacco using patients were telephoned and surveyed about counseling they received from dental and dental hygiene students who had received training and who had not received training.¹⁹ This study revealed that students trained in a comprehensive tobacco use program provided more counseling than did students who were not trained.¹⁹

Factors that Influence Tobacco Cessation Counseling Activities

In 1996, Chambers and Corbin surveyed 340 dental hygienists about their TCC actions and found that 35% of the dental hygienists stated patient resistance as a significant barrier to TCC.²⁰ Twenty-nine percent of the dental hygienists felt inadequately trained to perform TCC.²⁰ Lack of time was cited by 26% of the dental hygienists as a barrier to TCC.²⁰ Additional barriers to TCC included resistance by staff, inadequate knowledge of referral sources, and tobacco using employers.²⁰

Dolan, McGorray, Grinstead-Skigen and Mecklenburg surveyed 1,746 dentists and 723 dental hygienists regarding TCC activities.²¹ In addition to counseling activities, perceived barriers to TCC were collected from participants randomly assigned the long survey or telephone interview. Approximately one-half of the dentists randomly assigned the long survey or telephone interview indicated no barriers to TCC. Among dentists perceiving barriers, 22% indicated lack of reimbursement as a strong barrier, while 27% cited the same barrier as being moderate. Eighteen percent perceived the barrier of not knowing where to send patients for counseling as strong, while 33% perceived such to be somewhat of a barrier. As compared with higher percentages found by Chambers and Corbin, merely 11% of dentists cited the lack of time as a strong barrier to TCC; however, 35% stated this was somewhat of a barrier.

Bobo, Anderson, and Bowman tested the effectiveness of a half-day tobacco cessation counseling training workshop for chemical dependency staff.²² Authors concluded heavy case loads limit the amount of time for TCC. In addition, lack of confidence in ability, and lack of reimbursement from insurance companies were identified as barriers to TCC.

Russos and associates assessed oral health care providers' compliance with providing tobacco cessation counseling to adolescent patients in orthodontic offices after 1.5 hours of training.²³ They discovered negative feedback from patients, lack of staff modeling and the lack of a formal office tracking system may adversely influence counseling behavior.²³

Six months after family physicians attended a two-hour TCC workshop, Richmond, Mendelsohn, and Kehoe examined their TCC actions.²⁴ Authors found that 54% of the physicians cited lack of time was a significant barrier to TCC. Similar to findings presented by Russos and associates, Richmond and associates found that 23% of physicians cited negative feedback from patients as a significant barrier to TCC. Fourteen percent of the physicians cited lack of confidence to perform smoking cessation counseling as a significant barrier.

Gould, Eickhoff-Shemek, Stacy, and Mecklenburg surveyed 69 oral health care providers regarding TCC activities three months after NCI training.⁶ While the level of confidence to help smokers quit statistically increased from the training, 32% of the dental team still perceived patient resistance as a barrier to providing TCC.⁶ Approximately 25% of the providers cited lack of time, lack of financial reimbursement and lack of knowledge regarding referrals as being significant barriers to providing TCC.

Skegg examined the smoking cessation attitudes and counseling activities of dentists and dental hygienists for one year following a training program.²⁵ In a sample of 27 dentists and dental hygienists; 20 commented on perceived barriers to smoking cessation counseling. Seven identified lack of time as a barrier, five cited the fear of offending patients, two stated they believe clinical dentistry is more important, and two identified the lack of reimbursement for services as a barrier.

Block, Block, Hutton, and Johnson compared the tobacco counseling actions of dentists to those of allied health care providers in the upper midwest.²⁶ Fifty percent of the 154 dentists surveyed did not perceive any barriers to TCC. This percentage concurs with the previous findings of Richmond and associates.²⁴ Lack of sufficient patient education materials was cited by 60.4% of dentists as a barrier to tobacco cessation education.²⁶ Authors found 35.1% of dentists believed lack of time to be a significant barrier to counseling.²⁶ Twenty-two percent of dentists acknowledged lack of financial reimbursement for tobacco cessation counseling as a barrier to implementation.²⁶

Cooke, Mattick, and Campbell investigated factors influencing adoption of 'Fresh Start', a smoking cessation program, by staff in prenatal clinics.²⁷ Twenty-three prenatal clinics were targeted by trained midwives for implementation of the 'Fresh Start' smoking cessation program. Twelve of 23 prenatal clinics identified negative attitudes of the smoker as a barrier to program implementation. Lack of time was noted by eleven prenatal clinics, and nine cited they did not believe smoking cessation among patients to be integral to their medical role. Eight prenatal clinics cited lack of follow-up as negatively impacting adoption of the program. Seven clinics identified staff turnover and negative attitudes among staff to be significant barriers to smoking cessation counseling. Fewer than five prenatal clinics identified access and storage of materials, inadequate training, and cost of training as negatively influencing decisions to adopt the 'Fresh Start' program.

Yip, Hay, Ostroff, Stewart, and Cruz surveyed 244 fourth-year dental students regarding attitudes toward smoking cessation counseling.²⁸ Authors concluded more than 60% of respondents endorsed the following as barriers to providing TCC: lack of time, lack of adequate reimbursement, lack of confidence in ability, lack of adequate referral knowledge and resistance from patients. Barriers cited by more than 80% of students included the lack of sufficient referral knowledge and patient resistance.

Gottlieb, Guo, Blozis, and Huang compared the TCC activities of 110 family practice residents.²⁹ Thirty-five percent of participants were in the first year of residency, 33.6% in the second year, and 30.9% in the third year. Similar to findings by Skegg²⁵, Chambers, and Corbin²⁰, and to Bobo and associates²², Gottlieb and associates found 61.8 percent of the residents identified lack of time as a barrier to TCC.²⁹ Fifty-eight percent of residents identified lack of patient interest as a barrier, while 33.9% cited lack of health educators as a barrier. Lack of systems for tracking and promoting preventive care was identified by 33.9% of the residents, with 20% noting the lack of financial reimbursement as barriers to TCC.

Seventeen percent of the residents found lack of patient education materials to be a barrier to counseling activities, while only 5.6% felt inadequately prepared.

In findings similar to Cooke and associates²⁷, Latts, Prochazka, Salas, and Young examined the effectiveness of training nurses, medical assistants, nurse practitioners and physicians (N=66) in obstetric practices to provide smoking cessation counseling.³⁰ These researchers encountered several barriers when recruiting obstetric practices for the training. Specifically, they requested participation of 33 obstetric practices; however, only 18 agreed to participate. Nonparticipating offices claimed lack of time, insufficient staff, and lack of smoking patients as rationale for not undertaking smoking cessation counseling into their respective practices. These researchers alleged that contacts, commonly office managers who smoked, may have been more unwilling to participate in smoking cessation counseling training than contacts who did not smoke.

In another recent study, Albert, Ward, Ahluwalia, and Sadowsky assessed tobacco cessation knowledge, attitudes, and counseling behaviors of dental teams participating in the Aetna managed care plan.³¹ Surveys from 75 dental offices revealed that 95.2% of dentists were willing to receive training. However, 87.5% of those dentists indicated time as a barrier to implementing TCC. In addition, 75% of dentists also indicated lack of reimbursement for TCC as a barrier. These researchers concluded that dentists who were most confident about their smoking cessation knowledge more frequently advised their patients to quit. A summary table of identified factors is available in Table I.

Table I
Summary of Factors Found to Affect Tobacco Cessation Counseling

Factors Compiled:	Resources*												
	6	11	16	20	22	23	24	25	26	27	29	30	31
Lack of time	X	X	X	X	X		X	X	X	X	X	X	X
Lack of financial reimbursement	X	X	X		X			X	X		X		X
Patient Resistance/Negativity	X		X	X		X	X				X		
Lack of Confidence			X		X		X	X					
Inadequate Knowledge of Referrals	X	X	X	X									
Focus on other Health Care							X	X		X			
Resistance by Staff				X		X				X			
Inadequate Training				X							X		
No barriers for 50% of subjects		X							X				
Lack of Formal Office Tracking System						X					X		
Staff Turnover/Insufficient Staff										X		X	
Lack of Education Materials									X		X		
Lack of Smoking Patients												X	
Employer Smokes				X									

* Resources as numbered references

Summary

The deleterious health consequences of tobacco use, combined with the majority of tobacco users wanting to quit, suggests that more research regarding TCC be undertaken. The oral health care setting provides a unique opportunity for TCC, as a majority of smokers seek oral health care annually.⁶ It is apparent from numerous research reports that TCC education of health care providers and health care students favorably impacts TCC activities. Numerous factors have been identified by health care providers and health care students as impacting TCC activities. Lack of time, lack of financial reimbursement, and patient resistance/negativity were the three most common barriers found. Further studies examining the effectiveness of incorporating management of barriers to TCC within education, either during professional entry level education or

continuing education, is recommended. Additionally, research should examine the impact of removing identified barriers on implementation of TCC.

A recent grant from the Robert Wood Johnson Foundation has instigated a tobacco cessation initiative by the American Dental Hygienists' Association (ADHA).⁸ To promote program success, it is recommended that the ADHA sufficiently address identified barriers to tobacco cessation techniques while designing the "Ask, Advise, Refer" intervention program. Specifically, the ADHA may want to address potential reimbursement through insurance companies or employers for TCC provided. If the oral health care practice received financial reimbursement for providing TCC, dental hygienists might have more time in their schedule for this service; this would address the top two identified barriers.

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Health Behavior Models and Oral Health: A Review

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Dental hygienists help their clients develop health promoting behaviors, by providing essential information about general health, and oral health in particular. Individual health practices such as oral self-care are based on personal choices. The guiding principles found in health behavior models provide useful methods to the oral health care providers in promoting effective individual client behaviors.

Theories provide explanations about observable facts in a systematic manner. Research regarding health behavior has explored the effectiveness and applicability of various health models in oral health behavior modification. The Health Belief Model, Transtheoretical Model and Stages of Change, Theory of Reasoned Action, Self-Efficacy, Locus of Control, and Sense of Coherence are examples of models that focus on individuals assuming responsibility for their own health. Understanding the strengths of each and their applicability to health behaviors is critical for oral health care providers who work with patients to adopt methods and modify behaviors that contribute to good oral health.

This paper describes health behavior models that have been applied to oral health education, presents a critical analysis of the effectiveness of each model in oral health education, and provides examples of application to oral health education.

Keywords: theories, models, Health Belief Model, Transtheoretical Model, Stages of Change, Theory of Reasoned Action, self-efficacy, Locus of Control, Sense of Coherence

Introduction

Patient education is considered a hallmark of the dental hygiene profession. According to the American Dental Hygienists' Association (ADHA) Code of Ethics, dental hygienists have "a primary role in promoting the well being of individuals and the public by engaging in health promotion/disease prevention activities".¹ The American Dental Education Association (ADEA) lists identification of individual and population risk factors and development of strategies that promote health-related quality of life as one of the core competencies for entry into the dental hygiene profession.² Patient education is an integral part of dental hygiene education. In a recent survey of dental hygiene education programs, all respondents indicated that their programs included teaching patient education in the curriculum.³

To fulfill the profession's code of ethics, dental hygienists must have a thorough knowledge of health models and health behavior theories that affect oral health behaviors. Many such theories are now available and have been applied to oral health, and others are sure to be introduced and tested in the future. The purpose of this review is to outline the basic

principles of several major health theories that have been applied to oral health and to examine the strengths and limitations of each.

Health Theories

The overall goal of patient education is to provide patients the information they need to make informed life style choices and options for professional services. Early approaches to patient education tended to focus on health care provider to patient communication. During that time, the main message from health care providers to patients was to comply with a prescribed self-care regime. The medical community paid less attention to an individual's perception of health and disease only a few decades ago.^{4,5} Public health workers in the 1950's began to discuss the importance of individuals taking part in their own health. An early breakthrough in health education came in the 1950's with the introduction of the Health Belief Model. Other theories have since followed and applied to both acute and chronic health conditions. Theories most often associated with oral health are the Health Belief Model, Locus of Control, Self-Efficacy, Stages of Change, and Theory of Reasoned Action. Sense of Coherence, a theory introduced in the 1970's, has recently been applied to oral health. Other health theories have proven useful with health conditions such as patient self-management for HIV infection,⁶ emotional well-being for obesity,⁷ and Family Coherence and Conflict Resolution for diabetes management.⁸ This review will include only the models reported in the literature associated with oral health.

Health Belief Model

First proposed in the 1950's by Hockbaum, and adopted in the 1970's by the United States Public Health Service, the Health Belief Model (HBM) was one of the first attempts to view health within a social context.⁹ The underlying principle of the HBM is that individuals with better information make better health decisions. According to Hockbaum, people will find it worthwhile when making health related decisions to keep an open mind. A person who is prepared to accept new concepts, will have a better understanding of self. With a better understanding of how and why they make choices, individuals will be much better able to make them intelligently, independently, and maturely.⁹

The HBM is a staged theory, with each step in the decision making process dependent on the previous decision or belief. According to this theory, an individual must believe that s/he is susceptible to a condition; the condition is serious; there is a successful intervention for the condition; and can overcome all barriers to using the intervention. Each step is dependent on the previous belief.

Applying this theory to an oral health condition such as early childhood caries, the primary caregiver must believe that the child is susceptible to dental caries; that primary teeth are important and dental caries is a serious threat to them; that dental caries can be prevented; and must be willing to limit the child's exposure to fermentable carbohydrates, and must assist the child in practicing good oral hygiene.

A limitation of the HBM is that supplying information alone is usually not enough to change health behaviors. Behavior changes rarely follow a logical, stepwise progression.¹⁰ Cross sectional studies have found strong associations between good oral health and HBM stages.^{11,12} However, longitudinal studies have not shown good predictive value in following HBM principles.^{13,14,15} It is possible that measuring health beliefs cross sectionally reveals that, after a behavior is adopted, the individual believes the condition is serious and that interventions have value. However, measuring those beliefs before behavior changes take place has questionable value.

Transtheoretical Model and Stages of Change

The Transtheoretical Model and Stages of Change developed by Prochaska, Norcross, and DiClemente is another staged theory that measures an individual's readiness to adopt a new health behavior.⁵ Like HBM, Stages of Change is a staged model with each step contingent on the previous step. This theory states that individuals move along a predictable continuum of change; and that each step has distinct characteristics. Accurately assessing where an individual is along this continuum

allows health care workers and educators to tailor interventions appropriate to the person's stage of readiness. The six stages of change are: precontemplation, contemplation, preparation, action, maintenance, and termination.¹⁶

In the precontemplation stage, an individual has no intention of changing a behavior. At this stage, providing information regarding risks may be appropriate to initiate a person's thought for change. In the contemplation stage, the individual is considering making a change within the next six months. The individual will examine the pros and cons of making a change, carefully weighing the benefits of changing versus the costs of changing. To help evaluate the pros and cons of changing, the individual may explore options such as community support programs like smoking cessation programs that assist behavior changes. If the available options seem appropriate and beneficial, the individual may advance to the next stage of preparation. In the preparation stage, the individual is ready to make the change and actively makes plans to enact the change, for example enrolling in a tobacco cessation class. In the action stage, the change has been adopted, and in the maintenance stage, the change has been continuous for at least six months. The termination stage, often not attained, represents a state in which the individual feels as if the prior behavior never existed and is, therefore, highly unlikely to return to the previous behavior.¹⁷

Individuals move through the stages as they weigh the benefits and costs, or pros and cons, of the change. As the scale tips more toward the pro end of change, the individual may move to the next step. Self-efficacy develops as the individual believes a change in behavior is likely to result in a positive outcome. As an individual believes a change is possible and believes in his/her ability to enact the change, a move to a more advanced stage is likely.¹⁷

The strength of the theory is that it allows the client education program to provide the precise intervention for which the participant is ready. Applying the theory to smoking cessation, pre-contemplators may be given some educational material to consider. Computer based feedback for health care providers may help contemplators assess pros and cons of the behavior change. Those in the preparation stage may have set a quit date for smoking. Health care providers or health clinics can provide support using multiple methods. Consciousness raising, self-evaluation, and environmental evaluation are useful in the pre-contemplation and contemplation stages. Consciousness raising can alert an individual to a severe health problem and possible outcomes if left untreated. Self-evaluation and environmental evaluation assess personal habits and social environments that might affect a personal habit.

Counter-conditioning and contingency management may be most useful in the action and maintenance stages. Counter-conditioning allows the individual to substitute one behavior for another, encouraging a healthy alternative for an unhealthy habit. Contingency management relies on rewards to encourage positive changes and may be most useful for helping individuals who have reached the maintenance stage. Those in the termination stage may provide assistance or counseling to those trying to change the behavior.¹⁷

Regarding oral health behaviors, Stage of Change theory is most often used with tobacco cessation programs. Prochaska, Redding, and Evers tested a staged intervention against a standard self-help cessation program, following participants for 18 months. Results were similar at 12 months but at 18 months the staged group moved ahead.¹⁷ Behaviors and attitudes about smoking and cessation readiness often match the appropriate stage in cross sectional studies. A program evaluation at a clinic for the medically underserved questioned smokers to assess their stage of change. Smokers who planned to quit within six months scored higher on statements consistent with quitting than did smokers who were not planning to quit. Furthermore decisional balance scores of those planning to quit indicated more concerns over negative consequences of smoking.¹⁸

Evaluation of the effectiveness of smoking cessation programs based on stages of change theory have been less definitive than reported by the theory's proponents. Longitudinal analysis of smoking cessation programs based on stages of change theory found that using interventions based on the theory added little or borderline improvements over other cessation strategies.^{19,20} A systematic review of clinical trials based on Stages of Change interventions found the approach ineffective in school aged children.²¹ Cross sectional and prospective analysis of a workplace smoking cessation program mirrored results of previous research. Behaviors and attitudes significantly correlated with appropriate stage of change. However, the theory failed to predict progression through the stages at the one and two-year follow up.²²

Theory of Reasoned Action

Theory of Reasoned Action stresses the importance of attitudes and intentions in changing a behavior. According to this theory, the most important determinant of behavior is intention.²³ Very few actions that produce a healthy outcome happen without ample knowledge and full intention to practice the healthy behavior. Two cognitive processes are at work to develop healthy behaviors: 1) belief about what significant others think, and 2) personal motivation to comply with those significant people. Other external variables that will influence attitudes and thus behaviors are internally processed within the context of significance.

According to the Theory of Reasoned Action, people make rational decisions based on their knowledge, personal values and attitudes. Therefore, a person's intent to perform a certain action is the most immediate and relevant predictor of carrying out that action. Behavioral beliefs and normative beliefs are two kinds of beliefs that shape intentions.²³

Behavioral beliefs are the attitudes held by the individual alone. A person forms attitudes based on relative risks, benefits, and possible outcomes. Therefore, personal knowledge and perception of personal health importance influence behavioral beliefs. Normative beliefs are those held by other people who influence the individual. If a certain behavior is expected or is the social norm, or is expected by someone of importance to the individual, those expectations will have a bearing on an individual's intentions and, therefore, affect his or her behavior.²³

Intentions will only predict behavior if they are stable and consistent.²³ When faced with an unexpected obstacle, an individual might change his or her intentions and neglect to carry out the originally intended behavior. Another limitation of this theory is that intentions must be matched very closely to the behavior to have predictive power.

Social norms and community expectations are powerful predictors of individual behavior, according to the Theory of Reasoned Action. When using this theory in a community intervention, the behavior of the collective community may be more easily predicted than that of the individual. Social norms do not change as readily as individual choices; therefore, social norms are more stable and provide strong normative beliefs to those in a close community.²³

The Theory of Reasoned Action helps explain an individual's perceptions of normal and expected behavior. The theory seems to be most successful in predicting behaviors that are completely within the individual's control and in which intentions remain stable, such as daily oral hygiene practices. Extraneous factors outside of the individual's control, such as fatigue or change of environment, may quickly change intentions and therefore change behavior and outcome. This theory has proven to be effective in influencing oral hygiene in young adults. The social expectations of the group had a strong influence on their oral hygiene behavior.^{10,23} Applying this concept to patient education, a teenager may consistently practice oral hygiene at home, but a change in environment, such as moving to student housing at college, may change intentions and behavior. Fatigue associated with student life also might affect nightly oral health practices.

Self-Efficacy

Self-efficacy is a construct of the Social Cognitive Theory proposed by Bandura.²⁵ Social Cognitive Theory, a revision of Social Learning Theory, states that individuals do not learn or change behavior in a linear fashion. Rather, changes take place bidirectionally; environment, information, and behavior all affect one another. As an individual learns more, behaviors and environment may change, causing more knowledge to be gained, which, in turn, reinforces behavior and healthy environments. Lapses are a part of the learning process as the individual employs personal choices to develop behaviors consistent with individual choice and lifestyle.^{24,25}

Individuals with high self-efficacy believe their actions will affect outcome. As a healthy behavior produces results, success reinforces success. Individuals may have no intention of changing a behavior but after experiencing a success, behaviors, knowledge and environments change.²⁵

Self-efficacy is gained by several means. Enactive attainment, or experiencing success, is the most powerful method. Vicarious learning is another method. Individuals do not have to experience the affects of poor health choices if they can

learn from others' experiences. The third method of gaining self-efficacy is through verbal persuasion. Affective states such as pain or fatigue will deter self-efficacy.²⁵

Self-efficacy has been an accurate predictor of oral health in both cross sectional and longitudinal studies.^{27,28,29} Qualitative analysis of dental attitudes indicated that cognitive experiences, supportive and emotional dimensions, and childhood experiences influence dental attitudes and behaviors.²⁶ Dental self-efficacy was found to be a determinant in oral health and oral hygiene among diabetes patients and for general oral health in elderly patients.^{27,28} Self-efficacy has shown to be consistent with improvements in oral hygiene over time, but the benefit may be short term only. Periodontal patients showed improvements in oral hygiene and dental self-efficacy six months after the initial intervention but differences were lost over time.¹¹ Self-efficacy was found to be protective against early childhood caries (ECC). Researchers have proposed that self-efficacy may be a useful part of a multidimensional model to predict ECC.²⁹

Self-efficacy is perceiving control over actions that will have an affect on outcome. The theory differs from other theories addressing personal agency or control, in that self-efficacy is domain specific. That is, an individual can have high expectations that oral health is attainable through personal oral hygiene and professional care. The same individual may have low self efficacy in other areas of health.

Locus of Control

This theory, developed by Wallston, Wallston, & Kaplan in the mid 1970's, deals with perception of personal control over health issues. Internal locus of control (LOC) occurs when individuals think their personal actions determine their health status. Those with external locus of control means individuals perceive others in control of health decisions and health status. External sources may be fate, chance, luck, God, or powerful others.³⁰

The theory has been refined since its introduction. As originally presented and in much subsequent research, LOC has been considered a global orientation to health behavior. The scales were designed to be mid-level in specificity so they could be used to predict behaviors or outcomes for any condition. Validation of the theory, however, has found this to be a problematic approach because healthy people respond differently to the questions on the scales than do chronically ill individuals.³¹ Several researchers have used the basic scales but found the scales needed to be modified to measure specific diseases or conditions such as diabetes, headaches, and adolescent depression.³²⁻³⁴ This was successful within the context used in individual studies. However, because each study adapted the scales differently, little comparison between studies is possible. Development of the Multidimensional Locus of Control scale helped address this issue and make the scale appropriate for specific conditions.³¹

LOC has been found to be predictive for children's dental health. Researchers found children whose mothers had more external LOC were at higher risk for developing dental caries.³¹ In contrast, other research has found little association between mothers LOC, children's health status, and use of preventive health services.³² This theory continues to be refined for use in various populations and conditions.

Sense of Coherence

Antonovsky took a very different tact in health promotion and disease prevention. Antonovsky's central premise is that it is more useful to study health than to study disease. He referred to this method of study as salutogenesis, the beginnings of health. Salutogenesis defines health in terms of a continuum of ease to dis-ease and with the conditions surrounding the individual providing coping resources. Antonovsky's objection to the study of pathogenesis is that it tends to dichotomize people into either a "healthy" or "ill" state. He contends there is a continuum of "ease to dis-ease" state for most people.³³

The salutogenesis model closely examines the role of stressors and tension as contributing factors for health and dis-ease. A stressor is defined as a source of disturbance that upsets a sense of equilibrium. This may come from external or internal sources such as illness, heredity, job stress, or lack of personal control. Many sources of stimuli are handled routinely as

individual and are not stressors. Stressors produce tension and it is the perception of stress and the tension response that has an affect on the individual.³³

To cope with, and possibly to use, stressors to enhance life experience, people build a network of generalized resistance resources (GRRs). A GRR is more than a specific coping skill for a particular event. GRRs include all available resources at an individual level, a community and a cosmic level that enable people to manage daily crises and cataclysmic events. A network of GRRs may contain a person's heredity, education, finances, physical resources, values, attitudes, or faith.

GRRs can help an individual avoid stressors as in prevention, practicing good health habits, or avoiding dangerous situations. They may also enable a person to effectively manage a stressor and avoid psychological, emotional, or physical impairment. An examination of the list of GRRs shows that they encompass a broad range of elements. Included are biological elements such as the immune system, cognitive elements such as knowledge, material resources such as personal income or medical insurance, social factors such as support and social norms, and macrosocial support such as a belief in divine purpose.³³

A GRR has an element of farsightedness. This quality allows an individual to envision coping strategies and anticipate the response of the environment. The coping strategy is not the actual behavior but the planned behavior. This may give an individual a measure of personal control, but the actual response or behavior may be limited by circumstances such as physical ability or material resources.³³

Sense of coherence (SOC) is the main construct of salutogenesis. SOC is a method of seeing the world and one's place in it. It is cognitive, perceptual, and social. SOC is central to a salutogenic orientation to health and disease. From a pathogenic perspective, a clinician will diagnose a condition and work to cure it. From a salutogenic perspective, a clinician can work with a patient on goal-oriented behavior that will strengthen the sense of coherence and thereby move the patient toward the "ease" end of the ease to dis-ease continuum. SOC will move a person toward consistency and stability.³³

Researchers have found that mothers' SOC is significantly associated with several oral health indicators in adolescents.³⁴ Strong maternal SOC was associated with gingival health, overall caries rate, anterior caries, and professional dental visits.

No longitudinal studies have been conducted to measure the long term impact of SOC on oral health.³⁴ Summary Health behavior theories may be applied for both individual patient instruction or in developing community-based programs. For example, in providing oral hygiene instructions for diabetes patients, the dental hygienist may help develop self-efficacy in a patient using enactive attainment by pointing out how the patient's efforts have improved gingival health. Encouraging a patient to self-assess the gingival condition over time may allow the patient to observe the benefits of daily plaque removal as tissues bleed less and become firmer. Asking the patient if he/she has noticed anyone with loose teeth may cause vicarious learning. Many patients have observed loose teeth and tooth loss in family members. Explaining this tooth loss may have been caused by advanced periodontal disease allows the patient to learn vicariously through another person's experience without personally experiencing the adverse event. Dental hygienists may also help develop patients' sense of coherence by networking with medical providers, community support groups, and family members.

Many preschools, elementary schools, and day care centers have toothbrushing programs and/or teach dental health to students and parents. Dental hygienists involved in these community programs may use Theory of Reasoned Action to encourage daily brushing and thereby create a behavioral norm for the parent and child. Social norms of good nutrition, appropriate weaning schedules, and healthy smiles established in these early childhood programs might have an impact long after the program has ended.

Conclusion

Principles of evidence-based medicine and professional ethics require health providers to keep their knowledge current and employ tested techniques.¹ Longitudinal research evaluates outcomes for programs based on various theories. Examination of outcomes allows dental hygienists to employ the most appropriate theoretical base for patient education. Assisting patients in partaking in their oral health maintenance remains a constant challenge for oral health professionals at the community and individual level. A brief review of theories commonly used in relation to oral health shows that each

theory has proven successful in certain situations; each has limitations. Many of the available studies are cross sectional and cannot be used to determine cause effect relationships. It is possible that some theories are more applicable on a community level, and others more useful for individual counseling. Longitudinal studies are needed to test the predictive value of theories or the relative impact on various conditions. The Surgeon General's national call to action recommends research designed to determine the complex interactions of biological, social, and environmental influences on oral health.

"Such research must be complemented by prevention and behavioral science research (including community-based approaches and ways to change risk behaviors), health services research to explore how the structure and function of health care services affect health outcomes, and by population health and epidemiology research to understand potential associations among diseases and possible risk factors."³⁵

Following this recommendation, and in light of the current state of knowledge of the success and limitations of health behavior modification theories, research is needed to determine the long term outcomes of programs based on various theoretical constructs. Research is also needed to examine possible interactions between health theories, possible multidimensional models, or appropriateness of certain models for certain conditions.

Dental hygienists routinely provide patients information on a variety of oral health related issues. The benefit of time spent on in doing this may depend on the effectiveness of the intervention for a particular patient, particular condition, and in a particular setting. With a working knowledge of current health modification theories, oral health professionals are better equipped to provide educational services for patients and communities.

Notes

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Proliferative verrucous leukoplakia: An aggressive form of oral leukoplakia

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Proliferative verrucous leukoplakia (PVL) is an aggressive form of oral leukoplakia that is persistent, often multifocal, and refractory to treatment with a high risk of recurrence and malignant transformation. This article describes the clinical aspects and histologic features of a case that demonstrated the typical behavior pattern in a long-standing, persistent lesion of PVL of the mandibular gingiva and that ultimately developed into squamous cell carcinoma. Prognosis is poor for this seemingly harmless-appearing white lesion of the oral mucosa.

Keywords: Leukoplakia, proliferative verrucous, Leukoplakia, oral, Disease, premalignant, Cancer, oral

Introduction

Proliferative verrucous leukoplakia (PVL) is a recently delineated entity that is defined as a diffuse, white and smooth or papillary or wartlike area of the oral mucosa caused by varying degrees of epithelial hyperplasia.¹ In its early stages it is often clinically so bland that it is dismissed as frictional hyperkeratosis or as candidiasis, but, even though the clinical course is slow, it possesses a propensity for malignant transformation. Although PVL is well documented in the oral pathology literature, it is not documented in the dental hygiene or periodontic literature. Therefore, the purpose of this paper is twofold: (1) to acquaint dental health professionals, including dental hygienists and periodontists, with this highly significant variant of oral leukoplakia and (2) to document a case of PVL with gingival involvement that progressed to malignancy.

Literature Review

PVL was first described and segregated from other forms of leukoplakia by Hansen et al. in 1985.² It is significant because it has a high recurrence rate and the potential to develop into verrucous carcinoma or squamous cell carcinoma in 60% to 70% of the affected patients.³ PVL is more commonly found in elderly females and is associated with tobacco use or alcohol abuse one-third to one-half of the time.^{3,4} The most common locations are the gingiva or alveolar ridge (often extending into the vestibule), tongue, and buccal mucosa-sites that traditionally have not been considered high-risk areas for the development of oral squamous cell carcinoma, with the exception of the tongue. According to Haley et al. the

gingiva is the most likely site for the malignant transformation of PVL.⁵ PVL often begins as a focal lesion spreading laterally over time and can be multifocal.⁶ Early in its course it is a flat hyperkeratotic lesion that becomes progressively verrucous and histologically often exhibits varying degrees of epithelial dysplasia.

PVL Case Report

A 48-year-old Caucasian female was referred to a periodontist by her general dental practitioner for a biopsy to rule out oral lichen planus. The patient presented with a chief complaint of "a new white spot on my gum that is spreading and thickening." The patient stated that she first noticed the asymptomatic lesion 3 months ago. It involved the facial gingiva of the right mandibular incisors. She related a 9-year history of multifocal oral leukoplakia that had been clinically diagnosed as lichen planus, but during the nine years it was never biopsied. She had never used tobacco products or alcohol. She was taking prednisone for myasthenia gravis. At her referral appointment with the periodontist, oral examination disclosed multiple white plaques and rough-surfaced to verrucous-appearing lesions that involved the mandibular gingiva, right buccal mucosa, dorsum of tongue (Fig 1), hard palate, and floor of mouth. Based on the clinical findings, the differential diagnosis included hyperplastic candidiasis, lichen planus, and carcinoma arising from leukoplakia. However, over the ensuing two-year period, three biopsies of lesions from the anterior mandibular facial gingiva, right buccal mucosa, and dorsum of the tongue were microscopically diagnosed as "cyst with chronic inflammation," "leukoplakia," and "leukoplakia," respectively. Because there was no clinical evidence of a cyst and leukoplakia is strictly a clinical term, the periodontist sought a second opinion. An oral and maxillofacial pathologist was consulted and believed that the microscopic findings in all three specimens, although free of cytologic dysplasia, represented the early changes found in proliferative verrucous leukoplakia. The lesions were closely monitored for any changes suspicious for invasive squamous cell carcinoma or verrucous carcinoma. A biopsy was then performed on a spreading lesion involving the buccal gingiva in the premolar-molar area of the right mandible (Fig 2). The specimen from the buccal gingiva showed marked hyperorthokeratosis with verrucous epithelial hyperplasia (Fig 3). Periodic acid Schiff staining was negative for *Candida albicans*. There was no epithelial dysplasia present in the surgical specimen. Following the results of the last biopsy, the patient was referred to a head and neck cancer surgeon for follow-up and management of her oral condition. Two years after the last biopsy was performed, the patient developed gingival squamous cell carcinoma at the site (Fig 4). The patient expired 6 years after the original diagnosis. The cause of death is unknown to the authors.



Figure 1. Patient with multifocal smooth and verrucous plaques on the dorsal tongue.

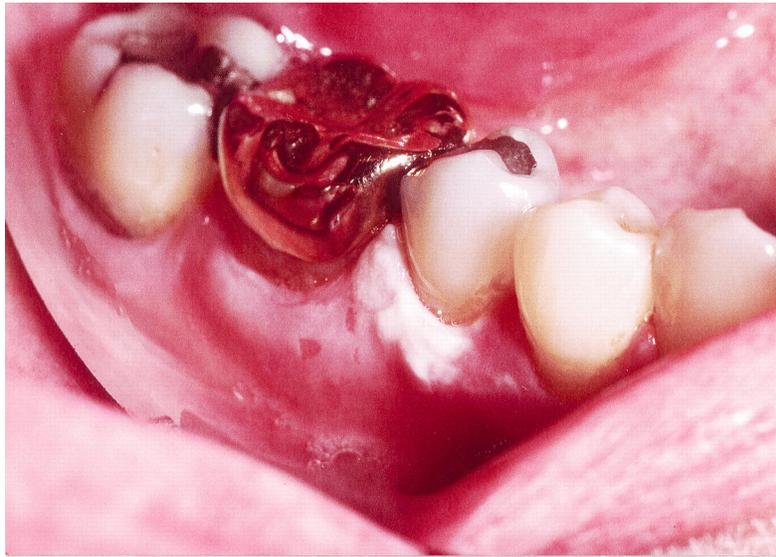


Figure 2. PVL of the mandibular gingiva. Note the transition from a smooth plaque in the first molar area to an exophytic verrucous lesion involving the free and attached gingiva of the bicuspid.

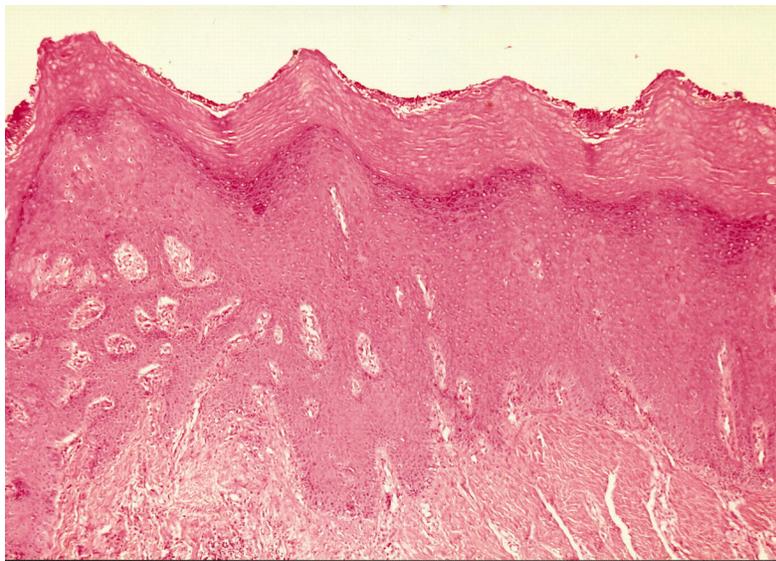


Figure 3. The lesion exhibits a verrucous pattern characterized by a thick hyperkeratotic surface, epithelial acanthosis, and no evidence of cytologic atypia (hematoxylin-eosin stain; original magnification x 100).

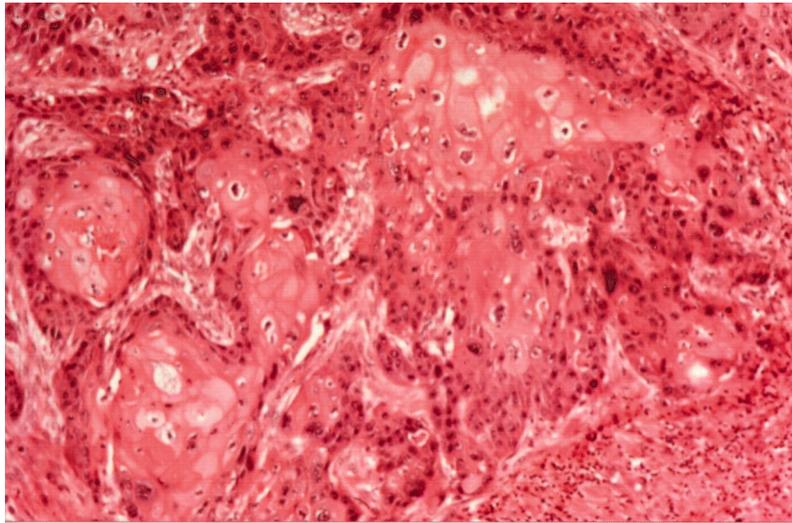


Figure 4. Photomicrograph showing islands of carcinomatous squamous epithelium invading the connective tissue (hematoxylin-eosin stain; original magnification x 50).

Discussion

Comparison and etiology

As this case illustrates, PVL is a high-risk variant of oral leukoplakia with a propensity for malignant transformation. Differences exist between PVL and homogeneous forms of leukoplakia with regards to epidemiology, clinical presentation, histopathology, and biologic behavior (Table I).⁵ The etiology of PVL is unknown. Tobacco does not appear to play a major role, nor does the coexistence of *Candida spp.*³ Human papilloma virus, subtype 16, may be suspected to be a cofactor in PVL.^{6,7}

Table I. Comparison of Proliferative Verrucous Leukoplakia and Leukoplakia*

Proliferative verrucous leukoplakia	Leukoplakia
Relatively uncommon	Common
Women > men (4:1)	Men > women (2:1)
Lower correlation with tobacco and alcohol use	Higher correlation with tobacco and alcohol use
High rate of malignant transformation (70% to 80%)	Moderate rate of malignant transformation (3% to 25%)
High mortality	Moderate mortality

*Modified from data presented by Haley et al.⁵

Clinical features

The patient, reported in this case was 48-years-old. This is consistent for the age range of PVL, (36 - 90 years with a mean of 70.2 years of age).² The clinical course of PVL is deceiving because it evolves very slowly (often over the course of several years), progressing from a flat white plaque to an exophytic plaque with a papillary or verrucous surface. In addition, multifocal lesions typically develop. The nine-year history of multiple oral white lesions that were clinically interpreted as lichen planus in our patient in fact represented a multifocal distribution of PVL. PVL can involve any oral site with the buccal mucosa, gingiva, and tongue being the most common locations.³ Interestingly, Fettig et al.⁶ have recently described

what they think is a subset of oral PVL that is limited to the gingiva. The study was composed of 10 patients (mean age 65 years) with recurrent lesions that were solitary or regional involving the free and attached gingiva, especially in the anterior regions. Multiple lesions did not develop. The gingival lesions in six of the 10 patients progressed to either squamous cell carcinoma or verrucous carcinoma.

Differential diagnosis

Baughman and Boland⁸ and Eversole⁹ have provided in-depth discussions on the clinical differential diagnosis for oral PVL. The late or advanced stages of PVL cannot be differentiated clinically from verrucous carcinoma or an exophytic papillary form of squamous cell carcinoma.⁹ However, in many instances, as in our patient's, the clinical differential includes chronic hyperplastic candidiasis, lichen planus, and leukoplakia. The hyperplastic form of candidiasis is characterized by multifocal thickened white plaques that may have a verrucoid appearance.⁹ The clinical features and history of prednisone use in this case warranted a consideration of hyperplastic candidiasis. However, multiple biopsies did not confirm the presence of candidal hyphae associated with the lesion. Although the patient had been told over a nine-year period that she had oral lichen planus, the lesions at the time of the first biopsy did not clinically show the characteristic lacy pattern (Wickham's striae) of lichen planus. Lichen planus involving the dorsal tongue may appear as smooth, white plaques sans the lacy striae.¹⁰ However, they are not verrucous as they are in this case. The multiple biopsies did not support lichen planus as well. Last in the differential for this patient was carcinoma arising in a pre-existing leukoplakia, which the aforementioned biopsies ruled out. Patients who use mouth rinses or toothpastes containing sanguinaria have developed leukoplakia that, in some instances, have had a corrugated surface and, therefore, have resembled PVL. This was not an issue in this case. The vast majority of these so-called sanguinaria-associated leukoplakias have occurred in the maxillary vestibule and alveolar mucosa.¹¹

Diagnosis

The definitive diagnosis of PVL is a clinicopathologic correlation, typically in retrospect, following multiple biopsies and a prolonged clinical course. The histologic findings are variable and usually a function of time or age of the lesion.⁴ The early lesions are deceptively bland exhibiting only hyperkeratosis, but over time they become progressively verrucous and often show varying degrees of epithelial dysplasia.^{12,13} The advanced lesions have a propensity for conventional squamous cell carcinoma and verrucous carcinoma within the histologic spectrum.

Treatment

The lesions of PVL are persistent, progressive, and relentless and have a high recurrence rate regardless of the treatment method employed.¹⁴ Complete surgical excision is difficult because of the diffuse, multifocal nature of the condition and the inability to assess accurately surgical margins clinically and microscopically. The presence of the dentition also complicates complete removal of gingival lesions. Other modalities, such as laser ablation, external beam radiation, and chemotherapy, have been unsatisfactory.^{4,5} However, Femiano et al. have recently claimed a significant degree of success in controlling recurrences using surgery in combination with methisoprinol, an antiviral agent in 25 patients.¹⁵ We believe that early-stage, small lesions should be treated with surgical (scalpel) excision. However, in late-stage lesions, which can extend over large areas and encompass multiple anatomic sites, the treatment becomes much more complex. Marx and Stern have provided a detailed discussion on the treatment rationale and various modalities used in the management of PVL.¹⁶ Nevertheless, the biological profile of PVL remains elusive, and the various modalities of treatment that have been used have resulted in variable success at best. We are in agreement with the conclusions of Reichart and Philipsen that multicenter studies are essential to determine etiologic factors and concepts for therapy.¹⁷

Conclusions

The biologic behavior of PVL is decidedly more aggressive than the other forms of leukoplakia. However, the initial clinical presentation of PVL is so innocuous that one can easily dismiss it as insignificant until there is widespread oral involvement and carcinomatous transformation. Moreover, PVL has a high predilection for the gingiva, which is also the most common site for its malignant transformation. We hope that this case report will alert dental practitioners, including dental hygienists and periodontists, to this dangerous form of leukoplakia so that patients can be identified early in the course of their disease and managed appropriately. With any questionable lesion, it is imperative that the clinician ask the pathologist to review the microscopic findings if a diagnosis is not consistent with the clinical findings. As the clinician did in this case, a request for an independent second microscopic opinion is warranted if the clinician continues to have concerns about an inconsistent clinicopathologic correlation.

Notes

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