# Editorial

JoAnn R. Gurenlian, RDH, PhD

## Preventing Oral Disease

Years ago, there was a cute commercial on television for a fast food chain. The advertisement had an elderly lady looking at a small hamburger on a large bun and asking "where's the beef?" Most people thought that was a humorous way of comparing one product with another. That commercial came to mind when I considered the research papers being presented in this issue of the Journal.

Several of the topics in this issue focus on preventing oral disease and extending access to oral care for underserved populations. These articles are encouraging as our profession needs to be able to demonstrate regularly to government agencies, legislators and policy makers that we have sufficient data to demonstrate our effectiveness as preventive health specialists.

Case in point, I recently received an email from the Israeli delegates to the International Federation of Dental Hygienists requesting assistance from other country delegates with providing data that demonstrates that dental hygienists have a positive effect on preventing oral disease. This was followed by the release of the Institute of Medicine report "Improving Access to Oral Health Care for Vulnerable and Underserved Populations." In this report, there was recognition that state laws needed to be amended to maximize oral health care. In particular, the report emphasized that oral health professionals need to be able to practice to the full extent of their education and training in a variety of settings. Upon release of the report, the Academy of General Dentistry challenged this notion, expressing concern that vulnerable populations would be placed at a greater disadvantage and their oral health might be threatened. The thought occurred to me that if we have greater information about the impact of dental hygiene services, we could easily address these concerns.

As a profession, we do need to take notice of this issue. It is not enough to claim a title. We need the evidence to support that we do, in fact, prevent oral disease. If you asked a dental hygienist in clinical practice about this, that person would strongly state that oral disease is prevented daily with the treatment provided in clinical practice. If you asked a dental hygiene educator, that person would tell you students are taught all about prevention in their entry level dental hygiene programs. However, if you ask the chair of a component, state, national or even international legislative committee, these individuals will provide a different perspective. We may think we are preventing oral disease, but we don't really have all the pieces in place to verify that concept.

So how do we change this picture to turn the concept into a reality? There are several approaches we can take to bolster our preventive efforts. First, we can re–examine our international and national research agendas to evaluate our emphasis on prevention. Second, we need to coordinate our efforts across the globe to create complimentary models of preventive research. This effort will enable us to gather substantive data that can be used to verify our preventive efforts.

Another approach that would be beneficial is to document in clinical practice and community settings the outcomes achieved by preventive dental hygiene interventions. Tobacco cessation programs need to include profiles that detail the number of individuals counseled, types of quit programs recommended and used and effects of those programs with respect to the number of individuals that were able to quit smoking, time elements of sustaining the ability to refrain from smoking and descriptions of any oral pathology associated with smoking behaviors (past and present). Oral cancer screening programs should have outcome parameters that examine comparisons of the comprehensive oral examination with other adjunct screening technologies, and the number of cases of dysplasia and carcinoma identified.

Sealant programs and CAMBRA protocols provide additional examples of preventive programs that can be used to assess the prevention of caries. Items that can be studied include risk factors, efficacy of products used, level of caries identified and treated and quality of life parameters.

With greater emphasis on systemic and oral health, our profession could be studying the ef-

fectiveness of taking vital signs in practice and community settings to identify those who may be hypertensive, and the use of interventions to prevent cardiovascular diseases. Or, consider the benefit of providing oral health education to individuals who are pregnant to explore the impact of this education on the oral health of the mother and infant in preventing periodontal disease and early childhood caries. In addition, there are opportunities to investigate the effectiveness of oral preventive measures in various settings. Consider the value of having data that demonstrates the power of prevention in long–term care facilities, hospitals and rehabilitation centers. Models that examine prevention from an inter–professional domain would be another avenue of research.

The intent here is not to create a laundry list of research ideas. Rather, the intent is to raise the profile on oral health prevention research. There are multiple opportunities to capitalize on the magnitude of these studies. Joining forces with our colleague around the globe to design and implement prevention studies would further the goal of demonstrating our development as a profession and our commitment to improving the health of the public.

If we, as a cadre of prevention specialists, challenge ourselves to conduct research on oral health prevention, we may find that we will have ample evidence to support the utilization and further development of dental hygienists in a variety of settings that address the current and future needs of the health care system. When someone asks us "where's the beef" about oral health prevention, won't it be nice to have the answers?

Sincerely,
JoAnn R. Gurenlian, RDH, PhD

# Linking Research to Clinical Practice

## Periodontal Disease and Chronic Obstructive Pulmonary Disease

Denise M. Bowen, RDH, MS

**The purpose of Linking Research to Clinical Practice is to present evidence based information to clinical dental hygienists so that they can make informed decisions regarding patient treatment and recommendations. Each issue will feature a different topic area of importance to clinical dental hygienists with A BOTTOM LINE to translate the research findings into clinical application.**

**Zhou X, Wang Z, Song Y, Zhang J, Wang C. Periodontal health and quality of life in patients with chronic obstructive pulmonary disease. *Respir Med*. 2011;105(1):67–73.**

**Objective:** To evaluate the association of periodontal health and parameters of quality of life assessed in 306 Chinese patients with chronic obstructive pulmonary disease (COPD).

**Methods:** Periodontal status and respiratory function in 306 COPD patients were clinically evaluated and their quality of life was assessed using the standardized St. George's Respiratory Questionnaire (SGRQ).

**Results:** The SGRQ scores were all significantly correlated with major lung function parameters ($r^2$=–0.37 to –0.28; $p<0.0001$) and Medical Research Council dyspnea scale ($r^2$=0.23 to 0.30; $p<0.0001$). The SGRQ scores also correlated with the 6 minute walk test ($r^2$=–0.15 to –0.13; $p<0.05$). Of periodontal health parameters, missing tooth number and plaque index appeared to be related to the scores of quality of life. The age and gender–adjusted Pearson's correlation coefficients between missing teeth and total, symptom and activity score were 0.09, 0.12 and 0.12, respectively ($p<0.05$). The Pearson's correlation coefficients between plaque index and symptom and activity score were 0.09 and 0.09 ($p<0.05$). After adjusting for age, gender, body mass index and smoking status, missing teeth remained significantly associated with symptom and activity score ($p=0.033$, $p=0.030$, respectively), while plaque index was significantly associated with symptom score ($p=0.007$).

**Conclusions:** Poor periodontal health as reflected by missing teeth and plaque index was significantly associated with lower quality of life in COPD patients. Our findings indicate the importance of promoting dental care in current public health strategies to improve the quality of life in COPD patients.

## Commentary

The focus of this study was to examine whether poor periodontal health and/or oral hygiene is related to quality of life in patients with COPD. Much attention has been focused on the links between oral and systemic diseases in the past decade, and scientists are attempting to identify the processes by which various diseases might be interrelated. One such area of interest is the link between periodontal disease and/or oral hygiene and respiratory diseases. When considering this area of research and its relationship to practice, it is important to review the types of respiratory disease that have been studied in relation to oral diseases. Acute respiratory infections, such as pneumonia, have been studied extensively in elderly individuals who are hospitalized or residing in long–term care facilities. One plausible explanation for the association between respiratory infections and periodontal disease or poor oral hygiene is that oral and respiratory pathogens housed within plaque biofilm are aspirated from the oropharynx into the lungs, causing aspiration pneumonia in susceptible individuals. Another theory re-

lates to systemic inflammatory changes or airway stimuli that are caused by periodontal diseases and respiratory disease. COPD includes 2 main types of diseases: chronic bronchitis and emphysema. The association of COPD and periodontal disease is likely impacted by the shared cofactor of smoking. Nonetheless, studies and systematic reviews have found an association between pneumonia or COPD and periodontal disease, even when statistically controlling for smoking and other common risk factors. No cause and effect relationship has been identified between periodontal disease and respiratory disease.

Patients with COPD have quality of life issues related to impaired respiratory function (i.e., declining airflow in and out of the lungs), a key outcome of the disease. The signs and symptoms of COPD include a chronic cough, shortness of breath (especially with activity), wheezing and chest tightness. These individuals also are susceptible to frequent acute respiratory infections including common colds, influenza and pneumonia. Zhou et al designed this study to determine if quality of life might be related to periodontal disease parameters in 306 Chinese patients with COPD. Subjects who met inclusion and exclusion criteria appropriate to studying these diseases (e.g., ≥30 years of age, diagnosed COPD with stable status, no prior major lung surgeries and expected life of at least 6 months) were recruited from 8 hospitals in Beijing. As would be expected for individuals with COPD and periodontal disease, the average age of subjects in this study, approximately 63 years, was higher than the minimum required. These patients were ambulatory, thus they represented typical COPD patients that might be seen in dental practices. The instrument chosen to measure quality of life, the SGRQ, is a questionnaire developed to correlate with medical measurements of chronic airflow limitation to determine if patients perceive improvements or deterioration in status. The SGRQ has been used in many other studies of patients with respiratory diseases, and has been determined to be a valid and reliable measurement instrument. It provides a total score for quality of life based on the individual respondent's self–assessment, and also includes subscales measuring the respondent's perception of symptoms (frequency of coughing, wheezing or sputum production), activity (limited by breathlessness) and impacts (influence of breathing problems on social or psychological functioning).

Other studies have documented an association between health–related quality of life and periodontal disease, and suggested that more severe periodontal disease has a stronger impact on quality of life than less severe disease. This information is important to dental hygienists who treat periodontal disease on a daily basis and provide patient education to patients about the importance of good oral health. Issues related to quality of life become particularly important to our patients who are elderly or have medically compromising conditions. Results of this study indicated that, in the case of patients with COPD, quality of life might be related to periodontal parameters, such as missing teeth and plaque scores. Previous studies have also documented a relationship between periodontal health and oral health behaviors in COPD patients.

When completing a study to assess the relationship between 2 variables or conditions (in this case COPD and quality of life), researchers must consider other risk factors that might affect quality of life in the subjects being studied. Statistical techniques, such as linear regression analysis, are used to adjust findings after taking these variables into consideration. In this study, after adjusting for age, gender, body mass index and smoking status, the number of missing teeth remained significantly associated with higher symptom and activity scores, while plaque index scores were significantly associated with symptom scores. These SGRQ scores are higher when respondents perceive more problems with breathlessness or greater limitations on activities. Thus, the positive correlation found in this study indicates that more missing teeth and greater amounts of plaque present were related to poorer quality of life in these subjects, based on their perception of their respiratory symptoms and/or activities. The authors concluded that interventional studies are needed to assess the efficacy of oral health care on improving quality of life in COPD patients. By promoting frequent periodontal health care and optimal daily oral hygiene in COPD patients, dental hygienists may play a role in improving their quality of life. Further research is needed to prospectively test outcomes of care, but these results provide interesting information for consideration in treatment and education of individuals with COPD.

**Sjögren P, Nilsson E, Forsell M, Johansson O, Hoogstraate J. A Systematic Review of the Preventive Effect of Oral Hygiene on Pneumonia and Respiratory Tract Infection in Elderly People in Hospitals and Nursing Homes: Effect Estimates and Methodological Quality of Randomized Controlled Trials. *J Am Geriatr Soc*. 2008;56(11):2124–2130.**

The objective of this study was to investigate the preventive effect of oral hygiene on pneumonia and respiratory tract infection, focusing on elderly people in hospitals and nursing homes, by systematically reviewing effect estimates and methodological

quality of randomized controlled trials (RCTs), and to provide an overview of additional clinical studies in this area. Literature searches were conducted in the Medline database, the Cochrane Library databases and by hand–searching reference lists. Included publications were analyzed for intervention (or topic) studied, main conclusions, strength of evidence and study design. RCTs were further analyzed for effect magnitudes and methodological details. Absolute risk reductions (ARRs) and numbers needed to treat (NNTs) were calculated. Fifteen publications fulfilled the inclusion criteria. There was a wide variation in the design and quality of the studies included. The RCTs revealed positive preventive effects of oral hygiene on pneumonia and respiratory tract infection in hospitalized elderly people and elderly nursing home residents, with ARRs from 6.6 to 11.7% and NNTs from 8.6 to 15.3 individuals. The non–RCT studies contributed to inconclusive evidence on the association and correlation between oral hygiene and pneumonia or respiratory tract infection in elderly people. Mechanical oral hygiene has a preventive effect on mortality from pneumonia and non–fatal pneumonia in hospitalized elderly people and elderly nursing home residents. Approximately 1 in 10 cases of death from pneumonia in elderly nursing home residents may be prevented by improving oral hygiene. Future research in this area should be focused on high–quality RCTs with appropriate sample size calculations.

## Commentary

This study analyzed previous research linking acute respiratory infections and pneumonia to oral hygiene in patients residing in hospitals and nursing homes. Its focus differs from the previous study discussed in that these patients were institutionalized. Pneumonia occurs commonly in this population, and it is the most common cause of death. A systematic review is a high level of evidence because it identifies, selects, evaluates and analyzes findings from all previous studies related to a well–defined research question. These authors wanted to determine if oral hygiene has an effect on pneumonia and respiratory tract infection in these elderly individuals. They developed a specific method for searching the literature published between 1996 and 2006, and also assessed the studies for type of intervention, main conclusions and strength of the study design. Studies included had to meet specific criteria for inclusion in the analyses. RCTs, which employ a control and experimental group, research controls and randomization, are considered high quality studies for inclusion. Therefore, they were further analyzed for main effects.

Of the 228 articles identified by electronic and hand searching of the literature, only 15 met criteria to be included. Four of the RCTs provided primary data that could be combined by the authors of this systematic review for secondary analysis. Findings indicated:

1. Positive effects of oral care on pneumonia or respiratory tract infections in nursing home or hospitalized elderly patients

2. A clinically relevant preventive effect for death from pneumonia for nursing home residents with weekly professional oral hygiene care by dental hygienists (with tooth brushing after every meal, alone, or in combination with 1% povidone iodine scrubbing of the oral pharynx by caregivers or nursing staff)

3. A possible reduction in the incidence of respiratory tract infection in hospitalized elderly patients undergoing heart surgery with use of a preoperative 0.12% chlorhexidine gluconate oral rinse

Non–randomized studies were also evaluated for the systematic review, although these studies are rated as a lower quality of evidence. Retrospective/prospective, longitudinal/cross–sectional or case–control research approaches were employed. Results indicated similar findings to the RCTs – a positive correlation exists between poor oral hygiene or denture hygiene and pneumonia or respiratory tract infection in dependent or frail elderly people. A positive correlation, once again, indicates that as 1 factor or variable increases, the other does as well, and vice versa – as 1 factor worsens, so does the second factor. In this case, poorer oral/denture hygiene was related to higher incidence of pneumonia or respiratory tract infections.

Absolute risk reduction was calculated at 6.6 to 11.7% of pneumonia cases. The authors concluded that mechanical oral hygiene (including weekly scaling by dental hygienists and tooth brushing by caregivers) has a preventive effect on pneumonia in institutionalized elderly. Further, the analysis indicated that 1 in 10 cases of pneumonia may be prevented by improving oral hygiene in these settings. Dental hygienists can make a difference when providing oral health services in long–term care facilities, and many are working in these settings. Practice restrictions and payment issues limit potential impact of dental hygienists in hospitals and nursing homes or long–term care facilities. Further research using well–designed RCTs should be conducted to determine beneficial effects.

## The Bottom Line

Each of these studies addressed the link between oral hygiene and respiratory disease: 1 in ambulatory patients with COPD, the other in elderly individuals in hospitals and nursing homes. Although dental hygienists are well aware of the oral health benefits of preventive and periodontal care we provide, it is interesting to note other possible positive outcomes, such as improved quality of life or prevention of acute systemic infections, including fatal pneumonia.

The findings of the first study suggest poor oral hygiene and missing teeth may be related to quality of life in patients with COPD. These individuals often have quality of life issues associated with chronic cough and dyspnea (shortness of breath) that can affect their normal daily activities. Strategies aimed at modifying factors which impact symptoms and enhance activities should significantly improve the well–being of COPD patients. This study would support inclusion of oral hygiene interventions for the prevention of lost teeth and the control of bacterial plaque biofilm in a comprehensive program for individuals with COPD because symptoms of COPD are impacted by missing teeth and higher plaque scores. Previous studies have shown that aspiration of oral bacteria may also exacerbate COPD or recurrent respiratory tract infections. Dental hygienists have the opportunity to educate individuals with COPD about the possible association between periodontal disease and COPD, as well as the possible positive impact of regular professional and daily oral hygiene regimens on their quality of life.

Both of these studies provide support for an association between oral hygiene and respiratory disease. Long–term randomized controlled clinical trials are needed to strengthen this evidence. In the meantime, the following conclusions can be drawn:

- Missing teeth and high plaque scores have been associated with poorer quality of life in patients with COPD – therefore, dental hygienists can discuss this possible association with these individuals as a part of their education about the need for regular professional dental hygiene/dental care and daily oral hygiene activities

- Residents of nursing homes and hospitalized elderly patients are at risk for pneumonia, and regular professional dental hygiene care provided in these settings can decrease incidence of respiratory tract infections and fatal pneumonia

## Summary

Although an association between respiratory disease and periodontal disease has been shown, there is not sufficient evidence to support a causal relationship. Evidence presented in this column indicates quality of life in COPD patients may be related to missing teeth and increased plaque scores. A systematic review also indicated that oral hygiene interventions, such as weekly scaling by dental hygienists and daily tooth brushing with or without povidone iodine swabbing, can reduce deaths from pneumonia and respiratory tract infections in elderly individuals residing in nursing homes. Findings also indicated a positive correlation exists between poor oral/denture hygiene and pneumonia or respiratory tract infection in elderly people who are hospitalized or living in long–term care facilities. This information indicates that oral hygiene and periodontal services for medically compromised patients and the elderly not only are important for improving or maintaining oral health, but also may impact systemic health and quality of life.

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# Bariatric Surgery and Implications for Oral Health: A Case Report

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## Abstract

**Purpose:** A case representative of issues dental practitioners may face when providing care to patients with a history of bariatric surgery is reviewed. Meta–analysis shows that, following bariatric surgery, 43 to 79% of diabetes, hyperlipidemia and hypertension in patients resolved to normal levels or no longer required therapy. However, bariatric surgery side effects have implications for oral health, including nutrient deficiencies impacting healing of oral tissues and gastroesophageal reflux, resulting in tooth erosion. Patients who have undergone bariatric surgery are seen with increasing frequency in dental offices and dental professionals need to be familiar with the challenges these patients present.


**Key words:** Bariatric, Disease, Oral Health, Periodontal Surgery

This study supports the NDHRA priority area, **Clinical Dental Hygiene Care:** Investigate the links between oral and systemic health.

## Introduction

Because of high rates of obesity, and the resultant 5 fold increase in bariatric surgery, it is likely the number of dental patients presenting with a history of bariatric surgery is also rising.[1–4] Heling et al found that 34% of patients reported an increase in frequency of dental visits following bariatric surgery, which further increases the likelihood more of these patients will be seen in the dental office.[5] This case report is representative of people undergoing bariatric surgery to reduce morbid obesity and manage chronic medical conditions.[1] Both before and after surgery, there are implications for dental care requiring careful follow–up. This report provides dental professionals with an overview of dental considerations to enhance their ability to provide bariatric patients with high quality preventive care and non–surgical periodontal therapy (NSPT), as prescribed.

## Review of the Literature

Bariatric surgery is not cosmetic surgery. Rather, it is medically necessary for many morbidly obese people to aid in loss of large amounts of weight to assist with risk reduction and management of chronic diseases that increase the risk of morbidity and mortality.[6] The implications of bariatric surgery, cardiovascular disease and diabetes for dental care will be briefly reviewed before sharing the details pertaining to the patient in this case report.

### Obesity

In the past 25 years, obesity in adults has doubled. The 2005 to 2006 National Health and Nutrition Examination Survey estimated that 34% of adults in the United States are obese as defined by a Body Mass Index (BMI) greater than 30 kg/m2, and 32.7% are overweight (BMI of 25 to 29.9 kg/m2), with 1.6 billion adults being affected worldwide.[2–4] Seventy–two million Americans and 400 million adults worldwide are obese (BMI>30 kg/m2).[3] Obesity is a systemic disease substantially raising the risk for co–morbidities and complications affecting overall health from chronic diseases such as hypertension, type 2 diabetes, coronary heart disease and stroke.[7,8] In addition to the link between obesity and chronic diseases, epidemiologic studies suggest an association between obesity and periodontal disease.[9–16] The link between periodontal disease and obesity, along with other chronic disease, such as cardiovascular disease, is proposed to be the biologic mediators of the inflammatory process.[12,17–20]

A meta–analysis supports bariatric surgery as an effective means of long term weight loss, therefore increasing the number of patients who undergo procedures such as gastric bypass and gastric lap band surgery.[6] As more patients present in the dental office with a history of bariatric surgery, it becomes crucial that dental professionals be familiar with these types of surgery and the potential impact on dental care.

### Bariatric Surgery

The impact of bariatric surgery on weight loss

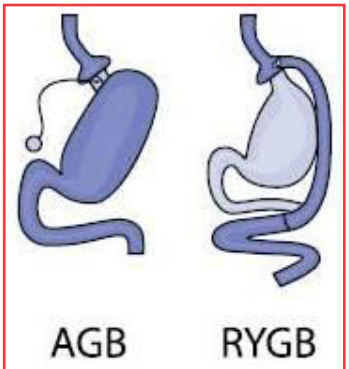
and chronic disease in a recent meta–analysis found diabetes resolved in 60% of cases, hyperlipidemia (high cholesterol and/or triglycerides) improved in 70% of patients and 43% had resolution of hypertension.[6] In the meta–analysis, resolution refers to the disappearance of the co–morbid condition or the condition no longer required therapy.[1] In addition to improvements in chronic disease, weight loss was significant and sustainable long term.[21,22]

The 2 categories of bariatric surgery include malabsorptive and restrictive. The most common bariatric surgeries are adjustable gastric bands (AGB) and Roux–en–Y gastric bypass (RYGP, Figure 1).[23] In malabsorptive–type surgeries such as RYGP, portions of the stomach and small intestine are bypassed, which leads to restriction of food intake along with reduction in the absorption capacity of the intestine. In restrictive–type surgeries, such as AGB, the mechanism of action is primarily a restriction in the amount of food consumed using a bracelet–like band that is placed around the upper part of the stomach and can be adjusted by adding or decreasing the amount of saline solution in the band or balloon.[24]

Following bariatric surgery, the stomach holds approximately 1 to 2 ounces, which requires the patient to eat frequent, small meals with the intake of fluids spread throughout the day. This frequency of meals puts the patient at increased risk for dental caries. However, the level of risk is dependent upon types of foods selected and other caries risk factors.[25] Bariatric surgery patients are encouraged to choose nutrient–dense foods, which reduces cariogenicity of the diet and minimize intake of empty calories, such as high fat and high–sugar type foods.[26] Another reason for increased caries risk and tooth erosion is the high prevalence of gastroesophageal reflux (GER) in the morbidly obese (73%) that is not entirely resolved following bariatric surgery.[27] GER may improve after RYGP, but it may worsen after AGB, with one–third of patients developing severe reflux.[27] In addition to issues with GER, bariatric surgery patients may also experience frequent vomiting.[5]

Another common problem experienced after bariatric surgery are nutritional deficiencies which have the potential to impact healing following dental treatment. Malnutrition and micronutrient deficiencies tend to be more common after malabsoprtive surgical procedures because of loss of intestinal surface for nutrient absorption, but it can occur in restrictive procedures as well.[24] A review of nutrition complications following malabsorptive–type bariatric surgery found the following incidence of nutrition issues: protein inadequacy (13 to 18%), vitamin A deficiency (12 to 69%), vitamin B12 deficiency (33%), iron deficiency (13 to 47%) and zinc deficiency (36 to 50%).[24,28] One concern for oral health professionals is the risk for calcium and vitamin D metabolic defects leading to issues with bone density following RYGP. Other studies found vitamin D depletion rose significantly beyond existing deficiencies from 57% to 63% in a 4 year span.[24] Research is needed to evaluate the long term impact on periodontal health. In restrictive–type surgery, nutrient deficiencies are less common because patients retain function of the entire gastrointestinal tract.[28] Therefore, the primary reason for deficiency in restrictive–type surgery is poor food selection.

Figure 1: Diagram of common bariatric surgeries.




Courtesy of Dr. Walter Pories, MD

An additional concern for patients who undergo bariatric surgery is the risk of gastric cancer. According to an article by Collins et al, historical cohorts demonstrate an increased incidence of gastric cancer in patients with gastric and duodenal ulcers after bariatric surgery.[29] This is due to inflammation, ulceration and hyperproliferative changes to the squamous epithelium of the esophagus caused by chronic reflux post surgery.[29] However, incidence is thought to be less in patients with the RYGP due to the anatomical differences between this surgical procedure and other gastric operations, such as distal gastrectomy.[30] Although the risk of developing gastric or esophageal cancer is a concern, overall bariatric surgery has shown an inverse association (reduction) for cancer incidence and mortality for all cancers.[31,32]

**Diabetes**

Diabetes is a chronic disease in which the body does not produce or properly use insulin, and type 2 (the most common form) specifically results from insulin resistance. Diabetes requires significant self care by the patient to maintain glycemic control and reduce the incidence of complications.[33] Research about the relationship between poorly controlled diabetes and severity of periodontal disease and tooth loss suggests a correlation.[18,34–36] Since poorly controlled diabetes increases the risk for more severe periodontitis, periodontal therapy

Table I: Sample Questions to Ask the Patient's Medical Provider and Implications for Dental Care

| | Rationale | Question | Answer |
|---|---|---|---|
| INR | Patient reports anticoagulant use and bleeding is anticipated with non–surgical periodontal therapy. To ensure patient safety, a consultation is needed to determine the patient's INR and whether modification of current anticoagulant regimen is necessary. | What was the date of the most recent INR and the result? Do you recommend the patient reduce dosage or stop use for several days prior to dental appointments when bleeding is anticipated? | Therapeutic range for the INR is between 2.5 + 0.5. Hemorrhage should not be an issue if the patient's INR is >3.0. In certain procedures where significant bleeding may occur, modification of the warfarin regimen may be necessary. |
| Hemoglobin A1c | Patient reports a history of diabetes and is at increased risk for prolonged healing time. There is a strong correlation between diabetes and periodontal disease and the inflammatory process in periodontal disease may negatively impact glycemic control. | What was the patient's last HbA1c level and the date of test? Has the patient been compliant with self–management of their diabetes? Do you the patient's diabetes controlled? | Goal: <7%. Patients with a goal of <6% may be at higher risk for hypoglycemic events. |
| Fasting Blood Glucose (FBG) | Need to know history of FBG as this is needed in addition to the HbA1C to access glycemic control. The recommended medication regime helps the dental practitioner determine patient compliance. | What is the patient's fasting blood glucose level? What type of oral medication and/or insulin regimen and usual dosage is the patient currently taking? | Glucose levels between 90 and 130 mg/dl and below 180 mg/dl 2 hours postmeal although these numbers may be higher for those at high risk for hypoglycemia. |
| Hypoglycemia | History of hypoglycemia is a predictor of future episodes so this information is essential to anticipate and prevent a medical emergency. | Have you had problems with hypoglycemia? What time of day does this usually occur? Have you had hypoglycemia during dental treatment? Have you been hospitalized for hypoglycemia? | If the patient reports history of hypoglycemia, ensure they ate a snack or meal with protein and/or fat prior to appointment. Check blood glucose with a glucometer.to ensure it is safe to proceed with treatment. |

must be part of the comprehensive care of the patient with diabetes.[18,35]

Despite the connection between uncontrolled diabetes and severity of periodontal disease, inconsistent research findings make it less clear that controlling periodontal disease improves metabolic control of a patient's diabetes.[34,37–43] Regardless of inconsistent research findings, medical and dental practitioners need to encourage patients to manage their periodontal health since it may be one of the factors involved in glycemic control.[36] In addition, dental professionals need to be concerned with the patient's glycemic control prior to beginning dental treatment to maximize healing and to prevent medical emergencies, such as hypoglycemia, in the dental chair (Table I). Ultimately, by taking a few precautionary steps and looking at the overall health of the patient, as well as periodontal health, dental professionals can aid in playing an essential role in the treatment of patients with diabetes.[35]

**Cardiovascular Disease**

Although bariatric surgery resolves conditions associated with cardiovascular disease, including hypertension and dyslipidemia (in 43 and 70% of patients respectively), the disease may still be a condition that has to be managed. In order to safely treat patients with a history of cardiovascular disease, the clinician needs to minimize hemodynamic changes.[6] If a patient has a history of ischemic heart disease, cardiac arrhythmias, cerebrovascular accident or anti–coagulant therapy, the following approaches to minimizing hemodynamic alterations should be implemented: shorter appointments in the morning so the patient is more rested and able to withstand stress, profound local anesthesia for pain control, possible conscious sedation and adequate pain control post–operatively.[44]

Hypertension blood pressure is a parameter that

should be routinely monitored to identify those patients at risk for hypertension and/or medical emergency during dental care. Hypertension affects 1 in 3 people in the United States.[45] Stage 1 hypertension is defined as a common, often asymptomatic disorder characterized by elevated blood pressure persistently exceeding 140/90 mmHg.[45] The National Institutes of Health's joint commission defined 4 levels of classification for blood pressure in adults (Table II).

Table II: Blood Pressure Classifications

| Stage | Systolic | Diastolic |
|---|---|---|
| Normal | < or = to 120 mm Hg | < or = to 80 mm Hg |
| Prehypertension | 120–139 mm Hg | 80–90 mm Hg |
| Stage 1 Hypertension | 140–159 mm Hg | 90–99 mm Hg |
| Stage 2 Hypertension | > or = to 160 mm Hg | > or = to 100 mm Hg |

Epidemiologic evidence suggests an association between hypertension and periodontal disease in a dose–dependent fashion, meaning that higher blood pressure is associated with more severe periodontitis.[46] A dental consideration for hypertensive patients is use of local anesthetic containing a vasoconstrictor, such as epinephrine, since there is a small risk of adverse events.[47,48] "Safe and effective periodontal management of such patients requires close medical and dental coordination, an understanding of the potential hazards during dental treatment, knowledge of drugs used in treatment of cardiovascular diseases, and the potential adverse effects of drugs commonly used in periodontal practice."[49] It is important for members of the dental team to have a thorough understanding of cardiovascular disease along with its potential effects on the periodontium in delivery of periodontal therapy.[20]

### Anti–coagulant Therapy

Another medical consideration that must be addressed prior to dental care is patients taking anticoagulants, as this poses a risk for hemorrhage from invasive dental procedures, such as periodontal therapy.[20] A medical consultation should precede any invasive dental treatment to determine the patient's most recent Prothrombin–time (Pro–time), international normalized ratio (INR) and potential need to adjust dosage of anticoagulant.[20] This is especially critical if the patient requires dental procedures where bleeding is anticipated, such periodontal surgery, NSPT or extractions.[49] A thorough medical history and consultation with the medical provider prior to starting treatment eliminates a potentially life–threatening medical emergency caused by anticoagulant therapy (Table I).

The literature is clear concerning patients with multiple medical conditions – they require careful consideration. Many of these conditions could have dental implications or affect the course of non–surgical periodontal therapy based upon whether or not the conditions are stabilized and controlled. In order to ensure safety of the patient, clinicians must take steps to gather additional information regarding the patient's current status from the medical practitioner prior to beginning dental treatment. "The ideal management of such individuals should involve the collaborative efforts of health care providers, nurses, dentists and dental hygienists, thus optimizing treatment and minimizing secondary complications derived from the oral cavity."[50]

## Patient Assessment

N.P., a 54 year old Hispanic male, presented to the dental clinic with a chief complaint of "needing to have his teeth cleaned." The patient moved to the United States from Mexico 22 years ago, and has had very limited dental treatment. He was 5'7" and weighed 418 pounds with a BMI of 65.5. Initial vital signs included a blood pressure reading of 116/60 and respirations at 20 breaths per minute. N.P. reported a history of hypertension, hyperlipidemia, pulmonary embolism, bariatric surgery (lap band), Type 2 diabetes mellitus and osteoarthritis. The patient lost 60 pounds following bariatric surgery (gastric lap band) in 2002.

The medical provider was consulted prior to dental treatment due to the medically compromised condition of the patient (Table III). Effective communication between the dental and medical professionals was necessary to ensure that the patient's needs were met and to monitor Pro–time, INR and hemoglobin A1c (HbA1C) levels during treatment. Table I provides an overview of issues addressed with the medical provider as well as their implications of the information for dental care.

N.P.'s health care provider indicated his most recent HbA1c was 8.2%, which equates to an average blood glucose over 182 mg/dl.[27] The goal for HbA1c in non–pregnant adults is less than 7% to prevent microvascular complications.[27] Re–evaluation of his HbA1c was scheduled for his next medical visit. In consultation with the medical provider, it was determined N.P. should stop taking Coumadin® 2 days prior to each NSPT appointment.

## Results

N.P.'s occlusal surfaces exhibited generalized extreme wear and/or erosion, and he complained of dentin hypersensitivity (Figure 2). A caries risk assessment and diet recall was performed to assess the patient's diet to determine its impact on the dentin hypersensitivity and caries risk. During the dietary assessment, N.P. reported severe GER problems limited his food selection.

Periodontal assessment revealed (Figure 3a–d, Figure 4, Figure 5):

- Generalized 4 to 6 mm probing depths on posterior teeth
- Furcation involvement, which included Grade I buccal of the maxillary left first and second molar and ML and Grade II buccal of the maxillary left third molar
- Tooth mobility – Class I maxillary left central incisor
- Bleeding Index: 39.8%
- Plaque Index: 100%

Preventive and Periodontal Treatment

Based on generalized moderate chronic periodontitis as evidenced by clinical attachment loss, radiographic bone loss, furcation involvement, tooth mobility, heavy calculus deposits and bleeding on probing, full mouth NSPT was prescribed along with oral hygiene instruction. Other preventive services to address dentin hypersensitivity and caries risk included fluoride therapy and nutrition counseling.

It is hypothesized that N.P.'s severe GER contributed to generalized occlusal erosion, dentin hypersensitivity and dental caries based on the high incidence of GER in obesity and post–gastric lap band surgery.[23,25,45] In addition, his dietary recall demonstrated GER impacted his ability to consume an adequate nutrient–dense diet. This had the potential to impact his immune response and ability to heal. His poor dietary intake was also a significant concern in regard to managing his diabetes.

The patient reported for 4 appointments for quadrant NSPT with local anesthesia over a 5 week period. Ultrasonic and hand instrumentation was utilized for debridement and disruption of plaque biofilm and calculus removal. Fluoride varnish was applied to assist with desensitization and caries prevention.

Periodontal re–evaluation was completed 6 weeks following completion of NSPT. Patient's

Table III: Medical History & Medications

| |
|---|
| Gastric lap band surgery (2002) |
| Gastroesophageal reflux disease (GERD)<br>• Medication: None |
| Pulmonary embolism (July 2007)<br>• Medication: Coumadin® (Warfarin), 7.5 mg is taken daily in PM |
| Hypertension and for 20 years<br>• Medication: Lisinopril 20 mg daily in AM; HCT® (Hydrochlorothiazide) 12.5 mg daily in AM; Lasix® (Furosemide) for diuretic, 80 mg daily in PM |
| Type 2 diabetes for 22 years<br>• Medication: Insulin,(Novolog® Mix 70/30 (FlexPen®) daily, usual dosage is 50 units in AM. and 40 units in PM |
| Hypercholesterolemia<br>• Lipitor® (Atorvastatin), 20 mg daily in PM |
| Patient has osteoarthritis and inflammatory rheumatism in back<br>• No medication |

Figure 2a: Maxillary Arch

Figure 2b: Mandibular Arch

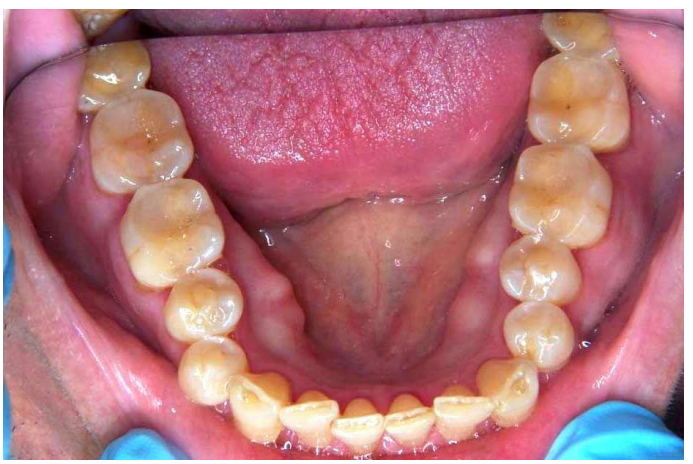


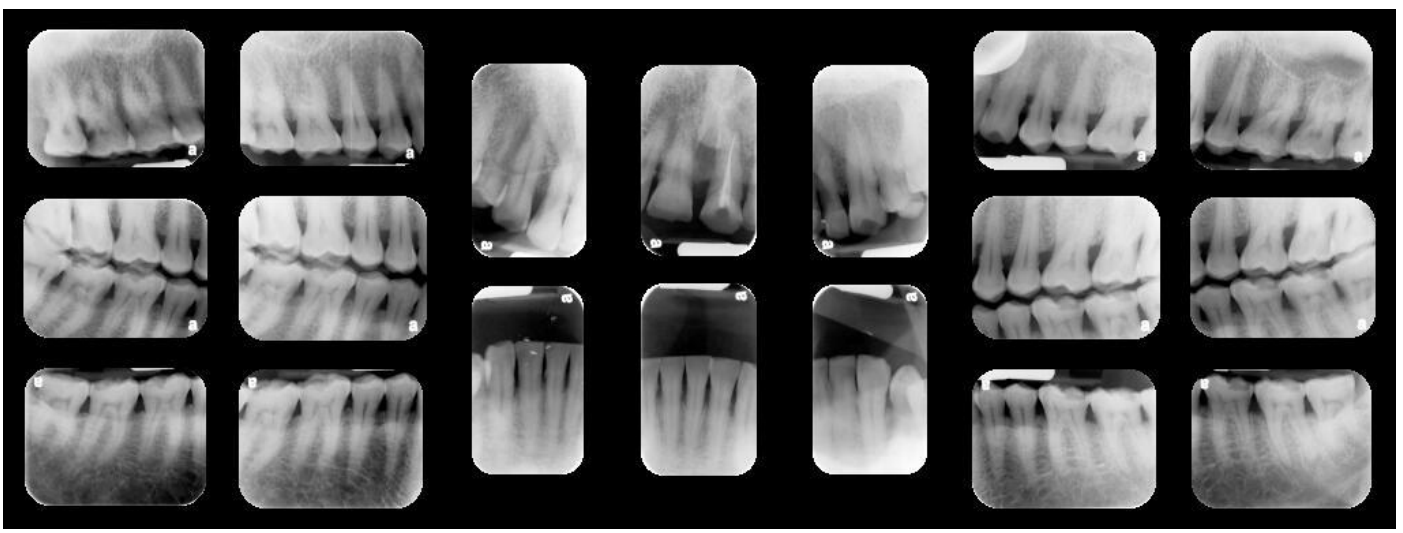
Figure 3a: Anterior View

Figure 3b: Buccal Mandibular Left View

Table 3c: Buccal Mandibular Left Third Molar

Table 3d: Lingual Maxillary Left View

Figure 4: Radiographic Full Mouth Series



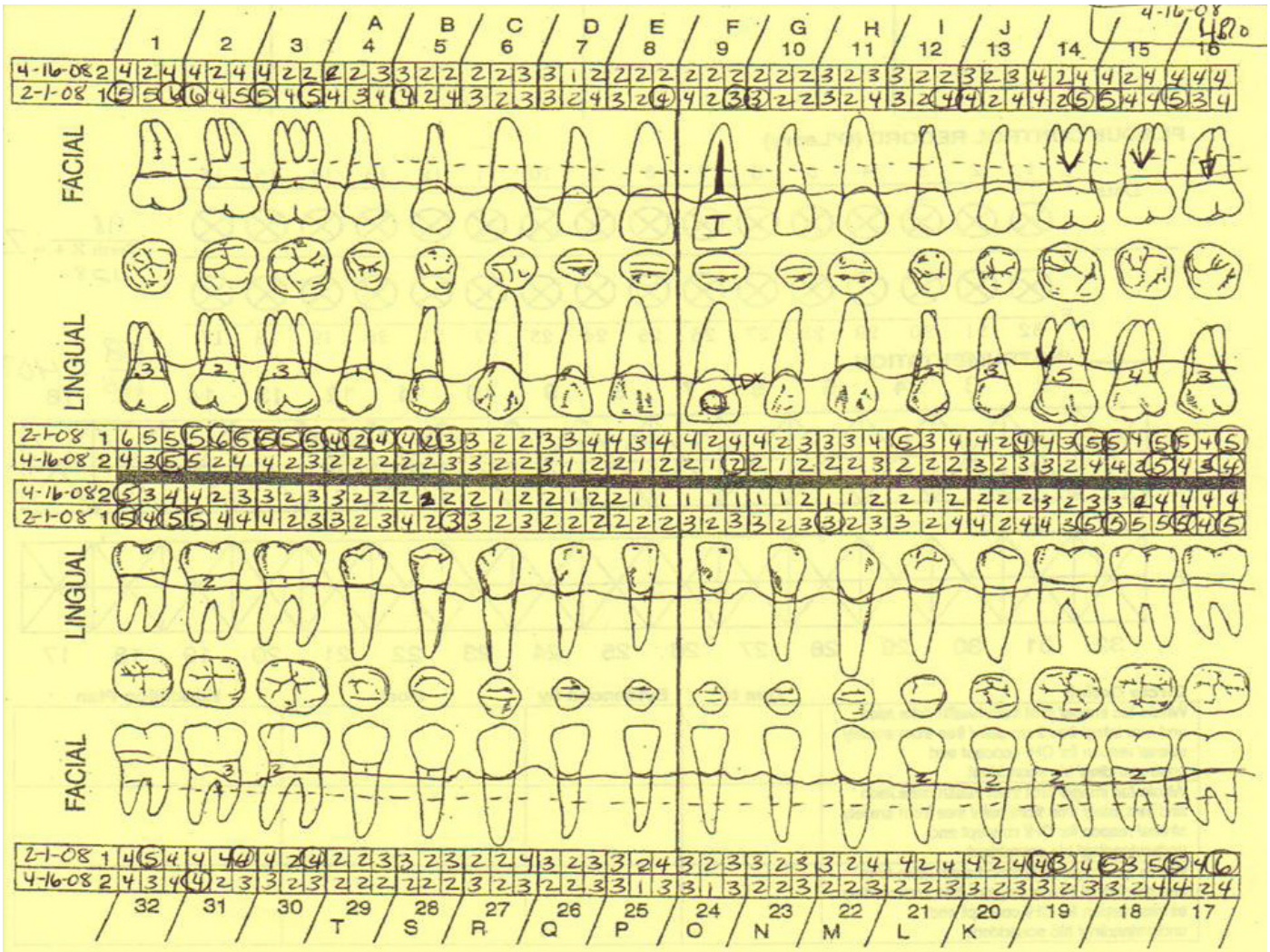
bleeding and plaque index improved from 39% and 100%, respectively, at baseline to 4.6% and 40%. Oral self–care was reviewed and reinforced. Periodontal data collection revealed pocket depths improved with all posterior areas measuring 4 mm or less. Monitoring and periodontal maintenance were planned at 3 month intervals. In addition to improvement in periodontal health, N.P.'s patient medical provider reported his HbA1c decreased to 7.7%, an improvement of 0.5% in the 4 months from baseline to re–evaluation. There are many factors that could have contributed to this positive shift in HbA1c levels. However, this is consistent with reductions in HbA1c in research reports following NSPT.[33]

## Discussion

This case was representative of issues dental providers face when providing care for bariatric surgery patients. Students, dentists and dental hygienists often learn about medical conditions in isolation, so cases like this present an opportunity to learn how to manage more complex patients seen routinely in dental offices. The role of the dental professional is increasingly challenging as the population grows more medically complex. In this particular case, significant investigation, consultation and education with the medical provider were required in regard to bariatric surgery and the chronic diseases this patient exhibited prior to providing dental treatment. The medical providers for this case were unaware of the need for the dental professional to be informed about neither glycemic control nor the potential impact that periodontal inflammation might have on diabetes control. Persistence by the dental practitioner was required to gain the necessary information prior to beginning treatment. This case presented the opportunity for educating the medical provider about the oral–systemic link. Even though communication between the dental professional and medical professional is essential to determine the best course of treatment for the medically compromised patient, many medical professionals may have limited knowledge about the oral–systemic connection.

Equally important is the feedback dental professionals can provide to the medical practitioner to help further regulate medical conditions and diseases. This case required follow–up bariatric surgery and surgical replacement of the gastric lap–band with new one, due to the poor weight

Figure 5: Periodontal Assessment




loss and severe GER. Medical providers were unaware of the impact of uncontrolled GER on oral health and potential for increased risk for esophageal cancer.

## Conclusion

The medically compromised dental patient requires extra precaution to ensure the patient's well–being and safety while providing dental hygiene care. Bariatric surgery patients seen in the dental office are at risk for a number of oral health related issues requiring management. The interprofessional health care team must work together to develop a comprehensive care plan to address all the patient's short and long–term medical and dental needs. The collaboration between the dental professional and medical professional is a vital component to determining the best course of treatment for the medically compromised patient. By working together, a comprehensive care plan can be created with all the patient's needs taken into consideration and met by the recommended dental treatment.

**Recommendations**

Dental professionals need to become more aware of the dental implications that bariatric surgery patients may present with at the dental office. Careful review of the patient's medical, medication, dental and psychosocial history is essential to determine the extent of consultations needed with other health care providers to ensure safe and effective prevention and management of oral disease. Because the literature suggests chronic diseases such as hypertension and diabetes mellitus may improve or resolve following bariatric surgery, close collaboration with medical providers will be necessary in order to monitor the patient's status in regard to blood glucose, INR and blood pressure.

The areas of particular interest for the bariatric patient include an understanding of the side effects the patient may be experiencing, such as vomiting, GER and possible challenges obtaining adequate nutrient intakes. These issues may impact oral health in a number of ways by increasing the risk

of dental caries, tooth erosion, esophageal cancer and poor healing following NSPT, surgery or extractions as result of nutrient deficiencies. These conditions present opportunities to collaborate with other health care providers to ensure the patients overall well–being.

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# Innovations in Education and Technology

## Use of Social Networking for Dental Hygiene Program Recruitment

Rachel S. Ennis, RDH, BA


### Abstract

**Purpose:** Social networking has become a popular and effective means of communication used by students in the millennial generation. Academic admissions officers are beginning to utilize social networking methods for recruitment of students. However, the dental hygiene literature has reported little information about the use of social networking for recruitment strategies.. This paper describes one institutions' process of creating and implementing a social network site for prospective and current students.



**Keywords:** Social networking, recruitment, admissions, dental hygiene, technology

This study supports the NDHRA priority area, **Professional Education and Development:** Identify the factors that affect recruitment and retention of students and faculty.


## Introduction

Social networking has become one of the most popular and effective means of communication used in our society today, especially with the Millennial generation (defined as those born after 1980). Because of the changing dynamics of this generation, it is necessary to consider different recruitment tactics employed by college programs to attract this population. Characteristics of this generation include constant, open communication, personal fulfillment and positive reinforcement with multiple mentors.[1] Social networking can be used to advertise virtually anything from entertainment (including restaurants, venues and events), to the health profession, sports, politics, literature and education programs.

Facebook, one of the most popular social networking mediums, has evolved from a social web site used mostly by college students, to a medium that can be used by virtually anyone who wishes to advertise a product. Facebook allows users to design and create a profile, which acts as a personalized website. The unique aspect of Facebook is that it enables social interaction within the site. The creator (or administrator) is able to control virtually every aspect of communication within the page. This includes who can access and contribute to what is presented within the profile, post links, photos, comments and discussions.

Graduate school admissions and college officers are using Facebook for recruiting, instead of relying on more traditional methods like mass mailings or emails. They are able to communicate with potential students and provide up–to–date news on the school.[2] Nora Barnes, director for the Center for Marketing Research at the University of Massachusetts–Dartmouth, confirmed this method of recruitment: "If you're an undergraduate or graduate institution and you're looking to attract people 35 and under, then I think you have to go to Facebook because that's where your opportunity is."[2] This type of social networking medium is one of the most promising recruitment tactics for Dental Hygiene programs appealing to Millennials.

### Development of the Social Network

In August 2009, Dr. Nancy Williams, Graduate Program Director for the University of Tennessee Health Science Center Master of Dental Hygiene Program (UTHSC MDH), proposed the idea of creating a Facebook page for the UTHSC MDH program. She indicated that she would like it presented in a professional way, allowing prospective students to become acquainted with the program, as well as creating a place for current MDH students to interact. Thus, the UTHSC MDH Facebook page, a site for both prospective and current students, was developed.

To begin the process of creating the UTHSC MDH

group page, several education–related pages were evaluated to study different layouts and designs. Initially, the page was set up as a "closed network," meaning a member had to be invited to join the page. The creator of the page was appointed as the sole administrator. Only the creator had access to page design and the ability to post topics, photos and links. In designing the page, the information section was developed first, including a brief description of the UTHSC MDH Program and an email contact. Next, links to the MDH curriculum and the UTHSC MDH website were added. An additional link to Dr. Kathleen King's website, the keynote speaker for the 2 previous years at the MDH summer week, was also included.

Under the discussion board section of the page, several topics were posted. Members of the page could post personal entries related to the topics, which included: the MDH summer week, former graduates' discussion of where they were currently employed, personal experiences with the MDH program, upcoming meetings and an invitation for prospective MDH students to submit questions. Dr. Nancy Williams, the MDH graduate program director, was added as an administrator, and her email address was provided. "Friend requests" were sent to all of the current MDH students, several past MDH graduates, current faculty members and some administrators. Dr. Susan Crim, the Dental Hygiene Department Chair, was contacted requesting permission to place a link to the MDH facebook page on the UTHSC Dental Hygiene website. The page had to be reviewed and approved by UTHSC administrators, as this was a relatively new concept. An information technology specialist was added as an administrator, in accordance with UTHSC protocol when using their website. The American Dental Hygienists' Association was also contacted, requesting to have a link to the page listed on their website.

After a link to the page was posted on the UTHSC MDH website, the settings for the page were modified, thereby creating an open network, so anyone could have access without needing an invite or requesting to join. Any member of the group page could post topics on the discussion board, add links or write on the wall. For the photo section, class composites of all 4 of the MDH classes that have been enrolled in the program beginning with the class of 2006 were posted. Also posted were photos of current faculty members, photos from MDH summer week and photos of MDH students at their graduation. Several photos depict activities from MDH summer week, including classroom/lecture, sightseeing activities and restaurant activities, all making the summer week look appealing and exciting. After uploading and posting the photos, they were tagged, which refers to a means of identifying the subjects of photos. In this instance, MDH students and faculty were tagged, and an email was then sent to the tagged individual alerting them that a picture identifying them had been posted on the page. Several students have contributed comments in the photo section.

At the beginning of January 2010, MDH applicants were invited to join the page, enabling prospective students to get a more personal feel for the program. They would be able to read the interactions between current and former students and faculty, and see photos. The photos and discussion board posts related to MDH week would allow the student to get an idea of what transpires during this period. Current students have been encouraged via email and through class discussion boards to visit the page and contribute to discussion board posts, including their experiences with MDH week, and upcoming meetings or events.

Participation from current MDH students is a challenge, due to time constraints. To address this concern, a short survey asking current MDH students to provide feedback on the page was sent out. The questions addressed the students' access to the page, whether they had posted comments and if they felt the page was beneficial to current students and/or prospective applicants. The general consensus was that the page was indeed being used and it was beneficial, especially for the purpose of recruiting prospective applicants. For current students, although they enjoyed having access to the page, time was a factor in using the page on a regular basis. From a recruiting perspective, students admitted to the MDH class of 2010 are now joining the page, contributing to the posts and asking questions, which serves to benefit all of the incoming students. Prior to this social network, students would have had to address the program director individually with their concerns.

**Social Networking and College Recruitment**

Although there is no current literature available for social networking and recruitment for dental hygiene programs, there is literature addressing current trends in college recruitment. In a report by Noel–Levitz, one of the strategies that is suggested for campus e–recruitment programs involves making the recruitment process a social experience.[3] A key strategy for any e–recruitment communication program is that it must allow personalization that encourages socialization. Students are looking for places where they can interact through blogs, instant messaging and social networking pages related to the program they want to study. "The authen-

tic voices of your students, faculty, staff, and alumni are important and compelling."[3]

One social networking site called Zinch is specifically geared to network with colleges. Students can fill out personal profiles that give colleges their information. Over 450 colleges use this site as a recruiting tool, and over 300,000 students currently make themselves available for the website. "Many traditional recruiters and training and development services may soon find themselves out of business unless they take advantage of the social networking revolution and its growing impact on business and training."[4]

The National Association for College Admission Counseling has conducted research indicating that the use of social networking tools is increasing in college admission offices. "Eighty–eight percent of admission offices believed social media were either 'somewhat' or 'very' important to their future recruitment efforts."[5] Additional research needs to be done concerning the success of recruitment for colleges and the cost/benefit relationship when using social media. Ethical and legal issues and the establishment of formal policies for the use of social media in recruitment and admissions also need to be addressed.[5]

According to a report on college recruiting of Millennials, social media will change the way almost all recruiting takes place.[6] Students are accustomed to having information available on a website all the time. It is no longer practical for university administrators to designate specified times and places for recruitment. "The smart organization will have an up–to–date, youth–oriented website for college recruiting and offer a variety of ways to interview, including online and virtual interviews," and this type of recruiting will allow colleges to create relationships with prospective students and recruit them over time.[6] This virtual experience for students allows them to access the information on their own terms.

With the UTHSC MDH page, students are able to use the site on an as needed basis. Prospective applicants can access the site for program information, and they are able to see the interaction between current MDH students and faculty, as well as ask questions about the program. They can get a more personal feel for what the program can offer.

## Conclusion

The current literature on college recruiting emphasizes the importance of social networking for successful recruiting. Because it is a relatively new concept, the use of social networking for students that are not part of the millennial generation is a more challenging dilemma. Encouraging social networking with this particular group of students is not too difficult – with the MDH program at UTHSC, online communication is already part of the program. As a result, students are engaged in a kind of social networking already. From a recruiting standpoint, as long as the MDH page is attracting attention to prospective and recently admitted students, this project has been a worthwhile endeavor. Current students can still enjoy the benefits of using the page on an as needed basis.

In March of 2010, a formal request was sent to Dr. Nancy Williams and Dr. Susan Crim to continue the administration of the UTHSC MDH page as a capstone project. This will allow the monitoring of the page for 2 more years of classes entering the program, and will give the administrators a better feel for the benefit of social networking for program recruitment and current students.

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# Extending Oral Health Care Services to Underserved Children through a School–Based Collaboration: Part 1 – A Descriptive Overview

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## Abstract

**Purpose:** The purpose of this report is to describe the process and outcomes of a collaborative, comprehensive preventive oral health program between the University of Missouri–Kansas City School of Dentistry, the Olathe School District and an Extended Care Permit I dental hygienist. The report describes the programs collectively working to provide school–based services to disadvantaged children in 4 Title I schools using the community collaborative practice oral health model and tele–dentistry.

**Methods:** The "Miles of Smiles" clinic was assembled in 4 elementary schools using portable dental equipment. Dental hygiene students, supervised by a dental hygiene faculty member with an extended care permit, provided comprehensive preventive oral health care to unserved and underserved children.

**Results:** Twenty–eight dental hygiene students provided prophylaxis, radiographs, sealants, fluoride varnish, oral health education and nutritional counseling to 339 children in the Miles of Smiles clinic during the 2008 to 2009 academic year. Sixty–three percent of children had decay and were referred to a dentist. Upon re–evaluating at the end of the school year, 11% had begun the transition process of seeking restorative care at a safety net clinic or from a local dentist.

**Conclusion:** School based oral health models, using dental hygienists with expanded scopes of practice to provide preventive oral health services and referrals, can serve as one approach to overcoming barriers and reaching vulnerable children that desperately need oral health care. However, transitioning children outside of their school to a safety net clinic or local dentist to receive restorative care was found to be problematic.

**Key words:** access to care, dental hygiene education, community–based dental education, dental care for children, oral healthcare for the underserved, portable equipment, teledentistry, school–based oral health

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## Introduction

The landmark publication Oral Health in America: A Report of the Surgeon General brought national attention to the fact that in the United States, the public infrastructure for oral health care services is insufficient to meet the needs of all Americans.[1] The report highlighted the extent of unserved and underserved populations where race, ethnicity and socioeconomic status factored significantly into the unequal distribution of services. Chronic dental disease is a concern for unserved and underserved populations of all ages, but especially in young children, where it is more prevalent than asthma and hay fever.[1] The National Call to Action to Promote Oral Health, a follow–up report to the Surgeon General's Oral Health in America, seeks to bring multiple stake holders together with 3 common goals: promote oral health, improve quality of life and eliminate oral health disparities.[2] The report noted that school children should not be unable to concentrate as a result of pain from untreated dental infections. Of the action items in the report, only 1 of the 5 specifically called for an "increase in the oral health workforce diversity, capacity and flexibility."[2] This paper will describe the implementation and initial outcomes of a school–based oral health program directed at children in need.

**Background**

There is growing consensus among governmental and professional organizations that changing the profile of dental hygienists to increase their involvement in public health can help improve access to oral health care.[3–6] Currently, 29 states allow dental hygienists:

- Direct access to initiate treatment based upon their assessment of a patient's needs without specific authorization of a dentist
- Treatment of a patient without the presence of a dentist
- Maintaining a provider–patient relationship[7]

In 2003, Kansas became one of these states when legislature passed a bill that expanded the scope of practice allowing dental hygienists with an Extended Care Permit I (ECP–I) to provide screening, education, preventive dental hygiene services (such as apply fluoride varnish) and topical anesthesia application in certain community based sites under the sponsorship of a dentist.[8] The parameters of the ECP–I are delineated in Figure 1.

Figure 1: Extended Care Permit I

- Tasks and procedures preventive in nature may be performed by a dental hygienist with and Extended Care Permit I with consent of the parent or legal guardian of children birth to five and children in public and nonpublic schools kindergarten through grade 12 regardless of the time of year and children participating in youth organizations, so long as such children birth to five, in public or nonpublic schools or participating in youth organizations also meet the requirements of medicaid, healthwave, or free or reduced lunch programs or Indian health services
- Tasks and procedures are limited to:
  - Removal of extraneous deposits, stains and debris from the teeth and the rendering of smooth surfaces of the teeth to the depths of the gingival sulci
  - The application of topical anesthetic if the dental hygienist has completed the required course of instruction approved by the dental board
  - The application of fluoride
  - Dental hygiene instruction
  - Assessment of the patient's apparent need for further evaluation by a dentist to diagnose the presence of dental caries and other abnormalities
  - Other duties as may be delegated verbally or in writing by the sponsoring dentists consistent with this act
- Dental hygienist must have performed 1,200 hours of dental hygiene care within the past three years or have been an instructor at an accredited dental hygiene program for two academic years within the past three years
- Dental hygienist must have proof of professional liability insurance
- Dental hygienist must be sponsored by a dentist licensed in the state of Kansas, including a signed agreement stating that the dentist shall monitor the dental hygienist's activities
- Dental hygienist must advise the patient and legal guardian that the services are preventive

**Kansas Dental Practice Act 2009[8]**

As a result of this change in the dental practice act, the "hub and spoke" model of service delivery (Figure 2) has evolved in Kansas, allowing the ECP–I dental hygienist to provide dental hygiene services to people where they live, work, go to school or receive social services. It has also allowed hygienists to refer patients back to safety net clinics or dentists willing to provide care in traditional private dental practices for care beyond the scope of practice for an ECP–I dental hygienist.[8,9] Safety net dental clinics are generally community based oral health providers located in low income locales. These clinics provide care to diverse populations that lack access to care, and are usually sponsored or situated in public health departments, community health centers, Indian Health Service Clinics, non–for profit agencies, dental schools, dental hygiene programs, school–based clinics and mobile dental vans.[10] This change in legislation, combined with implementation of the dental hub program, allowed Kansas to improve their overall grade of a D+ from Oral Health America in 2003 to a B in 2009.[11,12] The grades provided by Oral Health America offers a snap shot of the oral health in Kansas by looking at factors that contribute to good oral health.

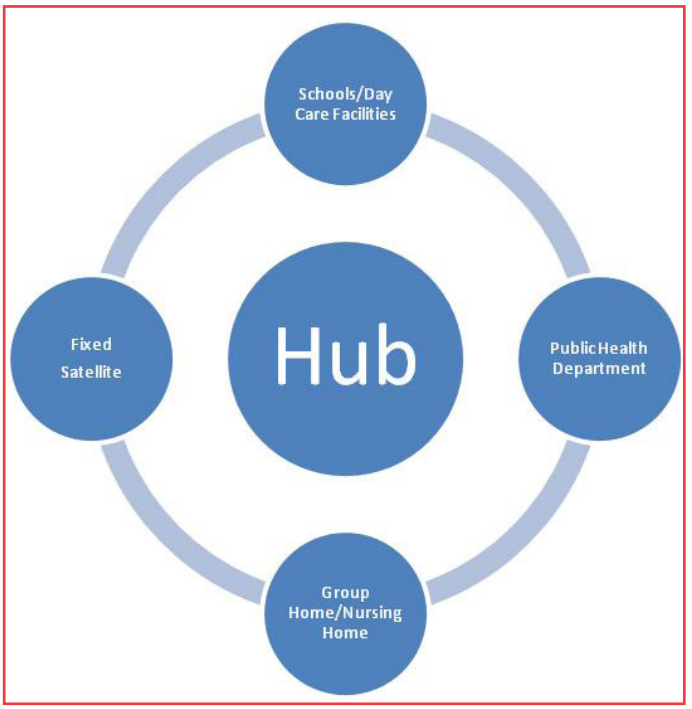
Although the infrastructure in Kansas has changed to improve access to care, the financial aspects required to access care are still problematic. The State Children's Health Insurance Program (SCHIP) was enacted in 1997 to expand health care services to low income children and pregnant women from families who do not qualify for Medicaid and are unable to afford private insurance. Until February 4, 2009, dental coverage was optional under the SCHIP program. The SCHIP reauthorization includes oral health provisions, as well as a dental wrap provision, where children of families that meet income and other eligibility SCHIP requirements that also have medical benefits through an employer–sponsored medical insurance plan can still access dental care through SCHIP.[13] Medicaid's Early Periodic Screening, Diag-

nostic and Treatment Program has always included comprehensive dental coverage for low income children, however, the numbers of participating dentists falls far below that needed to provide necessary services in a timely manner.[14] Deterrents reported by dentists include low reimbursement rates, administrative hassles and frequent broken appointments.[13] This was tragically illustrated in 2007 when 12 year old Deamonte Driver of Maryland died as a result of complications from an acute dental infection that spread to his brain. On January 11, 2007, Deamonte came home from school with a terrible headache. Eventually, he was rushed to Children's Hospital, where he underwent emergency brain surgery and subsequently died on February 25, 2007. Deamonte never received routine dental care. The Driver family, like many others, experienced systemic problems with the Medicaid system, compounded by barriers such as lack of transportation, bouts of homelessness and erratic telephone and mail service.[15] This case exemplifies the severity of dental access problems facing children in low income families and blatantly highlights the importance of publically funded dental programs for children.

While one could argue about the responsibility and role of the adults in Deamonte's life (mother, absent father, Medicaid administrators, dentists, etc.), the child was the innocent victim in this circumstance. On February 14, 2008, *One Year Later: Medicaid's Response to Systemic Problems Revealed by the Death of Deamonte Driver* was presented to the Domestic Policy Subcommittee of the House Oversight and Government Reform.[16] Burton L. Edlestein, DDS, MPH, Chairman of the Board of Children's Dental Health Project, an independent non–profit organization committed to improving children's access to oral health, testified about the federal government's roles and responsibilities in ensuring that children with Medicaid have access to dental care which is promised to them by federal law. Edlestein stated that "a new and concerted effort to reduce disease burden, focus care on children at greatest risk, and maximize the capacity of dental Medicaid programs is essential."[16] The 2010 PEW report, *The Cost of Delay: State Dental Policies Fail One in Five Children*, noted the national crisis of poor dental health and lack of access to care among disadvantaged children is a result of 3 broad systemic factors:[17]

1. Too few children have access to proven preventive measures, including sealants and fluoridation
2. Too few dentists are willing to treat Medicaid–enrolled children
3. In some communities, there are simply not enough dentists to provide care

Figure 2: Hub and Spoke Model[9]




Policymakers are called to address the oral health access to care problems and must address workforce capacity to find innovative solutions that will meet the needs of all sectors of the United States population.[3,17]

With this background surrounding access and disparity of oral health care services, this report describes an innovative workforce model that involves a collaborative program between the University of Missouri–Kansas City (UMKC) School of Dentistry, the Olathe School District and an ECP–I dental hygienist, collectively working to provide school–based, comprehensive preventive oral health services to disadvantaged children. The program takes place in 4 Title I schools (defined as exceeding 40% poverty based upon the number of students that qualify for free or reduced lunches) located in Olathe, Kansas, a suburb of Kansas City. This program, called "Miles of Smiles," began in January 2008 and is an extremely timely and important project. Aspects of the project include:

- Increasing access to oral health care and appropriateness of care for unserved and underserved persons (Health People 2010 Objective, National Call to Action)[1,2]
- Providing a much needed oral component (dental home) in school based health centers (Healthy People 2010, National Call to Action, Kansas Oral Health Plan)[1,2,18]
- Providing a channel for collaboration between caregivers, educators and social service providers (National Call to Action)[2]

- Mentoring dental hygiene students in their role of addressing access to care utilizing tele–health technology and an extended care permit (National Call to Action, Center for Health Workforce Studies, Kansas Oral Health Plan)[2,5,18]
- Providing the necessary infrastructure and demonstrating the value of using a dental hygienist as a mid–level provider (National Call to Action, Center for Health Workforce Studies)[2,5]

All Miles of Smiles participants receive comprehensive preventive oral health services (radiographs, prophylaxis, sealants, fluoride varnish, oral health education and nutritional counseling) directly in their elementary school during normal school hours. Approximately 30 to 60 minutes on average was taken out of their learning time. Services are provided by dental hygiene students supervised by a UMKC faculty holding an ECP–I. Medicaid was billed if the child had it. There were no out–of–pocket costs for participants if they did not have Medicaid. The first year of this program resulted in 339 children receiving comprehensive preventive oral health care.

### Dental Home

The American Academy of Pediatric Dentistry's definition of a dental home is derived from the American Academy of Pediatrics' definition of the medical home. The dental home is a relationship with an oral health care provider that has beneficial consequences of early professional dental care, appropriate care, periodic supervision, reduced treatment costs and access to otherwise unavailable services which can reduce disparities. Establishment of a dental home is initiated by the identification and interactions of the patient, parents, non–dental professionals and dental professionals in heightened awareness of all aspects of oral health.[19]

## Methods and Materials

### Model

Miles of Smiles is a hybrid replication of the "Community Collaborative Practice" (CCP) model developed by Apple Tree Dental, a not–for–profit organization in Minnesota.[20] The CCP model increases access to oral health care by expanding the role of dental hygienists in the delivery of preventive care services and establishing tele–dentistry links with dentists.[20] This was a fitting model for Miles of Smiles due to the legislative changes made to the Kansas Dental Practice Act that targeted improved access to oral health care by allowing dental hygienists less restrictive supervision using an Extended Care Permit (ECP).[8] As suggested by the U.S. Department of Health and Human Services, the infrastructure of this program integrated health care providers with the intent to fully treat disease.[1] Partnerships were developed with local dentists, school nurses, translators, educators, school district administrators, social service providers, caregivers and parents to promote holistic care. The development and nurturing of these partnerships was critical to the success of the program. Comprehensive preventive oral health care was provided on–site, directly in the child's school, enhancing child access.

### Funding

Start–up funding to develop and pilot the project, hire a program manager and purchase equipment and supplies was provided through a grant from The REACH Healthcare Foundation in 2008. Additional equipment and supplies were donated from A–DEC, Ultradent, Hu–Friedy and Premier Dental. The REACH Healthcare Foundation awarded a second grant to continue the project for the 2009 to 2010 academic year. Additional support for the project was provided by the National Children's Oral Health Foundation and the American Dental Hygienists' Association.

### Target Population

Low income children in 4 Title I schools in the Olathe School District were targeted to receive comprehensive preventive oral health services in a school–based setting during the first year of the program. Table I describes the target population's demographics and tremendous diversity. A significant portion of the target population qualified for free or reduced lunches, resulting in 816 disadvantaged children being eligible to participate in the program. Nearly 27% of the children attending target schools were English Language Learners, with Spanish being the most common primary language.

### Inclusion Criteria

Miles of Smiles was promoted in the target schools during the enrollment and registration period of the 2008 to 2009 school year. In accordance with the Kansas Dental Practice Act,[8] all children that qualified for free or reduced lunches were eligible to participate in the program. Parents or guardians were required to complete appropriate paperwork in order for the child to participate. Children treated in the Miles of Smiles clinic were considered patients of record at the UMKC School of Dentistry, and they completed the same registration, consent for treatment, health history and HIPPA forms as patients at the School of Dentistry. These forms were available in English and Spanish. Spanish transla-

Table I: Target Population Demographics

| Elementary School | Total number of children | Perecent free or reduced lunches | Total number eligible for services | Total number of ELL | Number of languages spoken |
|---|---|---|---|---|---|
| Fairview* | 348 | 66% | 230 | 135 | 9 |
| Ridgeview* | 227 | 74% | 168 | 120 | 7 |
| Washington* | 441 | 66% | 291 | 114 | 8 |
| Havencroft** | 318 | 40% | 127 | 22 | 6 |
| Total | 1473 | n/a | 816 | 393 | n/a |

*ELL center
**foreign language center

Table II: Summary of Tele–dentistry Technology

| | |
|---|---|
| Hardware for CMS | • Server: Dell Optiplex 755, Core2 Duo, 4gb RAM and 250GB HD with (encrypted) redundant local back up disks system. This supports both the clinical record and pacs (imaging) functions.<br>• Dell Latitude D830 Notebooks with 15.4" WXGA displays, Core2 Duo Processors, 4gb RAM and 200GB hard disks<br>• Secugen BioMouse – for biometric authentication/approvals<br>• Topaz – signature capture pads |
| Software for CMS | • Sever – Operating System – Windows Server 2003<br>• SQL Database – Interbase from Borland/Code Gear/Embarcadaro |
| Network | • Local Network at Outreach site – All devices are wired 100mb Ethernet<br>• Connection from outreach sites (schools) to dental school host system server farm – Direct (point–to–point) encrypted/secured VPN Connection over SSL (tunneled) using Cisco technology; estimated (dedicated) connection ~5–10mb over DSL. |
| Technologies | • MiPACS Storage Server & MiPACS Client – Medicor Imaging<br>• MS SQL Server<br>• Client – Operating System – Windows XP Pro<br>• Application Environment – Paradox – Corel Software<br>• Nomad Portable X–ray (source) with stand and remote release*<br>• Size 0, 1, & 2 Phosphor Storage Plates (PSP)<br>• Scan–X 12 DVM Digital X–Ray Processor (Images stored in MiPACS)**<br>• Sopro 717 Intraoral Camera Handpiece with Sopro Camera Dock Station (analog and USB2)<br>• Canon Rebel Digital camera (~12megapixel) with 100mm macro lens & ring light source. Capable of I/O/ 1:1 as well as extraoral images |

*Required to be in compliance with the Kansas Dental Practice Act
** Dicom compliant

tors were provided by the Olathe School District to assist with completing the forms. The same HIPPA privacy and security guidelines that govern activity at the school of dentistry applied to the project. All children, regardless of their ability to qualify for free or reduced lunches, were eligible to receive the comprehensive oral health screenings. A separate consent was collected for the screening aspect of the program.

**Data Collection**

The computer management system (CMS), or electronic record, in place at UMKC School of Dentistry was modified in 2008 to collect data specific to project outcomes. Researchers used SPSS to create a large database to track and report service utilization. Comprehensive screening data was collected by dental hygiene students and the supervising faculty in October 2007 to gather preliminary (baseline) data. In 2008, the data was used for the evaluation of the program. A full mouth charting was completed on each child noting present decay, sealants, oral hygiene, gingival health and urgency of care. Report cards, identifying the child's oral health condition and referral needs, were completed and sent home to parents and/or guardians.

Data to identify oral health needs and ability to access oral health care were collected during school enrollment by surveying a convenience sample of 876 parents and/or guardians (59% of parents and/or guardians) in the 4 target schools regarding their child's oral health needs and ability to access oral health care. The survey replicated the access to care questions asked during Smiles Across Kansas 2004,[21] which sought consent to screen third grade children to allow comparison of the data to state norms.

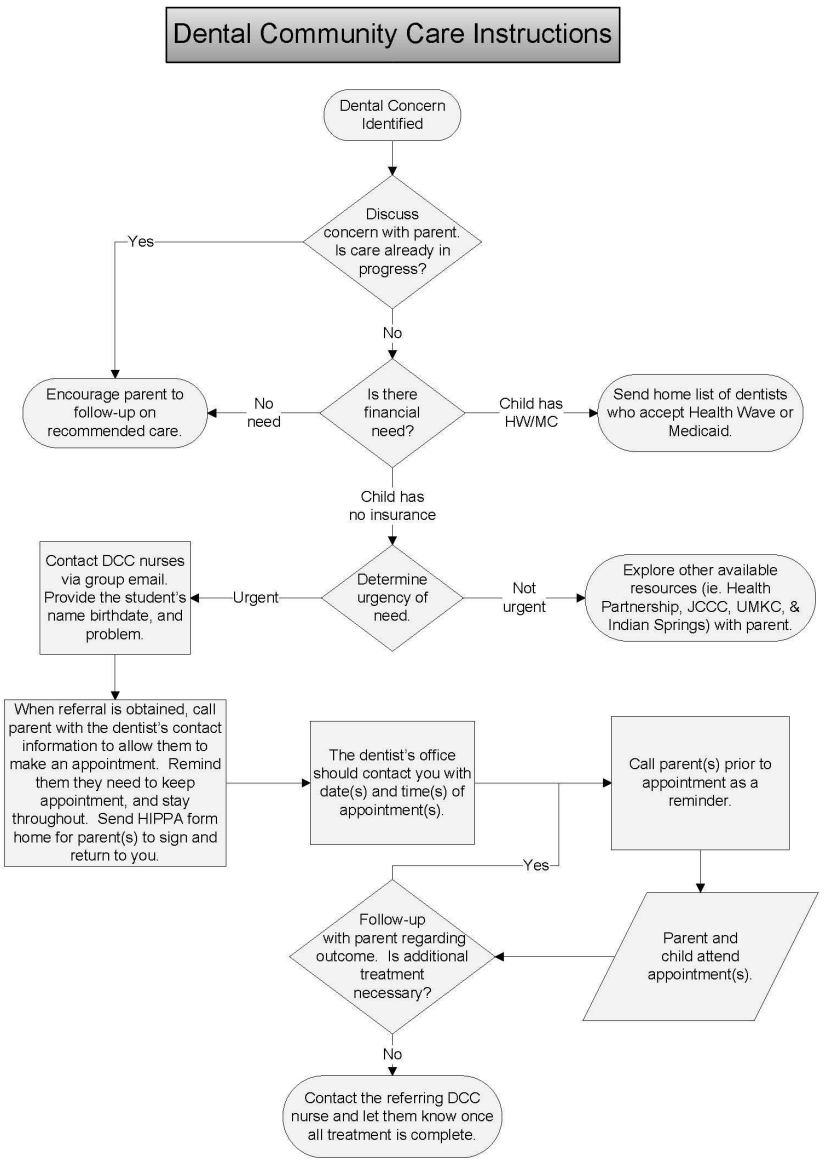
### Supplies and Equipment

The Miles of Smiles clinic utilizes the A–Dec Pac 1 Portable System (Model 3420) for portable dental hygiene equipment. The clinic is equipped with the Pac 1 Self–Contained Unit, which does not require an outside air supply, and the adjustable Porta–Chair. The clinic uses the store and forward method to exchange clinical information. The CMS is a full–featured SQL–based client–server electronic patient record, developed in house to document, store and transmit comprehensive clinical patient care, including radiographs and digital intra– and extra–oral images. Table II outlines the technology used.

### Care Provided

A dental hygienist with an ECP–I provided care to children enrolled in this program 1 to 2 days a week, and served as the faculty member who supervised 28 dental hygiene students as they provided care to children in the clinic 2 to 3 days a week. The Director of Quality Assurance at UMKC School of Dentistry performed a random quality assurance audit on 10% of the patient records using measures of service use.[22] In anticipation of having a large number of uninsured children with a need for restorative care, the school district's Student Health Services Coordinator organized a referral network, Dentists Community Cares, for children without insurance or the resources to pay for care. Ten community dentists volunteered to provide free care for 1 child a month through the program. The referral protocol, created in collaboration with the Olathe School District Director of Health Services, is outlined in Figure 3.

Figure 3: Dentists Community Care Referral Protocol




## Results

Table III provides demographic information about the 389 children who enrolled in Miles of Smiles. The majority of children were 9 to 14 years old, with slightly more males presenting. Nearly half of the children that enrolled were Hispanic, therefore, all written materials were available in Spanish as well as English.

Table IV summarizes the initial oral health status of the 637 students screened in the 4 target schools. The screenings revealed a significant amount of hard and soft tissue disease, and children needing urgent care within 24 hours. This data was used to substantiate the children's oral health need and attain grant funding to start the Miles of Smiles clinic.

Table III: Demographic information of children enrolled in Miles of Smiles (n=389)

| Category | | n(%) |
|---|---|---|
| Age | 0–5 | 4 (1.0) |
| | 6–8 | 165(42.4) |
| | 9–14 | 215(55.3) |
| | Unknown | 5 (1.3) |
| Gender | Male | 213(54.8) |
| | Female | 176(45.2) |
| Ethnicity | Hispanic | 193(49.6) |
| | Caucasian | 117(30.1) |
| | Black | 49(12.6) |
| | Asian/Pacific Islander | 19(4.9) |
| | Two or More | 9(2.3) |
| | Unknown | 2(.5) |

Nurses at each school reported seeing children due to tooth pain and referring children to a dentist each week. The Smiles Across Kansas 2007 Update, a comprehensive oral health survey of Kansas third graders, reported 21% of children had untreated decay and 36% had dental sealants.[23] Table V compares the data in our target population to Healthy People 2010, NHANES and state norms.[23–25]

The comparison of the study screening data with national and state data reveals that the overall oral health condition of children in the 4 participating elementary schools was worse than comparable data in all but 1 instance. Considerable improvements in the oral health of the target population were clearly necessary to meet the goals of Healthy People 2010.[24] Results of the oral health needs and ability to access oral health care survey revealed 37% of the families had not been to the dentist within the last year. Of those, 24% reported there were times they needed dental care but could not get it due to limited financial resources and lack of dentists accepting Medicaid. Eighteen percent reported they had never been to the dentist. Barriers for the target population included such things as cost, transportation, language, lack of providers and inability for parents to take off work.

Care was provided to a total of 339 of the 389 children that enrolled during the first year of the program (2008 to 2009 academic year), using an ECP–I dental hygienist, senior dental hygiene students and volunteer dentists in the community who delivered restorative care. Table VI outlines the collective sum of services and referrals provided in all 4 schools during the first year of the program. The care provided for the Miles of Smiles program was documented in patient records, and a quality assurance audit revealed that the care provided was consistent with the care provided in the general clinic at the School of Dentistry.

Sixty–three percent of the children had active decay and were referred to a local dentist. Upon re–evaluating the children at the end of the school year, only 11% of the children that had been re-

Table IV: Comprehensive Oral Health Screening Outcomes for Miles of Smiles Fall 2007

| Oral Health Screening | Results |
|---|---|
| Number screened | 637 |
| Unsatisfactory oral hygiene | 44% |
| Gingivitis | 32% |
| Percent untreated decay | 28% |
| Need treatment | 23% |
| Percent of sealants | 17% |
| Urgent care | 3% |

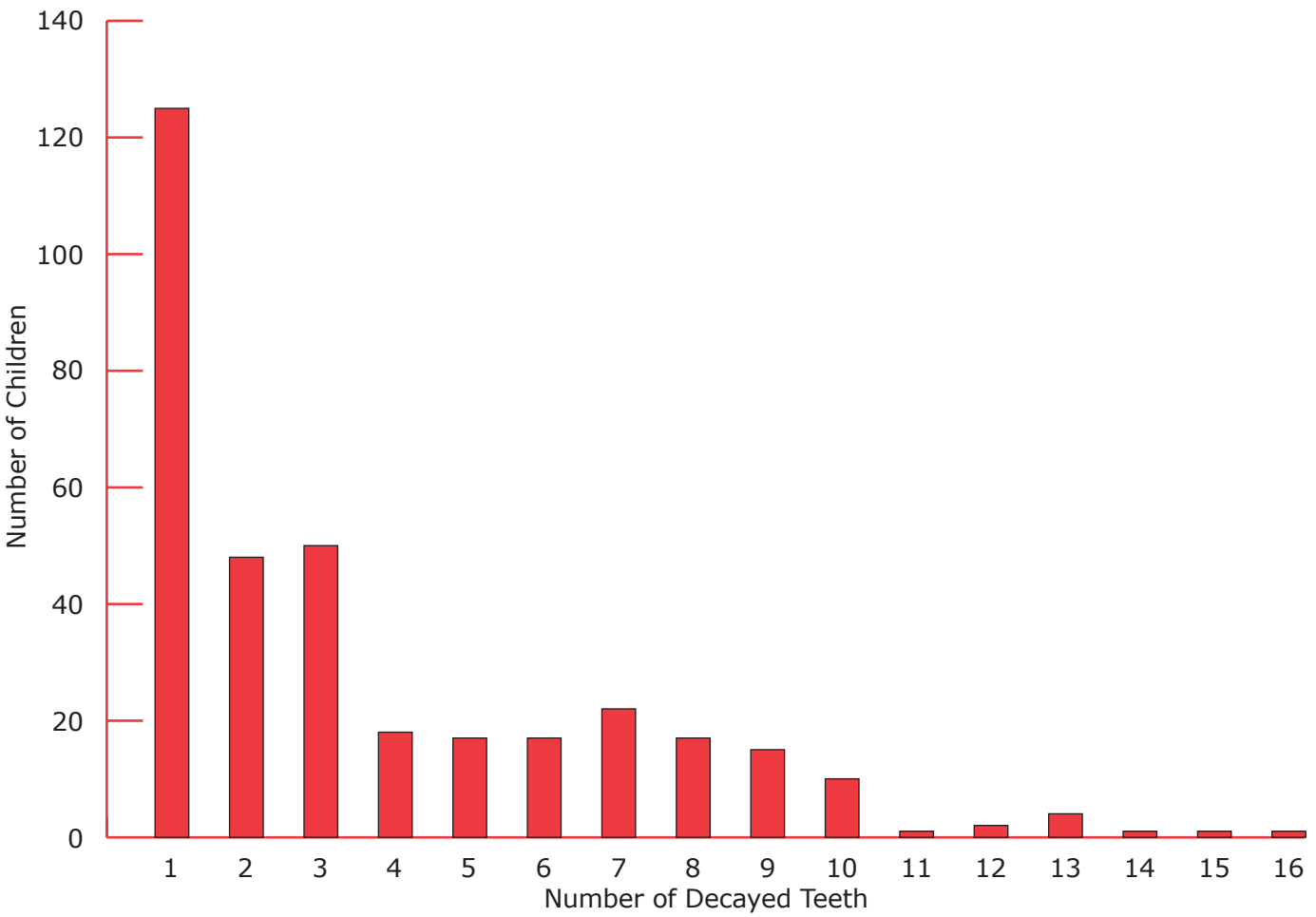
Table V: Comparison of Data to National and State Norms

| | Untreated decay | Sealants |
|---|---|---|
| Miles of Smiles ages 5–12 | 28% | 17% |
| Healthy People 2010 Target ages 6–8 (1988–1994) | 21% | 50% |
| Healthy People 2010 Baseline ages 6–8 (1988–1994) | 29% | 23% |
| NHANES 6–11 years | 22% | 32% |
| Smiles Across Kansas (third graders) | 21% | 36% |

Table VI: Summary of Preventive Procedures Completed

| Procedure | Number Completed (%) |
|---|---|
| Prophylaxis | 350 |
| Bitewing Radiographs (2) | 272 |
| Fluoride Varnish | 342 |
| Number of Children that had at least one sealant placed | 110 |
| Total Number of Sealants Placed | 302 |
| Decay Present and Referral to Dentist | 214 (63%) |
| Referral Initiated by Parent/ Guardian | 23 (11%) |

Figure 4: Summary of Decayed Teeth




ferred to a dentist initiated the transition process of seeking restorative care at a dental hub/safety net clinic or dental office. Figure 4 outlines the wide range of decay (0 to 20 teeth) found in each child.

In 2008, there were 1,233 persons per dentist in Johnson County (this stands in contrast to 2,013 persons per dentist in Kansas).[26] Resources were virtually non–existent for uninsured children, with only 1 clinic for uninsured low income persons in the county. Resources were equally limited for children that qualified for Medicaid or Healthwave. The Kansas Medical Assistance website listed 7 Medicaid dental providers in Olathe, Kansas.[27] Calling these providers on September 24, 2008 revealed only 4 of the providers routinely accepted new cases. A pediatric dentist who was not accepting new Medicaid patients agreed to provide restorative care to all of the children with Medicaid participating in Miles of Smiles, and also agreed to provide additional care to other children in need, suggesting to the researchers that increasing awareness surrounding unmet need may have a positive effect on participation in programs such as Miles of Smiles.

## Discussion

As an outcome of the U.S. Surgeon General's initial report discussing health care disparities in 2000, the academic dental community has been charged with the responsibility to "anticipate and prepare for curriculum changes that these new workforce models will demand."[1] Dental educators, including those in dental schools, allied dental programs and advanced education programs, are encouraged to "strengthen and build partnerships within these communities to ensure a seat at the table as broader discussion about the nation's health care workforce ensue."[28] The American Dental Education Association, the American Dental Hygienists' Association and other workforce groups support expanding the scope of an allied dental professional's employment as one mechanism to improve access to oral health care.[2,5–7,17]

The Miles of Smiles program is an example of a solution that addresses these recommendations through building partnerships with communities while educating dental hygiene students and expanding the scope of allied dental professionals. It has been well documented that students who are

exposed to alternative practice settings and patients that lack access to care are more likely to seek out employment opportunities in those areas once they enter the workforce.[29–33] Dental hygiene education is one means to influence dental hygiene students to seek a career in public health by exposing dental hygiene students to alternative practice settings and patients that lack access to care using an academic service learning model. It also helps to create an awareness of the needs within their own communities, exposing dental hygiene students to diversity and disparity, and it gives a sense of civic responsibility as a health care professional.[29,34–36]

The children targeted for the Miles of Smiles program had tremendous difficulties accessing dental care in the metropolitan area. The study showed the unmet oral health needs and inability to access oral health care resulting from limited financial resources and lack of dentists accepting Medicaid. The Smiles Across Kansas 2007 Update reported 14% of Kansas children could not get dental care within the last 12 months, and Hispanic children were more frequently uninsured, faced barriers to care and may have never seen a dentists.[23] Barriers identified by our target population were very similar to the barriers identified in the Smiles Across Kansas 2007 Update: cost, transportation, language, lack of providers, inability for parents to take off work and lack of information. In a recent publication about another school–based oral health care program, Niederman et al listed comparable barriers and noted that the community–based delivery model circumvents many of these barriers by bringing the providers to the patient rather than the patient to the providers.[37]

More recently, the PEW Center on the States assessed and graded all 50 states and the District of Columbia, using an A to F scale, on their ability to employ 8 proven and promising policy approaches that ensure dental health and access to care for disadvantaged children. Kansas earned a C. Less than 25% of high–risk schools were reached by school sealant programs, and more than half of Kansas Medicaid–enrolled children received no dental service in 2007. In spite of Kansas's Medicaid utilization rate rising for several consecutive years and the state reimbursing medical providers for basic preventive dental care for Medicaid–enrolled children, more than 16% of the population was still left unserved for dental care. The PEW Center on the States estimated that Kansas needs at least 90 dentists to meet the needs of these residents.[17]

During the course of this program, the researchers became aware of several disconcerting situations. For example, one young girl had 20 severely decayed primary teeth and was malnourished due to pain and sensitivity when eating. This child was significantly underweight. The dentist that diagnosed this child and restored her teeth deemed her case an emergency because of the pain and malnourishment. This patient had to be treated in the hospital under general anesthesia. She had 1 tooth extracted and a space maintainer placed to retain the open contact to allow the permanent tooth to erupt, 15 pulpotomies and 19 crowns. The total cost of the hospital facility fees, anesthesia and restorative charges were over $20,000. This care was provided at no cost to the family. Another sixth grade student had his permanent teeth erupt without the primary teeth exfoliating. His parents and teachers thought he had 2 rows of teeth. His maxillary lateral incisors were malpositioned so far lingually that they were directly behind the centrals, and his teeth were crowded due to a narrow arch. He had closed contacts, so it appeared to the untrained eye that this child had 2 rows of teeth. This condition has resulted in the child receiving extensive speech therapy. What he truly needed, however, was an orthodontic consult. This child was put in contact with Smiles Change Lives (a non–profit organization) to receive a complimentary consultation from an area orthodontist.

Many children presented with severe decay, abscesses and subgingival calculus. The examples discussed above demonstrate that a lack of oral health care resulted in increased costs, more invasive care and poor health outcomes.

As the number of dental hygiene graduates increase and the number of dental graduates decrease, it makes sense that expanding the scope of practice for dental hygienists is a reasonable and economical solution to address access to care disparities. The legislative changes expanding the scope of practice for dental hygienists in Kansas, allowing an ECP–I dental hygienist to provide care in public health settings, has provided the opportunity for programs, such as Miles of Smiles, to reach populations that lack access. The positive effects of implementing contemporary workforce models can be seen in the most recent Keep Kansas Smiling – Kansas Oral Health Grading Project, where Kansas was noted as being a leader in making oral health a priority.[11] The Miles of Smiles collaboration demonstrated that a school based oral health care program can reach those who need care the most. Almost two–thirds of the children that received preventive care in the Miles of Smiles clinic had decay present, which is more than twice the published national and state norms.[23–25] This report, along with Niederman's findings, show very similar findings in regards to children with decay transitioning to a dental prac-

tice to receive restorative care, with only 10 to 11% transitioning despite notifying the parents and/or guardians and offering referrals.[37] Future school–based delivery models should seek to find ways to improve these statistics and analyze the cost analysis of programs such as these.

The Director of Quality and Assurance noted that dental referrals need to be better documented in the patient record. As a result of this, the CMS system was modified in July 2009 to ask specific questions about dental referrals and treatment urgency. This additional data will provide improved information on outcomes and appropriateness of referrals.

The outcomes of the current project support Niederman's conclusions that a school–based oral health care model can overcome barriers to accessing care and improve children's oral health.[37] Both the findings from the Niederman study and this study demonstrate that community–based oral health programs are mutually beneficial for the university, students and the community.

## Conclusion

Addressing access to oral health care is a multi–faceted issue that will take a multi–faceted approach. School based oral health models, using dental hygienists with expanded scopes–of–practice to provide comprehensive preventive oral health services and referrals, can serve as one approach to overcoming barriers and reaching vulnerable children that desperately need oral health care. However, transitioning children outside of their school to a safety net clinic or local dentist to receive restorative care was found to be problematic. Expanded scopes of practice that allow for simple restorative procedures could address this problem.

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# Extending Oral Health Care Services to Underserved Children through a School–Based Collaboration: Part 2 – The Student Experience

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## Abstract

**Purpose:** The purpose of this study was to examine the experiences of dental hygiene students providing services to unserved and underserved children in a school–based collaboration between a dental school, school district and Extended Care Permit I (ECP–I) dental hygienist in Kansas.

**Methods:** Following comprehensive preventive oral health care services to children in 4 schools supervised by an ECP–I dental hygienist, 26 senior dental hygiene students enrolled in the dental hygiene program at the University of Missouri–Kansas City submitted rotation data records and self–reflection journals describing the experience. Using the constant comparative method, 3 faculty researchers unitized the data by identifying key themes.

**Results:** Data from student reflections was aggregated into 5 categories: skill development (46%), awareness (19%), type of experience (15%), description of environment/setting (13%) and role model (7%).

**Conclusion:** Participation in well–designed service learning programs is rewarding for students providing the services and works toward developing the skills needed to competently care for the changing needs of society. New models of oral health care and expanded roles for dental hygienists are providing greater access to preventive oral health care in Kansas.


**Key words:** access to care, school–based oral health, dental hygienist education, service learning, dental care for children

This study supports the NDHRA priority area, **Professional Education and Development:** Evaluate the extent to which current dental hygiene curricula prepare dental hygienists to meet the increasingly complex oral health needs of the public.

## Introduction

Dental education faces many challenges in managing multiple responsibilities for oral health through education, research and service.[1] In a policy statement on health care reform, the American Dental Education Association (ADEA) advocates for "a diverse and culturally competent workforce to meet the general and oral health needs of our demographically changing nation."[2] It further describes the need to educate dental and allied dental health professionals who are competent to care for the changing needs of society. ADEA calls for a commitment to the "exploration and implementation of new models of oral health care that provide care within an integrated health care system," and acknowledges that new models will involve expanded roles for allied dental professionals, as well as other health professionals.[3] The American Dental Hygienists' Association (ADHA) has also issued a call for action to foster positive changes in oral health care delivery.[4] The purpose of this study was to examine the dental hygiene student experience providing services to unserved and underserved children in a school–based collaboration between a dental school, a school district and an Extended Care Permit I (ECP–I) dental hygienist in Kansas.

The ECP–I in Kansas currently allows direct access to dental hygienists, with the designation to initiate treatment in community–based sites based upon their assessment of a patient's needs, as long as the dental hygienist is sponsored by a dentist licensed in the state (a full description of the ECP–I and ECP–II legislation can be found on the Kansas Dental Board website).[5] ECP–I dental hygienists can provide screenings, education, preventive dental hygiene services, apply fluoride varnish and apply topical anesthesia without the presence of a dentist on–site and without specific authorization of a dentist.

## Review of the Literature

The Macy Study calls for a shift from traditional dental school teaching clinics that feature student delivered care with a focus on education, to patient–centered delivery systems where treatment is based on the best interests of the patient and provided mainly by faculty while students participate on a progressive basis as their skills and knowledge develop.[1,6] The study also recommends that all dental schools adopt "a significant educational component in off–site clinics" where faculty actively participate in treating patients as well as supervise students to deliver patient–centered care.[7]

When patient–centered care is balanced with specific educational objectives and intentional learning goals of the student, both the patient and student are beneficiaries of what is known as service learning. The major goals of service learning are to address societal needs, improve education and promote civic engagement. Well–designed service learning curricula includes advanced preparation by learning of theory and skill development specifically related to the functions anticipated in the service experience, selected readings related to the subject area, active participation and meaningful reflection on the part of the student. Reflection is considered the critical element in connecting the service activity with student learning about the larger context in which the service occurs, complete with all of the social, moral, ethical and environmental implications, making service–learning a vehicle to facilitate change.[8–10]

Gadbury–Amyot et al used a multi–factorial approach to assess course outcomes and student experiences in an ethics course for dental and dental hygiene students.[11] Student reflections from the case–based and team–based teaching method (with a community–based service learning component) indicated that students became personally aware of health disparities and began a necessary dialog to consider ethical issues and potential solutions to the problems they observed.

Keselyak et al employed multiple data sources to evaluate student perceptions in a course that focused on teaching dental hygiene students how to provide care to patients with special health care needs.[12] Student reflections revealed that service learning had increased awareness, higher order thinking and professionalism. Students expressed concern for the organizational challenges and showed a concern for the struggles faced by special needs patients. The authors concluded that these skills and disposition would prepare future oral health practitioners to provide services to patients having special health care needs.

Dornan et al worked with a group of international education researchers to conduct a systematic review of the literature on how experience in the clinical and community setting contributes to early medical education.[13] They reported that early experience fostered self–awareness and empathic attitudes towards people experiencing illness. It also boosted student confidence, provided motivation, student satisfaction and helped students develop their professional identities. Students were able to develop their interpersonal skills as they learned about professional roles and responsibilities, health care systems and population needs. In some countries, medical students in the early years of their program provided preventive health care for underserved populations. These early experiences were also associated with increased recruitment to rural and underserved communities.

Educational initiatives that help students develop the skills to deliver quality care to diverse populations are needed to address disparities in health care.[14] The Achieving Diversity in Dentistry and Medicine (ADDM) project has worked to improve and expand the education of health professionals in the hopes of encouraging and preparing students for careers working with the underserved.[15] ADDM has prepared curricular guidelines for medical and dental schools with recommendations in 3 main content areas:

1. Basic concepts related to cultural competence
2. Foundational knowledge through self exploration to understand personal biases and health care issues in terms of diversity
3. Practical skill development that utilizes the student's new knowledge

Included among the long list of foundational concepts are topics such as access to care, language and communication, access to dental and/or health care and access to oral hygiene and health care products.

To date, the majority of graduating dentists are choosing careers within the private practice model. Data from a national survey of senior dental students in 2008 showed that 89.5% of seniors' long–term plans included going into some type of private practice setting, compared to 1.7% who plan to work in a community clinic practice.[16] Encouraging data from 2009 showed an increase in senior dental students' immediate plans upon graduation to work in a government setting, from 5.9% in 2008 to 11.3% in 2009.[17] These are interesting statistics in light of the increased number of expected extramural clinic rotations from 11.9% in 2004 to 18.8% in 2007.[16] In addition, when asked whether they agreed with the statement that access to oral health care is a major problem in the United States, and that providing care to all segments of society is a professional obliga-

tion, approximately 70% of senior dental students agreed or strongly agreed in 2008,[15] compared to 75% in 2009.[17] The data suggest that changes in the dental school curriculum may be influencing the perception of graduating dental students. There is no data for dental hygiene students with regard to these issues. Recognizing the current limitations set by licensing boards on practice settings and models, access to care from dental hygiene providers would be restricted in many states and dependent on the availability of dentists in non–traditional settings.[18] Improving the oral health status of all Americans will likely require less restrictive state practice acts, especially for dental hygienists. Educational institutions are being called to anticipate these changes by preparing students to provide expanded care in unconventional settings.[19]

Community activities have been a component of the curriculum in dental and dental hygiene education for many years. As faculty gain a better understanding of what makes service learning a meaningful educational experience in conjunction with a desire to explore and implement new models for providing care to vulnerable populations, faculty are embracing opportunities to engage in service learning. Recognizing that prevention is fundamental to general and oral health,[20] and understanding that children who receive preventive dental care early in life will encounter a 40% reduction in overall dental costs when compared to children who do not receive care,[21] a program called "Miles of Smiles" was designed to address the needs of vulnerable children in a local community. In a collaboration between the University of Missouri–Kansas City (UMKC) School of Dentistry, the Olathe School District and an ECP–I dental hygienist, school–based comprehensive preventive oral health care services were provided to disadvantaged children in 4 Title I schools, using a hybrid replica of the Community Collaborative Practice[22] oral health model, portable dental equipment and tele–dentistry. In the Miles of Smiles clinics, dental hygiene students are supervised by a dental hygienist faculty member with an ECP–I.[5] Students and faculty collectively provide comprehensive preventive oral health care to unserved and underserved children. These services include radiographs, prophylaxis, sealants, fluoride varnish application, oral health education and nutritional counseling. A descriptive study by Simmer–Beck et al describes the project and outcomes in full detail.[23]

The purpose of this study was to examine the experiences and attitudes of students in the Miles of Smiles program through their guided, written reflections and seek their perspective on learning related to specific dental hygiene competencies.

Table I: Demographics of study participants

| Demographic Characteristics | N (%)* |
|---|---|
| Gender | |
| Female | 25 (96) |
| Male | 1 (4) |
| Age | |
| 20–22 | 1 (4) |
| 23–25 | 19 (74) |
| 26–28 | 3 (12) |
| >28 | 3 (12) |
| Racial/Ethnicity Background** | |
| Asian | 1 (4) |
| Black or African American | 1 (4) |
| Hispanic or Latino | 2 (8) |
| White | 21(81) |

*Due to rounding and differences in rounding to questions, the totals may not total to 100%
**Categories according to US Census.gov

## Methods and Materials

To prepare for clinical community rotations, students were required to increase their knowledge about the organization and persons they would be serving. Students were instructed to develop a document that described the mission statement of their assigned organization, a description of the populations served by the organization and a review of the current research on issues impacting the population, as well as describe how dental hygiene students would help the organization fulfill their mission during the rotation. Each student was assigned to provide care in the Miles of Smiles clinic for 2 days within a single week during the fall semester, and 1 additional day during the spring semester for a total of 3 days. The rationale for scheduling 2 days within a single week at the clinic was to facilitate the implementation of learning from one session to the next as recommended by community partners in other settings who reported enhanced student efficiency on the second day, thereby giving both the student and the community partner opportunities for more productive services and learning.

Data sources included rotation tracking data provided by students and self–reflection journals for each rotation site. All 26 dental hygiene students enrolled in Dental Hygiene Clinic III and IV participated in the Miles of Smiles rotation. Table I provides the demographic information describing the students participating in these courses. UMKC's Social Sciences Institutional Review Board rendered this study exempt from review. Anonymity of students was assured by removing the names and de–identifying information from the student data reports and reflective journals before review.

Rotation data reports were completed by students at the end of each semester, confirmed through records review by the Director of Quality Assurance at the School of Dentistry and reported in aggregate form. This data includes the number of patients treated, their ethnicity, special health care needs of the population and services rendered, and identifies the specific dental hygiene program competencies students worked toward during the experience at the rotation site.

Reflective journals were completed by students the week immediately following the completion of the first rotation through the Miles of Smiles clinic. Students were guided to reflect upon the organization's mission statement and report how this affected decisions about provided services. They were also asked to discuss how classroom knowledge was applied, what was learned, how this learning benefitted the population being served, how they managed challenges, recommendations for the future, impact of the rotation on progress towards the dental hygiene program competencies and how the rotation impacted their attitudes towards the diversity of the community being served. They were also asked to identify problems they observed in accessing care among persons with special health care needs, and to recommend ways to address these problems.

To encourage honesty and accuracy in writing the reflective journals, students were informed that journals would be graded as "complete" or "incomplete" for meeting the course requirement. Using the constant comparative method as outlined by Lincoln and Guba,[24] 3 faculty researchers unitized the data from each journal reflection by identifying key themes. As the themes emerged, the unitized data was constantly reviewed and compared to specific themes. The research team discussed each unit and theme to reach a consensus as the themes aggregated into specific categories. Numerical frequency of themes were tracked and totaled within a category and subsequently calculated as a percentage of the total number defined overall.

To further validate the data analysis, a group debriefing session was held with all students at the end of the semester as a means of member checking the data. Students verbally discussed their experiences, allowing faculty to confirm the thematic analysis that emerged from the written reflections. This process also helped students to further reflect on their collective experiences, and served as a review of course content, making connections between didactic learning and actual experiences during service learning. Further member checking was also conducted by having the ECP–I dental hygienist/faculty member review the analysis for accuracy.

## Results

Students worked with children of Hispanic, Caucasian and African American ethnicity. They encountered children with a variety of special health care needs, including attention deficit disorder, bulimia, autism, epilepsy and attention deficit hyperactivity disorder. Communication with children from different cultures provided opportunities for students to experience working with language barriers. Diversity in socioeconomic status revealed challenges faced by families needing health care. In the process, dental hygiene students reported an opportunity to develop their skills in a majority of dental hygiene competencies.

The qualitative data obtained from a review of the reflective journals submitted as a course requirement revealed that some students responded to each of the specific issues requested in the guided reflection protocol while others did not. However, all students provided meaningful data. Analysis of all data sources yielded a list of 19 individual themes which were aggregated into the 5 categories. Table II outlines the categories that emerged from the data analysis and provides examples of the themes for each. Table III shows the numerical frequencies of themes that were tracked and totaled within a category and subsequently calculated as a percentage of the total number defined overall. The 5 categories with their corresponding percentages of the total responses were skill development (46%), awareness (19%), type of experience (15%), description of environment/setting (13%) and role model (7%).

The largest number of student responses was consolidated into the skill development category. The following direct quotes from student journals capture the 6 representative themes identified in this particular category (experience beyond the dental school, working in diverse populations, advanced preparation, charting mixed dentition, communication with children and difficulties adapting to the new environment), and provide a rich description from the student perspective.

"I applied classroom knowledge each time I completed an adult prophy, placed sealants and provided OHI. In the class Principles of Public Health, we learned about portable dental equipment and outreach programs. This was my opportunity to have hands on experience with these things." (Skill Development: Advanced preparation and experience beyond the dental school)

"I am so glad I got to go on this rotation because I realize how bad I was at charting mixed dentition…. Now…I am MUCH better at charting. Today…charting

went quickly since I had the experience this week at MOS." (Skill Development: Working with diverse populations and charting mixed dentitions)

"… I need to improve on using kid friendly language so that they can better understand what procedure I am about to perform… I will start making a list of words to use with different ages." And, "One of the little girls… was just scared to death and... started crying. It was so sad! …now that I think back, the school nurse and I went to get this little girl from her class and the school nurse basically just grabbed her out of line and took her to our treatment room without explaining much. While she was in the room and sitting in the chair for radiographs, tears just started running down her face. We tried to explain that we were just going to look and count her teeth, but she would not let us in her mouth!" (Skill Development: Communication with children)

"Some of the difficulties I faced were getting used to using the new environment at the school. The software and dental surrounding was very different from the dental school… The first day went a little slower than planned but… the second day was a lot easier." (Skill Development: Difficulties adapting to the new environment)

As students reflected on changes in attitude towards the diversity of the community, awareness emerged as another category. Exposure to this experience increased student awareness of the tremendous need for oral health care, the challenges people have with access to care and the diversity of the populations within their own communities. The following comments are representative samples from the group.

"I have the ability and the desire to help those in a community that are less fortunate. I thought that hygiene school was there for us to graduate and go into private practice and work there throughout the duration of our careers. …I have learned that the value of my baccalaureate degree is far more valuable than I could have ever imagined. The MOS program has given me more than extra experiences on sealants and child prophys. It has made me want to play a public role in prevention." (Awareness: Role as oral health care provider)

"We are taught the statistics about children who are minorities, poor, and have problems with access to care; but to actually see the statistics right before my eyes was shocking. I am so glad we are given the chance to… help these individuals with our skills and knowledge.

Table II: Emergent categories and representative themes from student reflection journals

| Emergent Category | Representative Themes |
|---|---|
| Skill Development | • Experiences beyond the dental school<br>• Working in diverse populations<br>• Advanced preparation<br>• Charting mixed dentition<br>• Communication with children<br>• Difficulties adapting to new environment |
| Awareness | • Role as oral health care provider<br>• Access to care<br>• Settings – public versus private |
| Type of Experience | • Relaxed atmosphere<br>• Service–learning<br>• Variety |
| Description of Environment/ Setting | • Portable equipment<br>• Working with partners (collaborative partnership)<br>• Unique environments |
| Role model | • Problem solving skills<br>• Organization skills<br>• Effective teacher<br>• Compassion |

Table III: Students' reflection category analysis, by number and percentage of total responses

| Category | N (%) |
|---|---|
| Skill Development | 82 (46%) |
| Awareness | 35 (19%) |
| Type of Experience | 27 (15%) |
| Description of Environment/Setting | 24 (13%) |
| Role model | 12 (7%) |
| Total number of tracked theme occurrences | 180 |

"I was truly surprised by the amount of untreated decay… (and the) great need for oral health care and education in (my) suburban community." (Awareness: Access to care)

Not only were students pleased to be helping the children in need, the rotation experience and reflection time provided opportunities for students to consider options and alternatives to the private practice

model for dental care delivery. The following comments reveal their thoughts.

"This is a very exciting process to be a part of. This project is definitely reaching out to those in the community that … need our help. I think it is great that the parents do not have to take off work or take their student out of school for long to get their oral health assessed and their teeth cleaned. …I found it interesting that we have school nurses but not hygienists. Many changes are being made with dental hygiene options since the extended care permit has come about. Hopefully we can continue to reach out to the communities just as this program has!" (Awareness: Setting – public versus private)

A selection of representative comments from the remaining categories (type of experience, description of the environment and role model) provide a context for describing the unique features of the Miles of Smiles rotation. Students found the experience to be enjoyable and embraced the more relaxed atmosphere when compared to their dental school–based clinic. They viewed the rotation as a good learning experience, while at the same time were pleased that they could provide much needed education and preventive services to children in the community. The samples provided below are representative of the type of experience category.

"I really enjoyed this rotation... one on one attention is a great learning experience. The atmosphere in the (MOS) clinic is very laid back and is really a nice break from the (dental school) clinic." (Type of experience: Relaxed atmosphere and variety)

"I learned a lot about children. …how some children have to take care of themselves at a very young age… that …parents can't afford to seek treatment for their children…(and) that … advice I …give these kids will help them in the long run... I really look forward to doing this again." (Type of experience: Service learning)

Data from all 26 students were re–examined for references to negative comments about the rotation. Three of the journals contained no remarks about a positive or negative experience, while the remaining 23 expressly described the experience in favorable terms.

Students were excited to use the portable equipment but found they needed to be flexible when providing care in an alternative practice setting. The following comments from the category describing the environment/setting indicate that students perceived the program as well organized, were able to get quick support as problems arose, functioned well working in pairs and felt well prepared for the program.

"I really like … working with the (impressive, new) portable equipment. I was very impressed with all of the new equipment. (The experience) expanded my skills of working with various x–ray equipment.

"A few peers … had problems with the unit breaking down, the radiographs not working, or running out of patients… We only had some complication finding where … students … were located. …We even beat the record by completing nine children in one day." (Description of the environment: Portable equipment)

"While one of us was the clinician, the other was an assistant. We established a working routine early on and were the first students to complete eight patients in one day." (Description of the environment: Working in pairs)

"We were tucked away in a storage area/faculty cutting room. Our make shift dental office was partitioned off in a corner… (and) was very cramped. At the second school we were in a gymnasium storage area/gym teacher's office." (Description of the environment: Unique environment)

Highlighting the unique features of this rotation, the following comment describes an encounter with a speech teacher demonstrating interaction and collaboration with other health professionals addressing the needs of children at the site.

"The speech teacher asked if … her six children (could) tour our area to teach them about hygiene. After these kids were complete the same teacher came back and asked us if a particular child was on our list. She stated that the child had double rows of teeth and that it was something that ran in the family. The teacher was mostly concerned because they are interfering with his speech and she did not think he was cleaning them very well. She said that the parents did not have any resources to fix the problem, and wanted us to do what we could for him. When the child came in we asked him if he thought his teeth were different or bothered him. He said that they did not bother him but he did think that he was quite different. After taking an occlusal film and observing the dentition clinically, the patient did not have double rows of teeth. He presented with his maxillary lateral incisors positioned directly lingual to his centrals, and no other malpositioning. The teacher was right about it affecting his speech and he was not keeping them clean." (Description of the environment: Unique environment and collaborative partnerships)

Under the supervision of an ECP–I/faculty member, students had an opportunity to provide preventive care to children in a public school setting. The faculty member modeled the following skills: management of equipment set up and malfunctions, organization and problem solving, compassion during patient care with a vulnerable population and effective and professional communication with various stake holders, such as patients, students, nurses, technicians, school teachers, staff, administrators, parents and referral dentists. Being an effective teacher was among the roles appreciated by students. The following comments show the respect students have for the role modeling by faculty.

"The portable dental equipment not working properly … Professor (blinded) knew who to call and he was able to come right over and resolve the problem … (He also) explain(ed) how to fix it if it were to happen again… I am very impressed with how calm Professor (blinded) stayed and how she was able to be worry free. I learn(ed) … what could go amiss in an off–site program and how to best deal with them." (Role model: Problem solving skills)

"It is inspirational to know that an individual is able and willing to put that much effort into a program of its magnitude. I feel like I would be able to start a program some day after being exposed to this process." (Role model: Organizational skills)

"Professor (blinded) gave me some great tips while doing sealants … Thank you Professor (blinded), you are an awesome teacher, mother, and professor." (Role model: Effective teacher)

"Professor (blinded) makes you feel right at home … Watching Professor (blinded) was great and helped me to know what to say to our patient and also how to say it." (Role model: Compassion)

## Discussion

Faculty and administrators at UMKC are committed to incorporating service–learning throughout the curriculum. The program of focus in this study is one of several within the Division of Dental Hygiene and demonstrates the extent to which faculty embrace the concept of extended opportunities for students to engage in meaningful activities that benefit both the student and the community. The model used in this program relies on the cooperation of community partners in the school district with the university, and is possible through the utilization of broadened legislation with the ECP–I. The ECP–I allowed the students in the program to work under the supervision of a dental hygienist to provide needed care to vulnerable children that would not otherwise have access to preventive oral health services. This collaborative model could not have became a reality without the financial support from the REACH Healthcare Foundation, who contributed by purchasing equipment and supplies and hiring an ECP–I dental hygienist to serve as the additional faculty member.

Service learning experiences often involve community partners functioning in the role of faculty, which can provide a rich, real–world experience for students. The value of having a faculty member serving as a role model for the ECP–I experience was that it provided consistency between expectations in the school–based dental hygiene clinic and expectations in the Miles of Smiles clinic for both the faculty and the students. Formicola has cited that faculty are often reluctant to accept off–site student accomplishments as worthy of credit towards graduation, as they perceive this care to be inferior.[6] However, working with a trusted member of the faculty who assumes the role of clinician–faculty has done much to support satisfaction (acceptance) in granting credit for procedures completed at the off–site Miles of Smiles clinic.

Skill development emerged with the highest percentage of comments, indicating that this rotation does support continued learning, and addresses (supports) most of the competencies expected of graduating dental hygiene students. Having a faculty member on–site providing one–on–one supervision and mentoring has contributed to the success of the skill development aspect. The Miles of Smiles project incorporated many of the recommendations and suggestions of the Macy Study: primary focus on patient–centered care, faculty and students working collaboratively to meet the needs of the patient and significant educational component using off–site clinics that help develop a variety of skills and attributes necessary to address the oral health care needs of a diverse population.[1]

According to Formicola, students treat and average of 6 to 7 patients a day at off–site clinics.[7] This was fairly consistent with the data that emerged in this study. Students reported treating anywhere from 3 to 9 patients per day at the Miles of Smiles clinic, which demonstrates an increase in productivity from the dental school–based clinic. The data also suggests experience with children is limited in the dental school clinics, and students are grateful for the opportunities this rotation provides.

The most impressive statements in the awareness theme are those that express surprise in learning that so many children have unmet dental needs within their own communities. This awareness

helped students become familiar with the changing epidemiology of oral health risks among this diverse population in the community, and is a core competency related to the impact of culture in oral health care.[15] Students reported an appreciation for the model that allowed them to provide services to this vulnerable population, to become aware of the importance of providing even the most basic preventive services and to help children learn more about their oral health. This is congruent with studies that suggest well structured service learning activities can instill a sense of ethics and professionalism in students while they internalize an appropriate vision of their role as health care professionals in the context of their community.[11,12,25] A sense of civic responsibility was evident as students reflected on the role of oral health care providers, shared thoughts about how rewarding it was to help the children and expressed a desire to continue serving their communities upon graduation. Dornan's descriptions of students' self awareness, empathic attitudes, confidence, motivation, satisfaction and development of their professional identities were also seen in the comments by students in this study.[13]

Exposure to diverse populations with language barriers helped students consider strategies to facilitate communication. As students work toward developing their communication skills, they are also learning to rely on the basic principles of cultural competence: self awareness, respect for diversity and sensitivity to communication.[26] Student reflections indicated that students could identify the effects of communication (both positive and negative), recognize that the children constituted a vulnerable population and became aware of how important their knowledge and skills were in helping people who do not have this specialized knowledge. Students had a personal opportunity to experience the special obligation society places on health care professionals to help others who are in need of care.

Students became aware of individuals who volunteered their time and offered to provide services at either free or reduced costs to individuals in need. Some of these professionals were recognized at professional meetings for their contributions and dedication to serving patients from vulnerable populations groups. Students attending these sessions had another opportunity to see these individuals valued and acknowledged, thus socializing students into understanding the value of professionals serving the needs of their community.

The ECP–I dental hygienist designation in Kansas provides a glimpse of what can be achieved with less restrictive laws, so that a safety net clinic can help vulnerable populations and students develop a sense of professional obligation.[5] Integrating more service learning activities throughout the curriculum, selecting students with a demonstrated commitment to community service and ensuring a diverse and culturally competent workforce would allow educators to initiate change in the profession.

Qualitative descriptions of the environmental setting provide a rich portrait of the experience from a student perspective that goes beyond describing the type of equipment and location of the site. Student reflections add an affective component, as well as a greater awareness of the challenges faced by visitors, teachers and students when rooms are geographically hard to find, space is at a premium (closets/faculty offices) and schedules differ from those at the dental school.

Student journals were guided by a series of questions to elicit students' thoughts about specific issues. These were selected based on careful review of the literature and course goals. While generalizability plays a minor role in qualitative research, the intent of this qualitative study is to develop an increased understanding of the student experience. The methods used in this study included strategies for validating the accuracy of the findings.[27] The results can be used to help other investigators generate hypotheses for similar student outreach clinical experiences.

In the future, combining first year dental students with senior dental hygiene students when delivering care would help develop a shared understanding of interdisciplinary service learning, the value of dental hygienists in alternative delivery models and a sense of shared satisfaction in meeting the needs of unserved and underserved children in the community through collaborative care. This is supported by Hood as she describes an unpublished study where students in inter–professional programs gained awareness of the need for inter–professional cooperation to improve patient outcomes, realize the value of other professions and increase the understanding of other practitioners/competencies.[28]

Long–term data is needed to follow the career choices and volunteer experiences of graduates to see if higher numbers of individuals pursue careers in alternative settings. Data from the dental hygiene program in this study show that, since 2003, 1 graduate completed a master's degree in public health, 7 graduates found employment in federally qualified health centers (FQHCs) and 2 considered working in FQHC facilities. Three FQHCs in the state have developed positions for dental hygienists since 2003, when rotations through these centers began.

Negotiations are currently underway for another FQHC position to become available by the end of 2011. Three graduates work with the U.S. Public Health Service, while another graduate is currently pursuing work with this organization.[29] As health care reform seeks more efficient ways of serving all Americans, dental hygienists are in a position to become part of the solution, using their education and professional skills in creative ways as laws become less restrictive. It will be imperative to not only develop alternative practice models and educational programs that provide care to vulnerable populations, but to also provide sound outcome measures to demonstrate the impact of these programs and activities.[4] Making the data part of the public domain may help other stake holders embrace the innovative models, practice acts and activities that address the needs of all Americans and demonstrate that the dental hygiene profession is serious about its professional obligation to society.

## Conclusion

The collaboration between a dental school and dental hygiene program, a school district and a dental hygienist with an ECP–I has made it possible for a service learning program to provide preventive oral health care to unserved and underserved children in 4 Title I schools. Dental hygiene students found it helpful in further developing their dental hygiene skills, creating an awareness of the needs and disparities within their communities, developing an appreciation for new models of care delivery and finding personal satisfaction in caring for those in need of their professional skills. Based on the data in this study, it is also clear that this collaborative program parallels the academic roles and responsibilities recommended by ADEA for improving the oral health status of all Americans.

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# Evaluation of Educational Material for Tobacco Prevention and Cessation Used in West Virginia University Dental Programs

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## Abstract

**Purpose:** Patient educational materials for tobacco prevention and cessation are crucial for dental and dental hygiene education. The programs rely upon written educational material for tobacco prevention and cessation, referred to as empty packs (EMT–PCs), which students distribute to the community during face to face or community–based oral health and tobacco awareness programs. The public often does not understand the EMT–PC that is received due to the high level of complexity and readability of the documents. The authors conducted a study to investigate the EMT–PCs available and used in the West Virginia University School of Dentistry programs. It was hypothesized that they were readable at the eighth grade or lower level, used appropriate font, had good production quality, had appropriate content and were current.

**Methods:** The authors selected 40 EMT–PCs used in tobacco prevention and cessation programs. Initially, the Fry Readability Formula was applied. Next, they evaluated the font, language, production quality, appropriateness for the target audience and recency of the document based upon its copyright or revision within the previous 5 years.

**Results:** The average reading level of the EMT–PCs was grade 6.67 (range 2–17+). The average font size was 13.8 (range 8–14) and the average date of production or revision was 2003. Patient educational materials for the general public should be produced at or below the eighth grade reading level, have a 12 point or larger font size and be produced or updated within the previous 5 years.

**Conclusion:** The hypothesis was supported in that EMT–PCs distributed in the West Virginia University School of Dentistry programs met the criteria for appropriate grade level, font, quality and content, while the average copyright or revision date was 5.9 years, slightly beyond the recommended 5 years. Effective EMT–PCs should be readable and appropriately directed to the target audiences. Dental professionals have access to current, quality tobacco cessation documents and should be aware of the need to evaluate the documents for appropriate literacy levels for various groups.


**Key words:** tobacco cessation education, readability, patient educational materials

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

## Introduction

In 2007, 19.3% of the United State's adult population smoked tobacco cigarettes.[1] The smoking rates in the Appalachian region were much higher – the West Virginia smoking prevalence rate was 26.8%, Kentucky's was 28.1% and Tennessee's was 24.2%.[1] From 2000 to 2004, the United States median smoking–attributable mortality rate (SAM) was 288.1 per 100,000.[2] The West Virginia SAM was 344.3, Kentucky's was 383.9 and Tennessee's was 337.4.[2] SAM is used as an estimate of the United State's public health burden from smoking. SAM is calculated by multiplying the number of deaths of adults over age 35 from any of the 19 diseases caused by cigarette smoking by an American Cancer Society–derived relative risk estimate of preventable deaths for each disease.[4]

The Appalachian region has an extensive rural population. People who reside in rural areas have been recognized as being more vulnerable through barriers imposed by geographic, economic, educational and socio–cultural factors.[3,4] Appalachian health behaviors are problematic, and tobacco use is a prime example. As an illustration, nearly half of the pregnant Appalachian women smoked during pregnancy – a rate 3 times higher than the national rate.[5]

Many Appalachian farmers grow tobacco, making it a common commodity. Tobacco companies target the rural Appalachian area.[6] Overall,

the tobacco industry markets its products with methodically researched strategies, budgeting $11.22 billion to promote cigarettes in 2001.[6] The responding tobacco prevention and cessation efforts need to determine useful, successful strategies to be effective in dissuading tobacco use in the face of such heavily funded promotion campaigns. At the West Virginia University School of Dentistry, tobacco prevention and cessation is important in the curriculum for the dental hygiene and dental programs and follows the U.S. Public Health Guidelines.[7] The guideline model for treatment of tobacco use and dependence is the implementation of the 5A's:[7]

- Ask or screen about smoking
- Advise to quit
- Assess willingness to quit
- Assist with quitting
- Arrange for follow–up

When a patient responds that they are not ready to quit, the corresponding intervention is to ask permission to provide information. If receptive, verbal motivational interviewing follows and EMT–PCs are given.

Thirteen percent of the United States population reads at less than the fourth grade level, with 55% lacking reading skills to function normally as an adult. Of the adult population, 20% have difficulty reading.[8] In 2003, the adult illiteracy rate in West Virginia was 13%.[9] Studies have shown that West Virginia has both a high tobacco use rate and an average illiteracy rate.[1,10]

Since tobacco use leads to more deaths than any other controllable risk factor, the EMT–PCs distributed by dental professionals should meet criteria for readability in tobacco control programs.[10] Many lay people do not understand the EMT–PCs they receive due to the high level of complexity and readability. In most circumstances, an EMT–PC, to be effective, should be readable at the national mean literacy level of the eighth grade, as recommended by the Department of Education.[8,10] EMT–PCs should also have a high production quality, be pre–tested and be appropriate for the given target audience.[10]

Reading level determination may be accomplished with any of several formulas. The Simple Measure of Gobbledegook formula (SMOG) counts words with more than 3 syllables in sample sentences, takes the square root of the count and adds 3 for the grade level.[11] The RAIN formula (Readability Assessment Instrument) uses a manual with 14 variables to determine readability.[11] The Fry formula was developed by Edward Fry in 1963 and extended in 1977. Three passages of 100 words are selected at random. The average number of sentences and syllables in 3 passages is determined and plotted onto the Fry graph and the grade level is read from the graph.[12]

This study's research hypotheses were that EMT–PCs, which were available at no charge and used in West Virginia School of Dentistry Programs (Community Dentistry program, the West Virginia University Dental Community Service Program and the West Virginia University Rural Dentistry Program) for the general public, were:

- Readable at the mean literacy level of eighth grade or below
- Had an appropriate format for ease of reading
- Had good production quality
- Had an appropriate font for the target group
- Were current

## Methods and Materials

EMT–PCs used by the West Virginia University Community Dentistry program, the West Virginia University Dental Community Service Program and the West Virginia University Rural Dentistry Program were sought for inclusion in the study. Forty EMT–PCs were provided and all were included in this study. Each document was reviewed in its entirety. The formats of the documents were identified as tri–fold, quad–fold, card, booklet or fact sheet.

### Reading Level

The authors independently and manually evaluated the documents using the Fry Readability Formula for the reading level of the EMT–PCs. Applying the Fry Readability formula involved 3 randomly selected 100 word samples from the EMT–PCs, counting each sample's sentences and its syllables to the nearest tenth, then calculating the average sentence and syllable length of the 3 samples.[12] The grade level of the EMT–PCs was read directly from the Fry graph from the plot of the average sentence and syllable lengths.[12] During calibration, the inter–rater agreement on the readability was 100%. Professional or clinical terms were collected from the EMT–PCs based on syllable length (over 3 syllables), as well as words requiring definitions within the text and words appearing in the list of Professional Jargon and Difficult Terminology found in Published Patient Education Materials or Professional Jargon.[8,13] The terms were not specifically used in the analysis, but are presented as examples of words that may pose problems for some readers who would be unfamiliar with health–related terminology.

### Font Style

The criteria for font evaluation included using a serif typeface – a font with a small line or bar at the top and bottom of each letter. Serif is the typeface most often used when children in the United States learn to read, and it is the most congenial and comfortable, whereas sans–serif is more common in Europe.[14] Examples of serif fonts include Times Roman, Primer and Century. Font size suitability was a font of 12 or larger, based upon previous studies.[14–16] A 12 point font provides ease of reading without strain.[15,16]

### Recency

Document recency was defined as EMT–PCs prepared or revised in the past 5 years. Other aspects of recency, such as current styles and current language, were not used in this study. Recency is important to consider as updated, cutting–edge information and images may be more compelling than those that are or appear to be outdated.[10]

### Content

Quality of content was based upon 10 key messages concerning tobacco use. Eight were derived from Strategy B1 Motivational Interviewing Strategies of the U.S. Public Health Guidelines.[7] From the Express Empathy Strategy, the topics included the benefits of quitting tobacco use, serious diseases related to tobacco use and the social aspects of tobacco use.[7] From the Develop Discrepancy Strategy, the topics were health effects of quitting and nicotine replacement medications to aid in quitting.[7] From the Roll with Resistance Strategy, the topics were withdrawal/addiction and tips to quit.[7] From the Support Self–efficacy Strategy, the key message was substitute activities.[7] The impact of smoking on oral health and the chemicals in tobacco were added as topics that oral health professionals would desire in their EMT–PCs.

### Production quality

Production quality was based upon paper quality, presence of photographs or artwork and appropriate use of color.[14] An EMT–PC with good production quality was defined as being made with glossy, heavy paper (above 20 pound paper), which could withstand repeated use, the use of color and the use of photographs. Average production quality was defined as the use of heavy (above 20 pound), but not glossy paper, the use of color and the use of art work, but not photographs. Poor quality was the use of 20 pound or less paper, no use of color or no use of art work or photographs.

Table I: EMT–PC Summary Data

| Category | |
|---|---|
| Reading grade level | Number |
| Above Grade 8 | 9 |
| Grade 8 | 3 |
| Grades 3–8 | 19 |
| Grades 2–3 | 9 |
| Mean | 6.67 (SD 3.72) |
| Font | |
| Serif | 28 |
| Sans serif | 11 |
| Mix of both | 1 |
| Point | |
| <12 | 8 |
| 12 | 21 |
| >12 | 6 |
| Multiple sizes | 5 |
| Mean | 13.8 (SD 2.57) |
| Intended Audience | |
| Teen | 13 |
| Adult | 13 |
| Young adult | 11 |
| Older adult | 1 |
| Adult for teen | 2 |
| Recency: | |
| Before 2000 | 3 |
| 2000–2003 | 14 |
| 2004–2009 | 11 |
| No date specified | 12 |
| Mean | 5.9 (SD 3.4) |

### Data Analysis

For data analysis, the average, range and standard deviation for reading level, font size, recency, production quality and content were determined. Also, difficult terms were identified.

## Results

The intended audiences for the 40 EMT–PCs included teens (13 EMT–PCs), adults (13 EMT–PCs), young adults (11 EMT–PCs), parents or adults for teens (2 EMT–PCs) and older adults (1 EMT–PC). There were no EMT–PCs in Spanish and no EMT–PCs for children under 11. The format of the documents included 24 tri–fold brochures, 3 quad–fold brochures, 6 cards, 5 booklets and 2 single fact sheets. The sources for the EMT–PCs were from private businesses (29 EMT–PCs), government agencies or research centers (9 EMT–PCs) and the American Dental Association (2 EMT–PCs).

Summary characteristics of the materials are presented in Table I. There were 9 documents above

the eighth grade, 3 at grade 8, 19 between grades 3 and 8 and 9 between grades 2 and 3. The mean grade level was grade 6.67 (standard deviation: 3.72).

The mean font size of the content of the documents was 13.8 (standard deviation: 2.57). The EMT–PCs for older adults were prepared with an appropriately large 14 point font, and the average font for the EMT–PCs prepared for teens was 12.3. Serif typeface was used in 70% of the texts and sans–serif was used in 27.5%, with 1 EMT–PC using both.

Table II: Key Messages In EMT–PCs

| EMT–PC sample size | 40 |
|---|---|
| Key Messages | Number of EMT–PC addressing the topic |
| Benefits of quitting tobacco | 16 |
| Serious diseases may result from tobacco use | 18 |
| There are detrimental social aspects of tobacco use | 17 |
| There are health affects of tobacco use | 19 |
| Nicotine Replacement Therapy/other medications | 7 |
| Withdrawl/addiction | 14 |
| Tips on quitting tobacco use | 10 |
| Substitute activities to tobacco use | 6 |
| The chemicals present in tobacco | 11 |
| Oral consequences/oral cancer and tobacco use | 16 |

Of the 28 EMT–PCs which had a copyright, revision or another identifiable date, the average recency was 5.9 years (standard deviation: 3.4).

The topics involved in the content analysis can be found in Table II. The topics were rated as present if mentioned at all in the document. Of the 10 topics, the average number of topics presented in each document was 3.2 (standard deviation: 1.9). Sixty–seven words or phrases in the EMT–PCs were considered clinical/professional terms of possible reading and comprehension difficulty (Table III). There were no references made in any of the EMT–PCs as having been pre–tested.

Good production quality occurred in 22.5% of EMT–PCs (the 5 booklets and 4 of the tri–folds, documents that were created by the American Dental Association, the American Cancer Society, the West Virginia Tobacco Cessation Program, the National Institute of Craniofacial Research, Indiana University School of Dentistry and Oral Health America). Average production quality occurred in 72.5% of EMT–PCs (the remaining tri–folds, quad–folds and cards). Poor production quality was evident in 5% (the 2 pages of typed information on 20 pound paper). Ten EMT–PCs (25%) showed tobacco related lesions or surgical consequences (Table IV).

## Discussion

The hypothesis for the readability of the EMT–PCs was supported in that the grade level of the material was an average of 6.67 and font size of 13.8, with 95% of the EMT–PCs having average to good production quality. The average recency was 5.9 years. The average content was 3 of the 10 evaluated elements, which follows the 2 to 3 topics per level of encounter (Express Empathy strategy, Develop Discrepancy Strategy, Roll with Resistance Strategy and Support Self–Efficacy Strategy) in the motivational interviewing strategies of the U.S Public Health Guidelines.[7]

Multiple brochures are given to patients or audience participants, which makes it possible to adequately cover all of the topics. It is important to know what a specific EMT–PC contains as well as its grade level. Tobacco prevention and cessation programs require considerable effort and presenting readable EMT–PCs with enough content to help a person quit or avoid tobacco use could be the difference a person needs for self–efficacy. When an EMT–PC is intended for an audience, general materials at or below the eighth grade level are appropriate. When the EMT–PC is for a specific individual, having a variety of materials of various reading levels from which to choose can customize the message.

People with a low health literacy level are more likely to have higher health care expenses, report poorer health and have more out–patient visits and hospitalizations due to a lack of understanding of their health problems and treatment.[13,17,18] Although the average reading level in the United States is eighth to ninth grade, studies have shown that the literacy levels are 3 to 5 years below the highest grade completed.[19] In selecting EMT–PCs, dental professionals should be aware of the impact and the frequency of low health literacy, especially in regions such as the Appalachians, in which there is a high rate of tobacco use and an average literacy rate. Dental hygienists and dentists select the EMT–PCs which ultimately determine if the needs of the target audience will be met.

None of the EMT–PCs selected for this study had reading levels noted within the document. It would

Table III: Professional Terms in EMT–PC

The following terms were in the 40 EMT–PC used in this study and may be unfamiliar to some readers:

| | | |
|---|---|---|
| abdominal aortic aneurism | epidermoid carcinoma | papillomatosis |
| acute necrotizing ulcerative gingivitis | feline carcinoma | periodontal |
| addiction | formaldehyde | phlegm |
| ammonia | gingivitis | physical dependence |
| anti–depressant | gulka | plaque |
| arsenic | halitosis | pneumonia |
| benign | larynx | polonium 210 |
| betel quid | lesion | prostate cancer |
| bidi | leukemia | radioactive |
| bronchitis | macular degeneration | receding gums |
| calculus | malocclusion | recession |
| carbon monoxide | metastatic | regress |
| carcinoma | metabolism | rheumatoid arthritis |
| carcinogen | methane | sinusitis |
| cessation | miscarriage | sloughing |
| Chantix® | nicotine | still born |
| chronic inflammation | nicotine replacement therapy | stomatitis nicotina |
| coronary heart disease | nodular | sudden infant death syndrome |
| cyanide | olfactory | Varenicline |
| dentifrice | oral cancer | volatile |
| dopamine | osteoporosis | withdrawal |
| emphysema | papilla | Zyban |

be helpful if organizations and professional associations would conduct the tests and print this information on their literature to assist oral health professionals. In the meantime, we suggest that when selecting EMT–PCs, dental hygienists and dentists use the Fry formula themselves to determine if the materials are appropriate for their target audience if no reading level is noted with the EMT–PC.

In the samples obtained for this study, the average EMT–PC was prepared below the recommended eighth grade reading level of the average United States adult reader, which was appropriate for the given target audience. None of the EMT–PCs were identified as being pre–tested for effectiveness in the delivery of the prevention/cessation message, none of the EMT–PCs directly targeted children and none of the EMT–PCs addressed people whose primary language was Spanish. When working with these groups, other EMT–PCs would be necessary beyond those from the study. The tobacco industry presents its message with high quality advertisements, utilizing advertising agencies, which specialize in creating a tempting, alluring image of glamour and mystique.[8] Their advertising messages are tested in focus groups and are target–group specific.

The EMT–PCs need to be produced to a high level of quality to capture the attention of the target audiences, and they also need to be pre–tested for effectiveness. There is an on–going debate about using fear appeals in promoting health behaviors.

Table IV: Production Quality of the EMT–PC

| Quality rating: | Number of Articles | Percentage |
|---|---|---|
| Good | 9 | 22.5% |
| Average | 29 | 72.5% |
| Poor | 2 | 5% |
| Total | 40 | 100% |

| Number of Photographs/ Drawings per EMT–PC | Number of EMT–PC (N=40) |
|---|---|
| 0–1 | 11 |
| 2–5 | 17 |
| 6–11 | 8 |
| ≥12 | 4 |
| Mean 4.8, SD 4.72 | |

Some studies indicate that the documents should be non–threatening and non–fear provoking.[8] Fear photos may not be effective in preventing tobacco use according to the American Heart Association.[5] Therefore, such photographs possibly distracted from a prevention message. Other studies report that the perceptions of high threat and high efficacy appear to produce the most message acceptance.[20] More research is needed as to how the message itself should be presented. With the reading formula currently available, and the technology to create and quickly modify text and art work, it is possible

to develop and test health promotion and disease prevention materials that provide needed information in a manner that positively influences behavior. It is hoped that with such EMT–PCs, the smoking and chewing rates may continue to decline and the SAM will also fall.

## Conclusion

The hypothesis that the EMT–PCs being distributed in the West Virginia University School of Dentistry programs met the criteria for appropriate grade level, font, quality and content was supported, while the average copyright or revision date was 5.9 years, slightly beyond the recommended 5 years. The readability and quality of EMT–PCs are measurable and should be considered when dental hygienists and dentists purchase tobacco EMT–PCs for their specific population base. The grade level of the EMT–PC is a critical concern since 14.5% of the United States population was illiterate in 2003.[9] Studies suggest that production guidelines for effective, appropriate documents should be developed, and organizations should collaborate to produce and pre–test and use the documents.[10] Current documents need to be fine–tuned and the messages more fully developed and expanded so that neither content nor readability is sacrificed. It is our ethical duty to provide patients with appropriate information concerning tobacco use.

A free continuing education program, "Health Literacy for Public Health Professionals Online Training," is available at www.cdc.gov/Features/OnlineTraining to help health professionals better understand the needs of the public for appropriate health educational materials.[21]

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# Improving Access to Preventive Dental Services through a School–Based Dental Sealant Program

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## Abstract

**Purpose:** The lack of access to preventive dental services, such as dental sealants, can be a major barrier to optimal dental health. School–based dental sealant programs can serve as programs to improve access to preventive dental services.

**Methods:** This school–based dental sealant program managed by a Boston dental school with collaborating partners in the metro west area of Massachusetts provides free dental sealants to second grade children. The number of second grade children having dental sealants was tracked for 6 school years and compared with the Healthy People 2010 objective of 50% of all children aged 8 years to have at least 1 dental sealant.

**Results:** From school years 2003 to 2004 through 2008 to 2009, 1,609 dental screenings were provided for second grade children. Of those, 1,189 received dental sealants. To determine whether or not the Healthy People 2010 objective was met, the number of children who received dental sealants from the school–based program was added to the number of children who already had their permanent first molars sealed by their own dentist at the time of the dental screening, plus children with sealants per parent report. In total, the aggregate second grade enrollment having sealants during the designated school years was 54%.

**Conclusion:** The specific Healthy People 2010 objective was achieved over the designated time period. School–based dental sealant programs can help to decrease or eliminate barriers for access to preventive dental services by increasing the number of children who receive dental sealants.


**Key words:** dental sealants, school–based dental sealant programs, Healthy People 2010

This study supports the NDHRA priority area, **Health Promotion/Disease Prevention:** Identify, describe, and explain mechanisms that promote access to oral health care, e.g., financial, physical, transportation.

## Introduction

Healthy People 2010 is a 10 year health promotion program for improving the health of all Americans. Led by the U.S. Department of Health and Human Services, Healthy People 2010 is organized into 28 focus areas with over 400 public health objectives. Health objectives for each focus area, developed and selected through consultation with a broad range of organizations, groups and individuals, provide a framework for monitoring and measuring improvements in the health status of the American population over the 10 year period from 2000 to 2010.[1]

The oral health focus of Healthy People 2010 combines well with with the strong tradition of community–based education and outreach activities at Boston University Henry M. Goldman School of Dental Medicine. Within the Department of Health Policy and Health Services Research, the focus of the Division of Community Health Programs is to improve oral health and enhance the quality of life for the community through strategic partnering, health education and promotion and implementation of public health initiatives, which have all helped in the development of school–based dental sealant programs.[2]

A major theme of the Surgeon General's Report on Oral Health is that oral health means much more than healthy teeth and gums. Oral health means being free from oral pain, oral cancers, birth defects and other diseases or problems that affect our daily functioning. Oral health problems affect our ability to eat certain foods, the way we communicate, how we view ourselves and how we are perceived by others. In advanced stages, oral health problems can affect our performance at work and at school. A recent news report about a young Maryland boy with an untreated dental disease has created a link between oral health and overall general health.[3] The social impact of oral health problems in children is substantial, since more than 51 million school hours are lost each year due to oral health related illness.[4]

Tooth decay remains the single most common chronic childhood disease, occurring 5 times as frequently as asthma, the second most chronic disease in children.[5] In Massachusetts, it is well documented that children are afflicted with oral disease. In 2007, a statewide oral health survey revealed that over 40% of the third graders had experienced dental disease, 17% had untreated dental disease and 5% experienced pain in their teeth or mouth.[6] Given the severe consequences of untreated oral diseases, barriers to dental care and the fact that safe and effective methods to prevent tooth decay are available, the implementation of school–based dental sealant programs becomes more significant in order to help decrease the prevalence of oral diseases.

Lack of access to preventive dental services, such as dental sealants, is a major barrier to optimal dental health. Dental sealants, thin resin coatings that are brushed on the chewing surfaces of teeth by oral health care professionals, are safe, painless and the most effective means of reducing tooth decay on the chewing surfaces of teeth.[7] For as long as the sealant remains on the tooth, the chewing surface of the tooth is virtually protected from developing a cavity. Since many cavities found in school children occur on the tooth's chewing surface,[8] the placement of dental sealants has the potential to greatly improve the oral health status of schoolchildren. Although the purpose of the school–based dental sealant program is to improve access to preventive dental services and serve as a cavity prevention program, it also provides dental health information for schoolchildren, thus increasing dental health knowledge for schoolchildren and their families.

Several studies have been conducted and hundreds of articles have been written about school–based dental sealant programs. Although this review of literature is not inclusive of every article written on this topic, the variety of studies and articles noted are relevant and current. The following concepts related to school–based dental sealant programs are also included in this literature review: the delivery of preventive services for schoolchildren, the effectiveness of using portable equipment in targeted school areas, reducing racial and economic disparities in the prevalence of dental sealants, the unmet need for dental services and an increase in awareness of school–based dental sealant programs as important and effective public health programs that can complement clinical care.[9–12]

Study findings indicate that school–based dental sealant programs can increase the prevalence of dental sealants and can help to reduce or eliminate the racial and economic disparities in the prevalence of sealants.[10] By removing certain barriers, such as cost, time and transportation, school–based dental sealant programs can successfully provide preventive dental services to schoolchildren.[11] Studies show the existence of oral health disparities with individuals from racial and ethnic minority groups, such as immigrants from South American countries, experience higher burdens of dental disease.[13] National data consistently demonstrates that people from racial and ethnic minority groups and individuals living in poverty are disproportionately affected by dental disease.[14] Oral health disparities are evident with the comparison of socio–economic status. Three times as many children from families with incomes below 100% of the federal poverty level have untreated dental decay compared to children from families with incomes above the federal poverty line.[14–16]

Further study is needed to evaluate the fact that school–based dental sealant programs must be both comprehensive and continuous for the maximum dental health benefit for schoolchildren to occur.[17] Following is a description of a school–based program implemented in Framingham, Massachusetts. Initial planning began in 2000, and the school–based dental sealant program is ongoing for school year 2009 to 2010.

## Methods and Materials

Framingham, the largest municipality in the Commonwealth of Massachusetts, is an economically developed town located 20 miles west/southwest of Boston, with 66,910 residents living in an area of 26.44 square miles.[18] The Framingham Public Schools system consists of 8 elementary schools, 3 middle schools and 1 high school, with a total enrollment of 8,154 students for the school year 2008 to 2009. The racial and ethnic distribution of students in the Framingham Public Schools system consists of the following: 20.8% Hispanic, 6.3% African American and 6% Asian. White, non–Hispanic students, including those who identify themselves as Brazilian, comprise 65.6% of Framingham's student population.[19]

According to the 2000 U.S. Census, the median family income in Framingham is less than $68,000.00 a year.[18] Close to 33% of the district's 8,154 school children participate in the federal lunch program. Two Framingham elementary schools still participating in the school–based dental sealant program have close to 50% of students receiving free or reduced–cost lunches.[20] Through a partnership with the Framingham Public Schools, planning for the implementation of the school–based dental sealant program began in 2000.

### Initial Plans for the School–Based Program

Administrators from one Framingham elementary school requested creation of an oral health program to become part of their summer 2000 health initiative. Acceptance of the request followed with a fun and interactive oral health education program which was implemented for 100 disadvantaged school age children. The following school year, an oral health survey was conducted by the Framingham School Health Services for parents of children enrolled in first and second grade. Parents were asked the following questions:

1. How would you rate the oral health of your child?
2. Has your child been seen by a dentist on a regular schedule?
3. Has your child already had dental sealants placed on molar teeth?

The survey showed that less than a third of the children whose parents responded to the survey had dental sealants placed, which was far short of the Healthy People 2010 objective of 50%.[1] As a result, the plan to implement a more comprehensive program to help eliminate barriers to dental services for uninsured and under–insured elementary schoolchildren who do not have access to a primary care dentist was put into action.

### Dental Screenings

In the 2002 to 2003 school year, after positive informed consent was obtained from the parents of each child, baseline data was gathered from dental screenings of third grade children from 3 Framingham elementary schools. Measurable dental variables recorded during the screenings included the following: number of teeth filled, number of teeth with untreated decay, number of teeth extracted, identification of first permanent molars with existing sealants and identification of first permanent molars in need of sealants.

Data from the dental screenings, in particular identification of first permanent molars with existing sealants, was compared to the previous year's survey findings. Although progress was made, only 36% of children had at least 1 sealant.[1] During the following school year, partnership with the Framingham Public Schools system expanded and a town–wide school–based dental sealant program for second grade children was implemented for all 8 public elementary schools. *Guidelines for Sealant Use*, published by the American Association of Public Health Dentistry,[21] were used, and the school–based dental sealant program was modeled after *Seal America, the Prevention Invention* protocol, which was designed with assistance by the American Association of Community Dental Programs.[22]

### Equipment and Staffing

The school–based dental sealant program utilizes a portable dental delivery system purchased with funding from a private foundation.[23] Staffing for the program consists of trained and competent dental personnel, including a dentist, dental hygienist and a dental assistant, along with the program director. The dentist's role helps to determine which teeth need to be sealed. The dental hygienist serves multiple roles, such as the program coordinator, the oral health educator and the dental health provider to apply both the sealants and fluoride varnish for participants in the town–wide, school–based dental sealant program. The dental assistant works chair–side with the dental hygienist to assist in sealant placement and fluoride application, and to record the previously mentioned specific dental information on the appropriate forms. The program director provides general oversight to the program.

In order to preserve the fidelity of the school–based dental program, systematic review of professional oral health guidelines and protocols, such as those in the *Guidelines for Sealant Use* and *Seal America, the Prevention Invention* protocol, are scheduled.[21,22] Annual review of equipment maintenance is enforced in order to ensure all portable equipment is working at optimal operation. Internal validity is ongoing with periodic calibrations scheduled for the oral health care team consisting of the following: decay assessment, placement of dental sealants and fluoride varnish applications.

### Dental Health Education

The school–based dental sealant program begins with a 20 to 25 minute oral health education classroom presentation for all second grade children in the Framingham school system. This presentation is combined with a tooth brushing demonstration using large–size animal puppets. Age–appropriate classroom lessons on "tooth protection," such as proper tooth brushing and flossing, nutrition, fluoride and sealants, along with an animated video, are presented to the children.

Parents of children attending schools in Framingham may have limited English proficiency or have English as their second language. These cultural barriers have the potential to affect the level of health literacy – the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make

Table I: Grade 2 Participants with Filled Teeth and Participants with Decayed Teeth (by school year)

| Grade 2 | 2003–2004 | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 | 2008–2009 | Totals |
|---|---|---|---|---|---|---|---|
| Total Enrollment | 675 | 653 | 654 | 677 | 642 | 685 | 3,986 |
| Number of children receiving dental screening | 286 | 255 | 258 | 253 | 273 | 284 | 1,609 |
| Number of children with filled teeth | 88 | 126 | 97 | 101 | 100 | 115 | 627 |
| Number of children with decayed teeth | 84 | 132 | 84 | 101 | 93 | 85 | 579 |
| Percentage of children screened having decay | 29% | 52% | 32% | 40% | 34% | 30% | 36% |

appropriate health decisions.[24] People with limited health literacy may have difficulty locating health providers and health services, filling out complex health forms or seeking preventive health care.[24]

In order to help increase health literacy, informed consent packets used in the school–based dental program consist of straightforward language, short sentences and well–defined dental terms. Studies have shown that simplified and less complicated information has improved health behaviors in people with low health literacy.[24] School populations identified as having Portuguese or Spanish as the primary language spoken by the parent receive information in the appropriate language. Therefore, double–sided informed consent packets in the primary language spoken at home and in English are sent home with each child to be reviewed by the parent. The packet includes the following: a letter explaining the sealant and fluoride program, a fact sheet about sealants and fluoride, a medical history and permission form and a return envelope for confidentiality. The program letter clearly states the intention of the program is to target children who do not visit a dentist regularly or do not have access to preventive services.

The dental hygienist/program coordinator works closely with school nurses, teachers and administrators to minimize disruption to classroom activities. The total amount of time spent for the entire oral health prevention program, which includes the oral health education classroom presentation, the dental screening and the application of dental sealants with fluoride varnish, is no more than 60 minutes. Spending 1 hour per year out of the classroom for this program is less time than it would take for 1 off–site dental visit to either place sealants or place a dental restoration. In the long run, this prevention program may actually save children lost time from their school environment. Since it may also serve as the child's initial visit with dental professionals, the program can provide a stress–free and fun–filled introduction to dental visits.

Table II: Grade 2 Participants with Filled and Participants with Decayed Teeth from School Years 2003–2004 through 2008–2009

| Variable | Frequency (n=1609) |
|---|---|
| Percent of children with filled teeth | 38.9% (627) |
| Percent of children with decayed teeth | 35.9% (579) |

Participation in the school–based program is voluntary. Parents can withdraw the child at any time. Dental progress reports are sent home with each child for parent review – these reports include dental screening results, notification of the dental sealant and fluoride varnish applications and, if needed, a referral list of local area dental providers for children in need of further dental services who do not have a dental provider nor dental insurance.

## Results

Frequency distributions of participant variables, in both numbers and percents, obtained from informed consent forms and/or screening sheets, are tabulated to include the following:

- Children receiving a dental screening and children with existing decay
- Children with filled teeth and children with decayed teeth
- Second grade children with dental sealants determined at the time of dental screening
- Parent report of existing sealants and sealants placed via the school–based program compared to goals of Healthy People 2010

Figure 1: Number of Filled and Number of Decayed Teeth in Grade 2

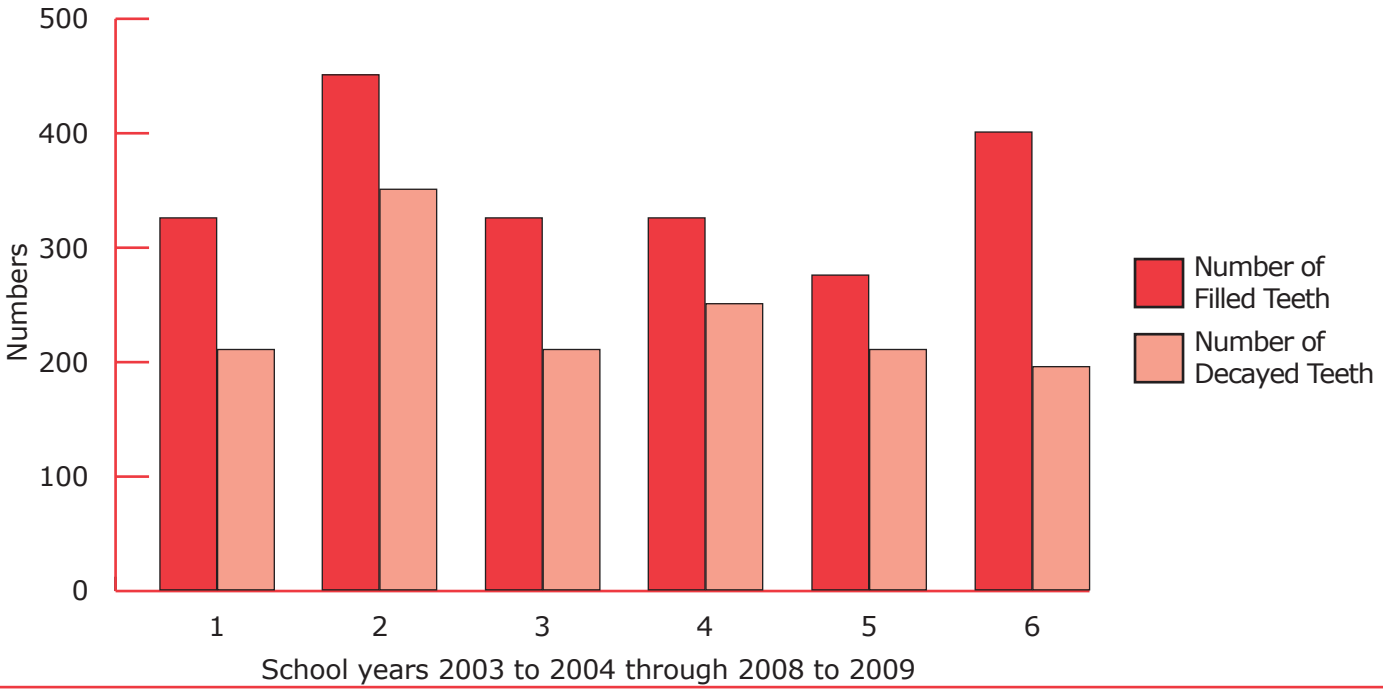
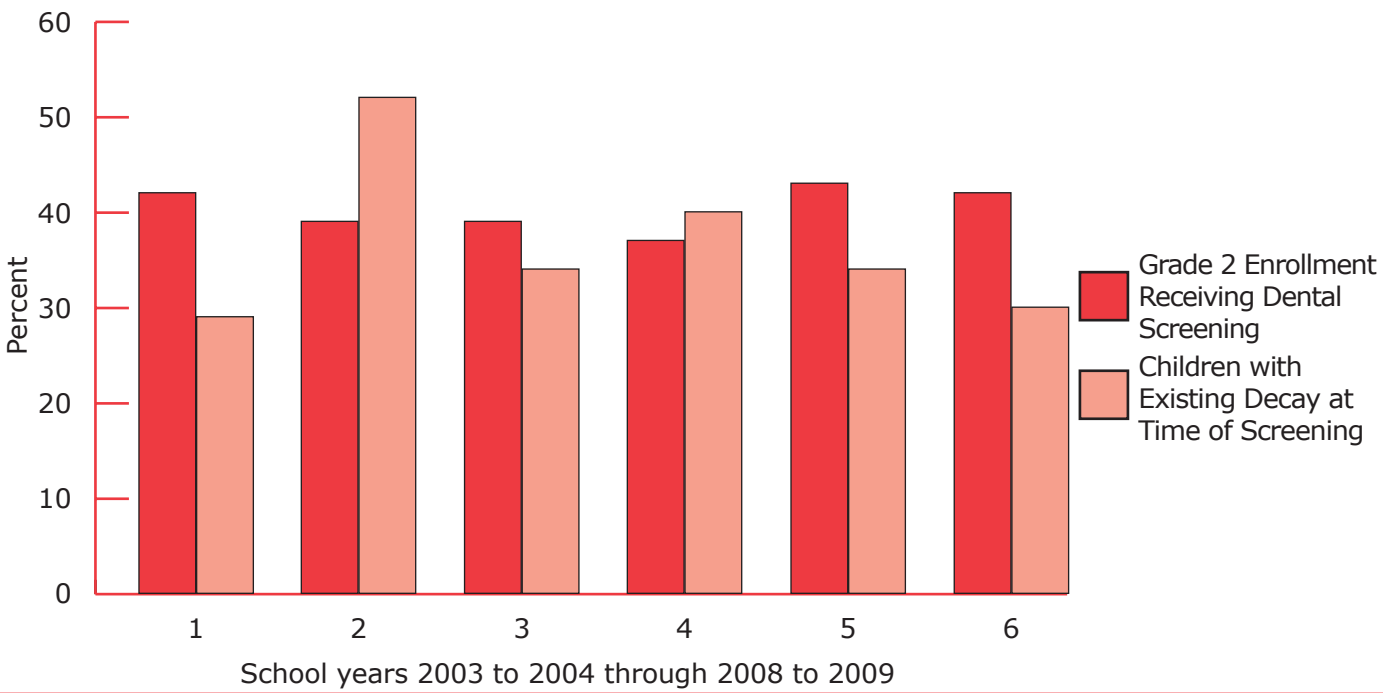



Figure 2: Percents of Children Receiving Dental Screenings Compared with Children with Existing Decay at Time of Screening




Tables I and II and Figures 1 and 2 denote the fluctuating numbers of children receiving dental screenings during the 6 year period. Throughout this period, fluctuations in the numbers of filled teeth and the numbers of decayed teeth are evident. One may wish to assume that this shows an increase in dental awareness, and though dental knowledge has helped in this achievement, this behavior change is beyond the scope of this article. However, we may assume that the increase in the number of filled teeth shows an increase in access to restorative services for the affected children.

Over the 6 year period, the percent of children receiving a dental screening who were shown to have existing decay has fluctuated from a low of 29% to a

Table III: Total Grade 2 Enrollment with Dental Sealants (by school year)

| GRADE 2 | 2003–2004 | 2004–2005 | 2005–2006 | 2006–2007 | 2007–2008 | 2008–2009 |
|---|---|---|---|---|---|---|
| Total Grade 2 enrollment | 675 | 653 | 654 | 677 | 642 | 685 |
| Number of children receiving sealants from school–based program | 199 | 213 | 195 | 199 | 219 | 164 |
| Number of children having had all permanent first molar sealants placed from their own dentist at time of our dental screening | 43 | 16 | 21 | 36 | 27 | 52 |
| Number of children with sealants per parent report | 130 | 131 | 147 | 122 | 116 | 117 |
| Total number of children with sealants | 372 | 360 | 363 | 357 | 362 | 333 |
| Total percentage of Grade 2 enrollment with sealants | 55% | 55% | 56% | 53% | 56% | 49% |

high of 52%. In the 2008 to 2009 school year, 30% of children receiving a dental screening were determined to have existing decay at the time of their dental screening.

Although children are accessing the dental care they need, an assumption can be made that not all children are accessing this necessary dental service. The oral health team with the school–based program is hopeful that continued efforts to promote both the importance of oral health and the importance of receiving necessary dental services will help to reach the children in need of further restorative treatment. By continuing to frame oral health problems as an important part of overall health, we can help local health care providers, especially pediatricians, deliver oral health promotion messages to parents and their children.

Table III highlights the total number of children enrolled in the second grade who had sealants placed during the 2003 to 2004 school year through the 2008 to 2009 school year. These calculations are shown in order to measure the achievement of the Healthy People 2010 objective that required 50% of all children aged 8 to have at least 1 dental sealant. Calculations were determined by adding the number of children who received dental sealants via the school–based program to the number of children who already had all first permanent molars sealed by their own dentist at the time of the dental screening, plus the number of children with sealants per parent reported via the informed consent permission form.

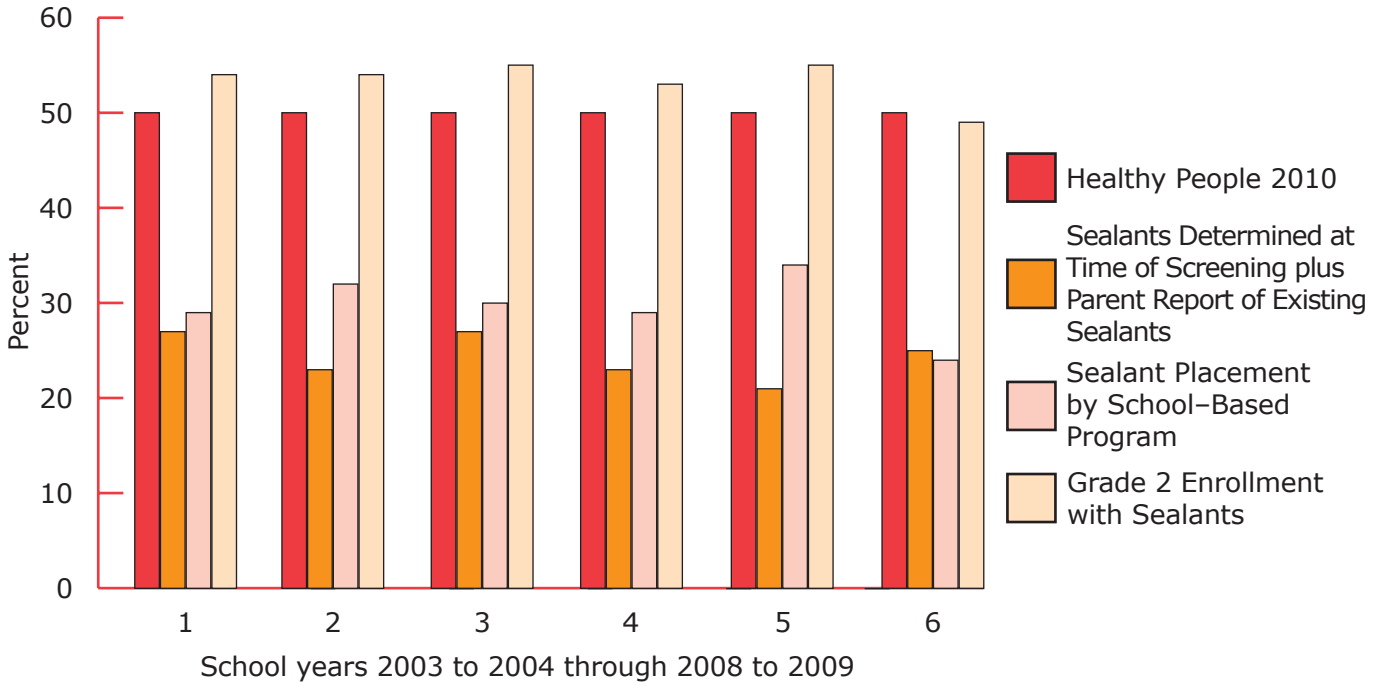
Figure 3 shows that the percent of Grade 2 children with sealants compared to the Healthy People 2010 objective of 50% of children aged 8 years having at least one dental sealant[1] was achieved for school years 2003 to 2004 through 2007 to 2008. However, in the 2008 to 2009 school year, this objective was 1% short of reaching that achievement. Although 49% of all children aged 8 years having at least 1 dental sealant was achieved, there's still work to do to improve access to preventive dental services.

## Discussion

Oral conditions are important determinants of general health and well–being. The goal of improving oral health must be an integral component of the mission of a health care system, and services must be delivered in a manner that is socially and culturally responsive and flexible to the ever–changing communities served. School–based dental sealant programs can help children understand the importance of proper daily oral hygiene and reinforce positive attitudes and practices toward improving oral health. Not all children receive the dental care they need which highlights the fact that oral health needs and barriers to care still exist.

To address the needs of 2 ethnic groups, such as children from Hispanic families and those from Brazilian families, the school–based sealant program in Framingham employs a bilingual, culturally appropriate staff. Bilingual and bicultural staff members provide additional support for non–English speaking children and their parents or guardians, which enhances our efforts to help the children get the necessary further dental services. All educational materials and forms have been created at an appropriate literacy level and are available with Eng-

Figure 3: School–Based Program Results of Grade 2 Enrollment with Sealants Compared to Goals of Healthy People 2010




lish on one side and either Spanish or Portuguese on the reverse side.

In order to help ensure that all children who need dental care receive preventive services, community health programs continue to enhance the program's outreach to parents and/or guardians, children and other community groups. Participation in annual health fairs affiliated with the public school system and the local YMCA continue to promote our messages. Pamphlets on children's oral health, dental sealants and fluoride varnish are distributed to local pediatrician offices that provide services to children at the highest risk for dental disease. Additionally, enhancing our collaboration with local health and dental centers, which serve as major referral sites for children identified with dental treatment needs, is a means to increase our promotion of oral health awareness.

## Conclusion

Although Massachusetts does not have a statewide dental sealant program at this time, privately funded school–based dental sealant programs can help to decrease or eliminate barriers to access. School–based dental sealant programs can increase the number of children who receive dental sealants on their molar teeth, as well as improve their oral health literacy, especially surrounding the value of dental sealants and preventive dental care for children, parents, teachers and non–dental health professionals.

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# The Impact of a Continuing Education Oral Health Program on Providing Services for Young Children by Dentists, Dental Hygienists and Dental Assistants

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## Abstract

**Purpose:** The purpose of this study was to determine the impact of a 4 hour continuing education (CE) program on the oral health knowledge and behaviors of dentists, dental hygienists and dental assistants in providing oral health services to young children in West Virginia general dental practices.

**Methods:** A free CE program was provided for 92 general dentists, 123 dental hygienists and 37 dental assistants (n=252) at 4 sites across West Virginia. Participants completed a pre– and post–test on topics including the timing of the first dental exam, fluorides, xylitol, Alternative Restorative Technique (ART) and their practice pattern of caring for children under 3 years old. A 6 month follow–up questionnaire was mailed to participants to assess outcomes.

**Results:** Participants showed a 22% increase in knowledge from the pre–test to the post–test ($p<0.001$) for all questions except for ART, which showed no change. The majority of dentists and hygienists (89%) increased their comfort in providing services for children under 3 years old. Participants (80%) stated they would increase the number of children under 3 years old they examine, yet 6 months after the program only 42% responded affirmatively ($p<0.001$). At the time of the program, 62% reported that they currently examine children at 1 year of age, and there was no significant change 6 months later. While 54% responded that they would contact their local physicians about early oral health care, only 27% followed through.

**Conclusion:** This program significantly increased the participants' knowledge and comfort level for providing infant and toddler oral health care. However, it did not motivate most to alter their practice behaviors to conform to national best practice guidelines.


**Key words:** oral health education, intervention program, dental knowledge, young children, dental home, early childhood caries

This study supports the NDHRA statement, **Health Promotion/ Disease Prevention:** Validate and test assessment instruments/ strategies/mechanisms that increase health promotion and disease prevention among diverse populations

## Introduction

Dental caries in 2 to 5 year old children has risen dramatically over the past decade as reported by the Centers for Disease Control (CDC).[1] These early years are a critical time in which prevention has a chance to affect the future oral health of children. Dentists, dental hygienists and dental assistants need to have appropriate knowledge and skills to be effective, and children need to have access to a dental home by the end of the first year of life. A dental home can be in a private dental office or community health clinic, but must provide access for a child to receive all their routine and emergency dental services as defined by the American Academy of Pediatric Dentistry (AAPD).[2]

## Review of the Literature

Typically, children have not been accepted into dental practices until they are 3 years old.[3–5] A 2008 study by Shulman showed that this is a significant problem in West Virginia as well, with only a third of dentists performing dental examinations on a child 2 years old or younger.[6] This could be due to the dentist lacking basic knowledge in caring for young children, thereby making the dentist uncomfortable meeting their needs.

National health organizations, such as the American Academy of Pediatrics and the AAPD, have recognized the need for early oral health care for children, suggesting their first dental visit should take place no later than 1 year of age.[7,8] Dentists or dental hygienists graduating before this became the standard of care in 2002 may not be as likely to see children under the age of 3. Continuing education (CE) programs, such as "Points of Light" in Michigan and others like "ABCD" in Washington, have been initiated in several

states to increase the access of young children for oral health care and to assess the knowledge gap. While dental service utilization has increased 21 to 25% for children under age 6,[9] the data does not specifically discuss children aged 1 to 2 years old. In fact, published data from the U.S. Department of Health and Human Services documents that parents only reported that 10% of their children aged 1 year old and 24% of children aged 2 years had a preventive dental care visit as in 2003.[10]

The issue of access is multifactorial. It is not just a problem of parents not being able to locate a dentist willing to treat their young child. Parent's oral health views and their prior dental experiences influence utilization of services in such a way that the parent may never seek care in the first place.[11]

While there are published studies documenting an increase in the knowledge of health care professionals through a CE program,[12–15] there is no agreement on these same programs altering their practice behaviors.[13,16,17] Rosner et al evaluated the effectiveness of a CE program on antimicrobial susceptibility testing, and found that a CE program for clinical laboratory scientists significantly increased the number of laboratories using the latest published guidelines.[17]

Mulligan et al utilized an intensive clinical training program for dentists, dental hygienists and dental assistants to successfully improve the knowledge, attitudes and behaviors towards HIV/AIDS.[13] A 1 day and a 4 consecutive day program were used, and they found that behaviors increased by 55% in the study regardless of the length of the program.

There are no published reports in the scientific literature of a CE program solely altering the practice pattern behaviors of dentists providing oral health care for young children. Therefore, this study was performed to determine the impact of a CE program on the oral health knowledge of general dentists, dental hygienists and dental assistants, and to alter the services they provide to young children in West Virginia.

## Methods and Materials

### The First Smiles Program

The First Smiles CE Program was developed in West Virginia by the authors to increase access by educating dentists, dental hygienists and assistants on the importance of identifying children suffering from early childhood caries (ECC), and to promote inclusion of the age 1 dental visit in their practice. The program was funded through the Benedum Foundation. Developed as a 4 hour CE program, First Smiles was designed to provide a practical and realistic approach to enable the oral health team to become more comfortable in handling young children, to identify risk factors of ECC and to understand the appropriate areas of prevention. The program focused on infant/toddler oral health needs, promotion and disease prevention. First Smiles programs were held at 4 initial sites and were offered at no cost to all oral health professionals and staff in their dental society's region. The program received institutional review board approval from West Virginia University prior to its initiation. Participants completed a pre–test prior to the program, reviewing oral health knowledge and the anticipatory guidance and services they provide for young children. A true/false and yes/no format were selected for simplicity and time efficiency.

In addition, all participants completed a post–test at the end of the program, with their CE credit linked to the submission of the form. The post–test contained 4 behavior–based questions to assess the current method of oral health care for young children in their practice, along with demographic information, including profession and year of graduation for dentists and hygienists.

A follow–up survey was mailed to participants with a self–addressed stamped envelope 6 months after completion of the program. The purpose of the follow–up evaluation was to determine the outcome of the First Smiles program on the 4 dental practice behaviors specifically addressed in the pre–test. The 6 month follow–up evaluation contained the same numerical coding as the previous program evaluation, and pre– and post–test for matching and analysis purposes. While some additional questions could have been asked on the 6 month survey, it was determined to keep the number to only 4 to encourage completion. A second mailing was done to individuals who did not respond to the first request. Statistical analysis was only performed on the participants that completed the 6 month evaluation.

The results of the pre– and post–test and follow–up evaluations were entered into Microsoft Office Excel 2003 for each location and uploaded into SPSS Graduate Pack 15.0 for Windows® for statistical analysis. The data was analyzed using the McNemar Chi–Square and a Paired Samples t–test with significance being set at $p<0.05$.

## Results

A total of 252 individuals consisting of 92 dentists, 123 dental hygienists and 37 dental assistants participated in the First Smiles CE. All of the participants completed the required forms at the time of the program, while 125 (50%) returned the 6 month follow–

up survey with a range of 47 to 69% for the various locations.

If an individual did not complete both a pre– and post–test response to a question, it was not included for analysis. The program was conducted live on multiple occasions and had some natural variability. The pre– and post–test responses for each of the 4 locations were therefore analyzed collectively. The responses for the 6 yes/no anticipatory guidance and oral health care pre–test questions were combined for all locations and types of participants. They were not statistically analyzed since the study goal was not to determine any effect the topic had on future practice policies. Finally, the participants were placed into groups according to their graduation years in 10 year increments (1968 to 1977, 1978 to 1987, 1988 to 1997 and 1998 to 2007) to compare for significant differences.

Table I depicts the combined responses to the 6 yes/no questions covering the types of oral health care and anticipatory guidance procedures completed during a routine exam/prophy appointment for children under 3 years old in their practice. Most participants discussed fluoride intake, nursing caries and demonstrated brushing techniques with parents. A clear majority discussed sippy cup use and prescribed fluoride supplements when indicated. Less than half used fluoride varnish in their practice.

The results of the pre– and post–test's 7 true/false knowledge–based questions are illustrated in Table II, combined for all 4 locations. The mean overall pre–test score was 58%, and the post–test was 80%, with the paired samples t–test showing a statistically significant improvement for all questions ($p<0.0001$) except for the caries rate for children 2 to 5 years old ($p<0.05$) and ART, which was not found to be significant since both the scores were the same.

Table III depicts the results of the 4 behavior–based practice questions answered on the program evaluation compared with the findings 6 months later. Six months after the First Smiles program, 90% of all oral health professionals (89% of dentists and dental hygienists) confirmed that the CE program increased their comfort level in performing oral examinations on children under 3 years old, which was not statistically different from the 92% response on the day of program (91% for dentists and dental hygienists, $p=0.581$). A statistically significant decline from 80 to 42% was observed over the 6 month period when participants were asked whether the CE program would increase the number of children under 3 years old they examine in their office ($p<0.005$). While 54% affirmatively responded that they would contact their local family physicians and pediatricians

Table I: Pre–test anticipatory guidance and types of oral health care responses when performing exam/prophy on children under 3 years old (Percentage with confidence interval)

| Item | N (%±95% CI) |
|---|---|
| Ask parents about fluoride intake | 252 (81±5) |
| Educate parent about nursing caries | 252 (84±5) |
| Educate parent about sippy cup use | 252 (75±5) |
| Prescribe fluoride supplements when needed | 252 (67±6) |
| Demonstrate brushing to parents | 252 (89±4) |
| Apply fluoride varnish to child's teeth | 252 (45±6) |

about the need for early oral health care on the day of the program, only 27% actually contacted them when surveyed 6 months later ($p<0.005$). On the day of the program, 62% responded that they accept children into their practice at 1 year old, with an increase to 67% 6 months later. However, this was not found to be statistically significant ($p=0.296$).

The 4 behavior–based questions were then analyzed by profession, specifically comparing the dental hygienists and dentists, with the responses as shown on Table IV. Dental assistants were not included for comparison since they do not provide direct services. Neither dentists nor dental hygienists changed their opinion on the program's effect on their comfort level of treating young children 6 months later. The responses for both the dentists and dental hygienists regarding the effect of First Smiles on the number of young children they treat showed a significant drop 6 months later ($p=0.001$). There were no significant differences in responses for accepting children aged 1 year for either group while large decreases were noted for both groups in the follow–up contact of their local physicians ($p<0.001$).

There were no significant differences found among participants based on their year of graduation when comparing the pre– and post–test and 4 behavior–based 6 month follow–up data.

## Discussion

The First Smiles program provided an excellent glimpse into the anticipatory guidance provided by oral health care professionals when treating children under 3 year old children in West Virginia.

Table II: Pre–test/Post–test comparison for knowledge–based questions for all 4 sites combined – N (%)

| Item | Responses (N) | Pre–test (N (%)) | Post–test N (%)) |
|---|---|---|---|
| Familiar with 2006 fluoride supplementation table | 225 | 81(36)* | 216(96)* |
| Children's first dental visit should be by age 1 | 233 | 191(82)* | 226(97)* |
| Caries rate for 2–5 year olds has decreased over past decade | 230 | 108(47)** | 127(55)** |
| Starting care by 1 year old reduces dental expenses for next 4 years | 232 | 211(91)* | 232(100)* |
| Xylitol use by pregnant mother until infant is 18 months old reduces cavities in child | 231 | 136(59)* | 226(98)* |
| Fluoride varnish is approved by the FDA as a topical fluoride agent* | 220 | 106(48)* | 147(67)* |
| ART is not of much use in infants/toddlers | 218 | 120(55) | 120(55) |
| Overall Test Score | 218 | 73(58)* | 174(80)* |

* Sig at p<.0001
**Sig at p<.05

Table III: Comparison of behavior–based practice questions on the day of the program versus 6 month survey – N (%)

| Item | Total Responses | Program Day | 6–month post–program |
|---|---|---|---|
| Program increased my comfort level for examining children under 3 years old | 125 | 115(92) | 112(90) |
| Number of children under 3 years old I examine will increase as a result of this program* | 123 | 99(80)* | 52(42)* |
| I will/have contacted my local physicians about the need for early dental care* | 125 | 68(54)* | 34(27)* |
| I accept children starting at one year old for dental exams | 119 | 74(62) | 80(67) |

* Sig at p<.005

While the anticipatory guidance provided to parents before participating in the First Smiles program did not adhere to all of the current recommendations as published by the AAPD,[8] it needs to be noted that a majority of dentists, dental hygienists and dental assistants did comply. Several areas were found to be needing improvement. First, parents were not always educated about the potential problems with sippy cup use, which is one of the most common causes of ECC in young children. Second, while many providers inquired about the fluoride intake for the child, fluoride supplements were not prescribed, even when it was determined that the child needed them. One might conclude that the dental hygienists and assistants would have answered negatively since they are not allowed to prescribe fluoride supplements, but an analysis of the results showed no statistical difference when comparing the various participant groups. This would indicate that the participants appeared to respond according to their office policy rather than by their ability to prescribe.

Lastly, less than 50% of participants utilized fluoride varnish, which is only slightly better than the 44% that Fiset et al found in data from Washington State in 1997.[18] Although their study was performed on adults, they concluded that the limited use was probably due to the cost of the product. The cost may indeed be the reason, but the authors suggest that it may also be that the product has not yet been approved by the Federal Drug Administration for caries reduction. The use of fluoride varnish is an evidence–based practice endorsed by the American Dental Association Symposium held in 2006 and the Association of State and Territorial Dental Directors in 2007.[19,20] These recommendations should be followed by all oral health professionals.

When comparing the pre– and post–test out-

Table IV: Comparison by profession of behavior–based practice questions on the day of the program versus 6 month survey – N (%)

| Item | Dentist Matched Responses | Dentists | Dentists | Hygienist Matched Responses | Dental hygienists | Dental hygienists |
|---|---|---|---|---|---|---|
| | | Program Day | 6–month post | | Program Day | 6–month post |
| Program increased my comfort level for examining children under 3 years old | 51 | 44 (86) | 45 (88) | 60 | 57 (95) | 54 (90) |
| Number of children under 3 years old I examine will increase as a result of this program | 52 | 36 (69)* | 21 (40)* | 46 | 40 (87)* | 16 (35)* |
| I will/have contacted my local physicians about the need for early dental care | 50 | 31 (62)* | 12 (24)* | 51 | 17 (33)* | 4 (8)* |
| I accept children starting at one year old for dental exams | 48 | 31 (65) | 33 (69) | 55 | 31 (56) | 34 (62) |

*Sig at p<.001

comes of the knowledge–based portion of the program, remarkable improvements were found for all but 2 questions. The results for ART did not show any improvement, which may be due to a lack of familiarity of the technique before attending First Smiles, and the minimal time this particular item was covered in the 4 hour program. There was no statistical difference noted between the participant types. The issue of caries trends for children 2 to 5 years old was also answered incorrectly and may have been due to the massive amount of information presented at the program.

Responses from the participants at the end of the program clearly confirmed significant knowledge improvements with xylitol, fluoride supplements and varnish. There can be little doubt that this program significantly improved the participant's knowledge.

The First Smiles curriculum resulted in participants having increased comfort for examining young children. It also appeared to encourage many attendees to treat additional young children in their practices, start dental exams at 1 year old and even contact their local physician to facilitate the establishment of a dental home by age 1. However, improving knowledge from a CE program is one thing – altering practice behaviors is another. As a result, it was vital to evaluate the findings 6 months after the program had been held to determine whether the participants stated plans were fulfilled. One must also realize that just because dentists and hygienists are willing to provide services to this young population does not mean that the parents will bring their child to a dental facility. Another critical component to increasing access to oral health care for this age group is the education of the public. Parents need to understand the need for early oral health care in dental offices and the positive effect it can have on their child's oral health.

Even though the First Smiles program had many beneficial effects, it did not alter the behavior for a majority of the participants. For example, while over half of the attendees responded that they would contact their local physicians, less than one third actually followed through with their stated plan. The purpose of contacting their local physicians was to not only educate them on the need for a child's first dental exam by age 1, but to make the physician aware that they could refer these young children to their dental office for care. It is easy to agree to complete this step during attendance of a course away from their office, but quite another when the practitioner returns to the hectic everyday life of their practice. The requirement to take actions, like contacting local physicians, takes time, initiative and commitment. Many did not develop the amount of dedication required. Only 42% increased the number of children under 3 years old in their practice. The inability of a CE program to change practice behaviors is not solely an issue in dentistry.

In 1998, Davis reviewed more than 6,000 articles on continuing medical education (CME), including over 100 in their study.[21] He found that traditional, relatively short (1 day or less) formal CME events generally generated no change in physician practice behaviors. The most effective strategies included multiple interventions, reminders and patient–mediated strategies.

Davis further delineated these differences in his 1999 review of 14 controlled trials of formal didactic and/or interactive CME interventions, in which at least 50% of the participants were physicians.[22] He concluded that interactive CME sessions which enhanced participant activity and provided the ability to practice skills can effect change in professional practices and health care outcomes.

Numerous studies exist in the literature that successfully demonstrate the effect of multiple interventions and interactive CME sessions on behavior outcomes.[23–30] Of particular note is a comprehensive updated Cochrane review conducted by Forsetlund et al in 2009.[31] They reviewed an additional 81 CE meetings and workshops that studied the effects on professional practice and health care outcomes that were published from 1999 to 2006. They concluded that educational meetings by themselves are not an effective method for producing changes in complex behaviors. The best method was one that included interactive and didactic formats. They presented no conclusion on the optimum number of interventions required to make a significant impact on professional practices.

This study would confirm these findings for dentistry as well. A 1 time CE program is not likely to alter the practice behaviors of most dentists, dental hygienists and dental assistants. It would take a program with additional intermittent reinforcements to have a more significant effect. However, without the knowledge gained from programs like First Smiles, the oral health care professional would not be able to provide the best possible services for these young children.

An example of an effective program is the "ABCD" program in Washington, which began in 1995. It has clearly not just increased the knowledge of general dentists, but also significantly decreased the decayed and filled teeth of children surveyed in 2002 as compared to controls in another county. Kobayashi also demonstrated that the program was cost effective.[32] Nearly 19% of children under age 2 now receive dental care as compared to 3% prior to the program. The "ABCD" program has received many accolades as well. However, one must take note that the program offers increased financial reimbursements if a dentist participates in the program, which includes a CE program. It may be that this financial incentive is the key component to affecting increased access.

This current study does have its limitations. It is important to take into consideration that the First Smiles program was free to participants. This may have encouraged some individuals to attend in order to obtain CE hours at no cost, even though they had little interest in the topic presented. The authors found the participants to be engaging and appreciative for First Smiles, which was confirmed by the overwhelming positive program evaluations. Another limitation was the use of yes/no or true/false questions. Further discrimination would have been able to be done if a graduated scale, such as a Likert scale, was used.

Future studies need to be conducted in this area of dentistry to determine if current programs being conducted across the United States need to be modified to improve their effectiveness, as this study has found. While increasing knowledge of oral health care professionals is important, it is the critical outcome of improving access to care for this age group that needs to be the goal. If dentists continue to limit access to this young age group even after programs like First Smiles, alternative delivery methods of prevention need to be seriously considered, such as enabling mid–level providers to provide such services.

Effective oral health public awareness programs must be developed to educate parents on the need for early oral health care for children, no later than 1 year of age. Increasing the number of general dental practices willing to provide care to this age group is of little help if the parents do not bring their young child to the dentist for care. The recent passage of health care reform, mandating dental coverage for children, will only increase the need for additional access for this young population and should be a wake–up call to the dental profession to promptly resolve access issues to general and pediatric dental practices.

The last key point to consider is that all pediatric dentists must commit to the age 1 dental examination and prevention practices for this age group to set the example for general dental practices to follow.

## Conclusion

First Smiles significantly increased the participant's knowledge and comfort level for providing infant and toddler oral health care in West Virginia. This program did not motivate the majority of participants to alter their practice policies to conform to national best practice guidelines of examining children by age 1. Additional research needs to be conducted to determine if a program with intermittent reinforcements at selected time intervals could have a greater effect on access for this young age group.

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# A Comparison of Millennial Dental Hygiene Student and Faculty Classroom Expectations

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## Abstract

**Purpose:** Research has shown that Millennial students are different than students in previous generations. This study compares the expectations of the didactic environment of faculty and students in a baccalaureate dental hygiene program. Expectations of faculty and students were examined, and comparisons between Millennial and non–Millennial students and faculty were made in order to improve the educational experience of dental hygiene students.

**Methods:** Students and faculty completed a survey adapted from McCargar's role expectations survey. Items were chosen from the survey to cover such areas as technology, group work and authority. The survey consisted of a Likert–type scale including strongly agree, agree, neutral, disagree and strongly disagree. Data was entered into SPSS 15.0 database. Scoring on negative questions was reversed so that the score would be positive. Individual answers are given the following scoring assignments: Strongly Agree (+2), Agree (+1), Neutral (0), Disagree (–1) and Strongly Disagree (–2). Scores were added together to create a summative score for each item. Descriptive statistics and an unpaired t–test comparing responses were used to analyze data. Cronbach's alpha was run to measure the internal consistency of the instrument.

**Results:** Twelve faculty and 94 students returned surveys. Students felt strongly that copies of course notes should be available online and faculty should return emails within 24 hours. Statistically significant differences in the expectations of Millennial and non–Millennial students were found in regards to issues of authority, community service, attendance and evaluation. The majority of significant differences were found between Millennial students and faculty. Significant differences were found in interaction, community service, technology and homework.

**Conclusion:** Faculty should examine the expectations of their students and should use the findings to create learning experiences that are more effective for students. Expectations change with each generation, and it is important to change techniques and methodologies in order to meet the needs of current students and the profession.


**Key words:** education, Millennial, expectations, didactic

This study supports the NDHRA priority area, **Professional Education and Development:** Identify the factors that affect recruitment and retention of faculty

## Introduction

The Millennials, born in the year 1982 or after, have not only matriculated into undergraduate programs, but are also entering graduate and undergraduate health profession programs. In 2007, Mangold wrote an article which outlined the contrast between Baby Boomers and Millennials and the implications this may have on nursing education.[1] Some of these implications include the use of digital media, interactive learning, collaborative team work and mentoring.[1] Since then, nursing educators have examined how to best teach Millennials.[2,3] Nursing is not the only field that is noticing the Millennial students as unique. Recent presentations at the American Dental Education Association's Annual Sessions have focused on Millennial students in dental education.[4] Millennials have entered the health professions, and health care educators must be prepared to provide effective instruction to this new generation.

The characteristics of Millennial students are distinctly different from the Baby Boomer and Generation X faculty who may have different expectations of teaching and learning in higher education. A wealth of research is available regarding the characteristics of Millennials in higher education, but little research exists on the expectations that Millennial students have in undergraduate health professions programs. Currently, no research is available examining the expectations of undergraduate dental hygiene students and the expectations of the faculty that teach them

related to generational differences. Dental hygiene student and faculty expectations should be examined to provide students with a successful learning experience.

## Review of the Literature

As Millennial students overwhelm higher education, there has been a large effort to identify the characteristics and attitudes of the newest generation to better educate this cohort of students. Howe and Strauss have led the way in investigating and publishing the characteristics of Millennial students, and their work has defined characteristics unique to the Millennial generation.[5]

The parents of Millennials have been extremely involved in their children's lives and have provided direction for them. With this direction, Millennials have also been pressured to achieve high levels of performance in sports, academics, arts and many other aspects of their lives. Even though the Millennial generation has been given specific direction, and they feel pressure in their lives from others, they are still a conventional generation, in that they respect authority, rules and other cultures more than previous generations. Millennials are also team–oriented and finds value in community service activities.[1,5,6] Sandfort and Haworth found that this generation thinks a college degree is a way to guarantee a middle class lifestyle. Ninety percent of Millennials interviewed expect to attend college and 70% expect to have professional jobs and put less emphasis on their careers and more emphasis on other aspects of their life compared to their parents.[6] Other researchers have found that Millennials are a connected generation.[7] This means they use electronics and technology to stay connected to friends and obtain information. Mobility is an important aspect of being connected – they stay connected no matter where they are. With this mobility and connectedness, Millennials also expect immediacy.

Jonas–Dwyer and Pospisil examined how the characteristics of Millennial students affect the academic environment.[8] Using technology is a way of life for Millennials, and higher education faculty must incorporate its use into the classroom. Millennials are also looking to faculty as leaders and role models, and they want the faculty to take the lead in the classroom. Yet Millennials demand respect for themselves and their ideas. Millennial students indicate that the use of humor and fun was expected in the learning process. Another study of the needs and expectations of Millennial students in higher education found that Millennials have expectations different from previous generations of students.[9] The survey identified that students do not view computers and the Internet as technology, but as a necessity and as communication tools.

As outlined by Vella, meeting learner expectations is one of the main principles in adult education.[10] The first principle of adult education is to complete a needs assessment of your learners to define what they expect and need from a course. Needs assessments not only consider course content, but also consider the learners' preferred learning styles and their backgrounds. Several studies in multiple disciplines have identified that student and faculty expectations are different.[10–12]

The health professions have begun to examine generational differences. A comparison study of Generation X and Millennial medical students at one medical school (n=809) revealed strong personality differences between the 2 generations. Millennial students were more open and more willing to change than the Generation X students.[13]

Two studies examined the preferences for teaching methods among Generation X and Millennial students in health care disciplines.[14,15] Both studies found their Millennial students did not have preferences similar to their generational cohort. These studies may indicate that Millennial health professions students may have different expectations than their peers in other fields of study.

Just as Millennials have different needs as learners, faculty who are classified as Boomers or Generation X have different expectations. The body of research related to these differences is limited, and with no research on the expectations of dental hygiene students and dental hygiene faculty. The following research explores dental hygiene faculty and student expectations related to generation.

## Methods and Materials

After Institutional Review Board approval was obtained, participants were asked to complete a survey related to faculty and student expectations. Eligible participants were baccalaureate dental hygiene students enrolled at a Midwestern 4 year research university and the dental hygiene and dental faculty who teach dental hygiene courses at the university. Student participants received a recruitment letter asking them to participate in the study. Upon completion of the questionnaire, students placed it in a collection envelope. Faculty received a recruitment letter and questionnaire in their university mailboxes as well as an email asking them to participate in the study. Faculty returned the questionnaires in an envelope to the primary investigator's mailbox. Faculty and student participation was voluntary.

The survey instrument was adapted from McCargar's survey of role expectations and slightly modified to include items pertaining to the use of technology, group work and Millennial characteristics.[16] Twenty questions for student expectations and 20 questions for faculty expectations were chosen from the McCargar survey. Questions related to the characteristics of Millennials were chosen from the original survey, especially those pertaining to group work and specific technologies used in the classroom. McCargar established the validity of the study with a panel of expert judges, and a field test provided Cronbach's alpha of 0.77. Since minimal changes were made to the instrument, the validity and reliability of the instrument was presumed to remain the same.

Data was entered into a SPSS 15.0 database. Scoring on negative questions was reversed so that the score would be positive. Individual answers are given the following scoring assignments: Strongly Agree (+2), Agree (+1), Neutral (0), Disagree (–1) and Strongly Disagree (–2). Scores were added together to create a summative score. Descriptive statistics and an unpaired t–test comparing responses were used to analyze data. Cronbach's alpha was used to measure the internal consistency of the instrument.

## Results

Twenty surveys were distributed to faculty and 12 were returned for a 60% response rate. Ninety–four surveys were distributed to students and 90 were returned for a 96% response rate. The mean age of students was 23.01 and the mean age of faculty was 44.36. Seventy–nine students were Millennials (87.7%) and 11 students were non–Millennial (12.2%). Ninety–nine percent of students were female and 88% were white. All students were entry–level, full–time dental hygiene students. All faculty were full time who teach didactic courses to dental hygiene students, and all were non–Millennial. Two faculty respondents were dentists and 10 were dental hygienists.

Dental hygiene students strongly agreed with many items related to rules, responsibility and attendance. Students also strongly agreed on items related to faculty providing access to class notes and email response time. In general, dental hygiene students were agreeable on most statements, however, students disagreed with calling faculty by their first name, amount of homework and the faculty evaluating students with only a midterm and final.

Comparatively, faculty strongly agreed in areas concerning interaction in the classroom, students following rules and policies and students accepting responsibility for learning. Mandatory attendance and accepting mistakes as a natural part of learning was an expectation that faculty have of students. Students using computers and the Internet to complete assignments and faculty having proficiency in technology were also areas that faculty strongly agreed upon. Finally, faculty strongly agreed that they should provide a written list of class policies within the syllabus, admit to not knowing an answer to a question and provide periodic evaluations throughout the quarter.

Faculty most strongly disagreed with being called by their first name. They also disagreed with providing copies of course notes, being available at home and exclusively giving a midterm and a final.

Even though the student population surveyed contained mostly Millennial students (87.7%), significant differences between the 2 groups were identified in 5 areas concerning student expectations, and 2 areas concerning faculty expectations. Both Millennial and non–Millennial students disagreed with calling faculty by their first name, but non–Millennial students more strongly disagreed with this statement. Another area of significant difference was encouraging peers to follow rules. Non–Millennial students agreed more strongly than Millennial students that students should encourage their peers to follow class rules. The third area was accepting responsibility for learning. While both groups were in agreement, non–Millennial students agreed more strongly that students should accept responsibility for learning.

Millennial students disagreed that students should be required to do community service, while non–Millennials were in agreement with this statement. There was also a statistically significant difference in agreement in regards to attendance in all class, labs and clinics. Again, non–Millennial students felt more strongly that students should attend all class sessions.

There were 2 differences in Millennial and non–Millennial expectations of faculty. Millennial students agreed that faculty should socialize with students outside of class, while non–Millennials were neutral on this subject. The second difference in faculty expectations was that non–Millennial students agreed more strongly that faculty should provide periodic evaluations throughout the quarter, more so than Millennial students (Tables I–a, I–b).

Significant differences between faculty and Millennial students were found in several areas. Millennial students felt they should not disagree with

Table I–a: Differences in Expectations between Millennial and Non–Millennial Students
Mean based on scale from 2 to –2 (SA=2 A=1 N=0 D=–1 SD=–2)

| Question | | | | | |
|---|---|---|---|---|---|
| Students Should: | Group | Mean | SD | t | Sig (2–tailed) |
| Accept the authority of teachers | Millennial | 1.55 | .658 | .412 | .682 |
| | Non–Millennial | 1.64 | .505 | | |
| Call faculty by their first name | Millennial | –.91 | .894 | –2.256 | .027 |
| | Non–Millennial | –1.55 | .688 | | |
| Disagree with the faculty | Millennial | –.28 | .783 | –.244 | .812 |
| | Non–Millennial | –.36 | 1.120 | | |
| Laugh in class | Millennial | .92 | .859 | –.054 | .957 |
| | Non–Millennial | .91 | .831 | | |
| Volunteer to participate in class activities | Millennial | 1.27 | .571 | –.235 | .819 |
| | Non–Millennial | 1.18 | 1.168 | | |
| Interact with the teacher and other students during class | Millennial | 1.42 | .591 | –.731 | .467 |
| | Non–Millennial | 1.27 | .786 | | |
| Present their own opinions in class | Millennial | 1.29 | .686 | –.801 | .425 |
| | Non–Millennial | 1.10 | .994 | | |
| Follow class rules | Millennial | 1.73 | .445 | –.638 | .525 |
| | Non–Millennial | 1.64 | .674 | | |
| Encourage peers to follow class rules | Millennial | 1.43 | .614 | 2.767 | .013 |
| | Non–Millennial | 1.82 | .405 | | |
| Accept responsibility for learning | Millennial | 1.53 | .502 | 2.132 | .050 |
| | Non–Millennial | 1.82 | .405 | | |
| Learn something because it might be on a test | Millennial | 1.29 | .682 | –.909 | .366 |
| | Non–Millennial | 1.09 | .701 | | |
| Ask the teacher how to get a better grade | Millennial | .97 | .847 | –.234 | .816 |
| | Non–Millennial | .91 | 1.044 | | |
| Accept mistakes as a natural part of learning | Millennial | 1.18 | .615 | .931 | .354 |
| | Non–Millennial | 1.36 | .674 | | |
| Use a computer and the Internet to complete assignments | Millennial | .78 | .943 | .723 | .472 |
| | Non–Millennial | 1.00 | .775 | | |
| Be required to do community service | Millennial | –.03 | 1.132 | 2.498 | .014 |
| | Non–Millennial | .91 | 1.375 | | |
| Receive academic credit for community service | Millennial | .51 | 1.096 | .603 | .548 |
| | Non–Millennial | .73 | 1.421 | | |
| Be required to work in groups | Millennial | .23 | .960 | .745 | .458 |
| | Non–Millennial | .45 | .820 | | |
| Receive one grade for everyone in a group project | Millennial | .10 | 1.223 | –.503 | .616 |
| | Non–Millennial | –.09 | .944 | | |
| Be a member of your professional organization | Millennial | .87 | .992 | 1.854 | .067 |
| | Non–Millennial | 1.45 | .820 | | |
| Attend all classes, labs, and clinics | Millennial | 1.52 | .677 | 3.031 | .006 |
| | Non–Millennial | 1.90 | .316 | | |

Table I–b: Differences in Expectations between Millennial and Non–Millennial Students
Mean based on scale from 2 to –2 (SA=2 A=1 N=0 D=–1 SD=–2)

| Question | | | | | |
|---|---|---|---|---|---|
| Faculty Should: | Group | Mean | SD | t | Sig. (2–tailed) |
| Use Power Point Slides for lectures | Millennial | 1.41 | .610 | 1.200 | .233 |
| | Non–Millennial | 1.64 | .505 | | |
| Distribute copies of class lecture notes | Millennial | 1.70 | .540 | .721 | .473 |
| | Non–Millennial | 1.82 | .405 | | |
| Make class notes available online | Millennial | 1.53 | .617 | .522 | .603 |
| | Non–Millennial | 1.64 | .674 | | |
| Provide a written list of class policies within the syllabus | Millennial | 1.44 | .655 | 1.350 | .181 |
| | Non–Millennial | 1.73 | .647 | | |
| Follow the course syllabus exactly | Millennial | .68 | .899 | –.160 | .873 |
| | Non–Millennial | .64 | 1.027 | | |
| Respond to student emails within 24 hours | Millennial | 1.59 | .543 | –.274 | .785 |
| | Non–Millennial | 1.55 | .688 | | |
| Be available to students whenever needed, including telephone calls at home | Millennial | –.04 | .912 | –.173 | .863 |
| | Non–Millennial | –.09 | 1.221 | | |
| Require the use of a computer and the Internet to complete assignments | Millennial | .27 | .983 | –.262 | .794 |
| | Non–Millennial | .18 | 1.079 | | |
| Be proficient in the use of technology for class-room instruction | Millennial | 1.22 | .592 | –.659 | .512 |
| | Non–Millennial | 1.09 | .539 | | |
| Admit not knowing an answer to a question | Millennial | 1.39 | .649 | –1.430 | .156 |
| | Non–Millennial | 1.09 | .701 | | |
| Socialize with students outside of class | Millennial | .71 | .834 | –2.618 | .010 |
| | Non–Millennial | .00 | .894 | | |
| Use several different teaching methods throughout the quarter | Millennial | .99 | .899 | .347 | .730 |
| | Non–Millennial | 1.09 | 1.136 | | |
| Require more than two hours of homework a week, per class. | Millennial | –.57 | .915 | .401 | .690 |
| | Non–Millennial | –.45 | .688 | | |
| Require students to work in groups | Millennial | –.14 | 1.028 | .146 | .884 |
| | Non–Millennial | –.09 | 1.300 | | |
| Assign students to a work group | Millennial | –.19 | 1.087 | –.241 | .810 |
| | Non–Millennial | –.27 | .905 | | |
| Allow students to pick their own work groups | Millennial | 1.03 | .800 | –.097 | .923 |
| | Non–Millennial | 1.00 | .894 | | |
| Call on students who don't participate in class | Millennial | –.38 | .951 | .331 | .741 |
| | Non–Millennial | –.27 | 1.348 | | |
| Be a member of their professional organization | Millennial | 1.08 | .944 | .049 | .961 |
| | Non–Millennial | 1.09 | 1.044 | | |
| Provide periodic assignments, quizzes, and or evaluations throughout the course | Millennial | 1.11 | .734 | 2.282 | .025 |
| | Non–Millennial | 1.64 | .505 | | |
| Give a midterm and a final only | Millennial | –1.00 | .755 | –1.806 | .074 |
| | Non–Millennial | –.47 | .931 | | |

faculty, while faculty were more agreeable to having students disagree. Millennial students also felt that it was acceptable for faculty to socialize with students outside of class, while faculty disagreed with this statement. Faculty also agreed more strongly that students should volunteer to participate in class activities. In the areas of technology, faculty strongly agreed that students should use a computer and the Internet to complete assignments, while Millennials only agreed with this statement. Millennial students agreed that faculty should use Power Point slides for lectures and should make class notes available online. Faculty did not agree as strongly on these statements. Students displayed more agreement for learning something because it could be on a test when compared with faculty. Faculty felt more strongly that students should be required to do community service. Differences were also found in the amount of homework required by faculty. Students disagreed with requiring more than 2 hours of homework per week per class, while faculty agreed with this statement. There was statistically significant data reported that students agreed they should be allowed to pick their own work groups, while faculty did not agree as strongly. Finally, faculty agreed they should call on students who do not participate, while students disagreed with this statement (Tables II–a, II–b).

## Discussion

Dental hygiene students generally mirror Millennial students on most factors. Major differences were found with the expectations of Millennial students and faculty. The expectations dental hygiene students have of the didactic classroom environment are similar to literature cited about Millennial student expectations. The survey revealed that students strongly agree that they should accept authority and follow the rules established by the teacher. Similarly, students disagreed that they should call faculty by their first names. These findings are consistent with the findings of Howe and Strauss who found that Millennials respect authority and follow rules.[5] These results display that students are looking to faculty as leaders and role models in the classroom and faculty should embrace these roles.

Students prefer that faculty incorporate the use of technology in the classroom and be available through efficient electronic means, such as email and/or instant messaging. Having a course website include the syllabus and assignments can give students 24 hour access to course information. Students also did not feel strongly that they should be required to do community service. This is contradictory to the fact that Sandfort and Haworth found that community service is important to Millennial students.[6] However, if community service is a part of Millennials lives, then they may feel it does not need to be required by an academic program.

Faculty expectations revealed a more diverse group of issues, the first area being interaction in the classroom. Faculty strongly agreed that faculty and students should interact and that students should volunteer to participate in class. Faculty also felt strongly that students should follow rules and accept responsibility for learning, including attending all class sessions. Most of the literature focuses on the students' expectations, therefore making the results of faculty expectations difficult to compare to current research. Faculty should make their expectations clear to their students verbally or in writing at the beginning of the course.

While Millennial and non–Millennial students generally had similar expectations, there were areas of marked differences. Non–Millennial students had higher levels of agreement on encouraging peers to follow rules, accepting responsibility for learning and attending all class sessions. Previous research has found that Millennial students prefer more group activities, interactive activities, quicker response time, more integration of technology and entertainment in the classroom.[17–19] The results of this study are more consistent with the findings of Walker et al, who found no differences in the preference of teaching methods between Millennial and Generation X nursing students.[14] Reasons for this may include that students in health professions are a selective group and therefore are more likely to be homogenous. Another surprising result was that Millennial students disagreed that community service should be required, while non–Millennials were in agreement. This is not consistent with the findings of Sandfort and Haworth who found that community service is important to Millennials.[6] While disagreement with this statement does not mean Millennials do not value community service, it does show that they have different ideas concerning the requirement of community service than their non–Millennial classmates. One reason may be that Millennials participate in community service outside of school and do not feel it is necessary to require this as part of the curriculum. Another interesting difference was that Millennials more strongly agreed to faculty socializing with students outside of class than non–Millennials. This creates a challenge for faculty to uphold the authority and role model figure that Millennials expect, while also balancing the social aspects of relationships with students. Dental hygiene programs that include more diverse age differences in their students will also have challenges in meeting the needs of these groups.

Table II–a: Differences in Expectations between Millennial Students and Faculty
Mean based on scale from 2 to −2 (SA=2 A=1 N=0 D=−1 SD=−2)

| Question | | | | | |
|---|---|---|---|---|---|
| Students Should: | Group | Mean | SD | t | Sig.(2–tailed) |
| Accept the authority of teachers | Millennial | 1.56 | .639 | .735 | .464 |
| | Faculty | 1.42 | .669 | | |
| Call faculty by their first name | Millennial | −.99 | .893 | 1.598 | .113 |
| | Faculty | −1.42 | .669 | | |
| Disagree with the faculty | Millennial | −.29 | .824 | −2.036 | .037 |
| | Faculty | .25 | .866 | | |
| Laugh in class | Millennial | .92 | .851 | .345 | .731 |
| | Faculty | .83 | .718 | | |
| Volunteer to participate in class activities | Millennial | 1.26 | .663 | −2.022 | .046 |
| | Faculty | 1.67 | .651 | | |
| Interact with the teacher and other students during class | Millennial | 1.40 | .614 | −1.403 | .164 |
| | Faculty | 1.67 | .651 | | |
| Present their own opinions in class | Millennial | 1.27 | .723 | .487 | .627 |
| | Faculty | 1.17 | .577 | | |
| Follow class rules | Millennial | 1.72 | .475 | .364 | .717 |
| | Faculty | 1.67 | .651 | | |
| Encourage peers to follow class rules | Millennial | 1.48 | .604 | −1.009 | .316 |
| | Faculty | 1.67 | .651 | | |
| Accept responsibility for learning | Millennial | 1.57 | .498 | −1.162 | .248 |
| | Faculty | 1.75 | .622 | | |
| Learn something because it might be on a test | Millennial | 1.27 | .684 | 2.328 | .038 |
| | Faculty | .42 | 1.240 | | |
| Ask the teacher how to get a better grade | Millennial | .97 | .867 | .502 | .616 |
| | Faculty | .83 | .835 | | |
| Accept mistakes as a natural part of learning | Millennial | 1.20 | .622 | −1.555 | .123 |
| | Faculty | 1.50 | .674 | | |
| Use a computer and the Internet to complete assignments | Millennial | .81 | .923 | −2.494 | .014 |
| | Faculty | 1.50 | .674 | | |
| Be required to do community service | Millennial | .09 | 1.196 | −4.444 | .000 |
| | Faculty | 1.17 | .718 | | |
| Receive academic credit for community service | Millennial | .53 | 1.134 | .342 | .733 |
| | Faculty | .42 | .900 | | |
| Be required to work in groups | Millennial | .26 | .943 | −1.461 | .147 |
| | Faculty | .67 | .651 | | |
| Receive one grade for everyone in a group project | Millennial | .08 | 1.189 | −.926 | .356 |
| | Faculty | .42 | 1.165 | | |
| Be a member of SADHA | Millennial | .94 | .987 | −.462 | .645 |
| | Faculty | 1.08 | .900 | | |
| Attend all classes, labs, and clinics | Millennial | 1.56 | .656 | −.938 | .351 |
| | Faculty | 1.75 | .622 | | |

Table II–b: Differences in Expectations between Millennial Students and Faculty
Mean based on scale from 2 to –2 (SA=2 A=1 N=0 D=–1 SD=–2)

| Question | | | | | |
|---|---|---|---|---|---|
| Faculty Should | Group | Mean | SD | t | Sig.(2–tailed) |
| Use Power Point Slides for lectures | Millennial | 1.43 | .601 | 2.692 | .008 |
| | Faculty | .92 | .793 | | |
| Distribute copies of class lecture notes | Millennial | 1.71 | .525 | 4.767 | .000 |
| | Faculty | .92 | .669 | | |
| Make class notes available online | Millennial | 1.54 | .621 | 4.993 | .000 |
| | Faculty | .58 | .669 | | |
| Provide a written list of class policies within the syllabus | Millennial | 1.48 | .657 | –.958 | .340 |
| | Faculty | 1.67 | .492 | | |
| Follow the course syllabus exactly | Millennial | .68 | .910 | .903 | .369 |
| | Faculty | .42 | 1.165 | | |
| Respond to student emails within 24 hours | Millennial | 1.59 | .559 | 1.779 | .101 |
| | Faculty | 1.00 | 1.128 | | |
| Be available to students whenever needed, including telephone calls at home | Millennial | –.04 | .947 | 1.555 | .123 |
| | Faculty | –.050 | 1.00 | | |
| Require the use of a computer and the Internet to complete assignments | Millennial | .26 | .989 | –1.367 | .175 |
| | Faculty | .67 | .888 | | |
| Be proficient in the use of technology for classroom instruction | Millennial | 1.20 | .584 | –1.689 | .094 |
| | Faculty | 1.50 | .522 | | |
| Admit not knowing an answer to a question | Millennial | 1.36 | .659 | –1.150 | .253 |
| | Faculty | 1.58 | .515 | | |
| Socialize with students outside of class | Millennial | .62 | .869 | 3.928 | .000 |
| | Faculty | –.42 | .793 | | |
| Use several different teaching methods throughout the quarter | Millennial | 1.00 | .924 | –.600 | .550 |
| | Faculty | 1.17 | .718 | | |
| Require more than two hours of homework a week, per class. | Millennial | –.56 | .888 | –5.223 | .000 |
| | Faculty | .33 | .492 | | |
| Require students to work in groups | Millennial | –.13 | 1.057 | –1.195 | .235 |
| | Faculty | .25 | .965 | | |
| Assign students to a work group | Millennial | –.20 | 1.062 | –1.431 | .155 |
| | Faculty | .25 | .622 | | |
| Allow students to pick their own work groups | Millennial | 1.02 | .807 | 2.708 | .019 |
| | Faculty | .08 | 1.165 | | |
| Call on students who don't participate in class | Millennial | –.37 | .999 | –4.358 | .000 |
| | Faculty | .92 | .515 | | |
| Be a member of ADHA | Millennial | 1.08 | .951 | –.881 | .381 |
| | Faculty | 1.33 | .888 | | |
| Provide periodic assignments, quizzes, and or evaluations throughout the course | Millennial | 1.18 | .728 | –1.865 | .065 |
| | Faculty | 1.58 | .515 | | |
| Give a midterm and a final only | Millennial | –.53 | .927 | 1.065 | .290 |
| | Faculty | –.83 | .835 | | |

Millennial and non–Millennial dental hygiene students did not have drastically different expectations, but that is not the case between Millennial students and faculty. Millennial students felt they should not disagree with faculty, most likely because they hold faculty in a position of authority.[5] Faculty may need to encourage Millennial students to explore opposite points of view on issues presented in the classroom. Even though Millennials hold faculty as authority figures, they still felt as though it was acceptable to socialize with faculty outside of class. Faculty disagreed with this statement. This role makes it challenging for faculty to establish authority and respect in the classroom and also maintain a more friendly relationship with students.

Another disagreement between faculty and students was requiring community service. Faculty agreed that it should be required stronger than students did. This finding is not consistent with finding of Sandfort and Haworth that found that students value community service.[6] The reason for this disagreement is unknown and warrants further investigation.

On issues of technology there were also several differences. Millennials have been known as tech–savvy and have been using technology all of their lives.[2–5] Faculty felt more strongly that the computer and Internet should be used to complete assignments. This may be because students are using more interactive technologies to complete assignments. This generation of students does not view computers and the Internet as technology – they view it as a way of life and are probably looking for more advanced technologies in the classroom. Millennials felt more strongly than faculty that Power Point slides should be used for lectures, and that class notes should be available online. This is consistent with the findings that Millennials want instant access and avaliablilty.[1–5] Faculty should use course web sites and electronic communications to allow for efficient accessibility and communication with students.

The next area of significant difference was about group work. Previous research finds that Millennial students like to work in groups.5 Results from the survey revealed that students felt that faculty should not assign them to work groups, while agreeing that they should be allowed to pick their own groups. While neither faculty nor students felt strongly either way about group work, how group work is assigned highlighted different expectations. Through the students' reports it was suggested that they want to be allowed to pick their own groups. On the other hand, faculty felt more strongly that these groups should be assigned. While group work seems to be favorable to students and faculty, faculty will have to weigh out the benefits and drawbacks of assigning students to groups or letting them choose their own groups.

Limitations of this study include the limited population. Only 12 faculty and 90 students were surveyed, with only 11 students classified as non–Millennials. All students were in a baccalaureate dental hygiene program, and the student population lacked diversity. Entrance into the program is highly selective, and therefore the population included only a select homogenous group. National data on dental hygiene students reports that 97% are female and 88.6% are white, non–Hispanic, similar to the student population of this study (99% female, 88% white).[20] Further research should include students and faculty in other types of dental hygiene programs. Generalizing the results of this study outside of the surveyed institution is difficult considering that, even though the demographics of the population may be similar, the background and experiences of students are different and were not assessed by this survey. Differences in expectations between associate and baccalaureate students should also be examined.

Another challenge with the methods of this study was that the students surveyed were already enrolled in the program and had already been exposed to current expectations held by the faculty and program administration. The program in which students were enrolled is a traditional program with limited use of Millennial accepted educational technology. The students' prior experience with educational technology or non–traditional learning formats was not assessed. Faculty use and experience with educational technology was also not assessed as part of this survey. A survey of pre–dental hygiene students would decrease the amount of influence that previous experiences had on students. Subsequent studies should include this population and account for previous educational experiences of students and faculty.

As with any Likert–type survey, the only responses received are strongly agree, agree, neutral, disagree and strongly disagree. This survey does not reveal the reasons why students and faculty agree and disagree with certain statements. Further research should include focus groups and/or open ended questions, allowing students and faculty to give reasons for their responses. Without these reasons, it is challenging to make changes to accommodate different generations of students.

## Conclusion

This study finds that Millennial dental hygiene students tend to mirror Millennial student characteristics, such as use of digital media, interactive learning and mentoring. Non–Millennial students had different views accepting responsibility for learning, community service and attendance. The data also shows differences in the relationship expectations between faculty and students.

After the Millennial generation there will continue to be future generations with unique characteristics and learning needs. Examining student and faculty expectations can help faculty learn more about their students and what they expect, and students can learn what the faculty's expectations are of them. Dental hygiene faculty can use expectations to help shape and structure their assignments and learning activities for a more effective and rewarding educational experience for both faculty and students.

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