Title
Oral Health Education for Pediatric Nurse Practitioner Students

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Oral Health Education for Pediatric Nurse Practitioner Students
by
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THESIS
Submitted in partial satisfaction of the requirements for the degree of
MASTER OF SCIENCE
in
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in the
GRADUATE DIVISION

of the
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
ABSTRACT

Purpose: This study was designed to provide oral health education to pediatric nurse practitioner students at the University of California, San Francisco. We predicted that following a multifaceted educational intervention, study participants will improve their knowledge and confidence, and be more likely to incorporate oral health examinations into their routine examinations of children.

Methods: 31 pediatric nurse practitioner students were enrolled in the study. Participants completed a written questionnaire before and after receiving a multifaceted educational intervention which included didactic education, simulation exercises in small groups, and clinical observation with a pediatric dentist.

Results: A significant improvement was seen in the study subject’s knowledge of oral health topics (p < 0.001), confidence when providing counseling (p < 0.001), attitudes toward including counseling in exams (p = 0.0057), and the number of oral health exam performed by the pediatric nurse practitioner students(p < 0.001) using the Wilcoxon signed-rank test for all calculations.

Conclusions: Our study suggests that a multi-faceted oral health education program may increase a PNP’s knowledge, improve confidence, and encourage them to include oral health in their examinations of children.
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INTRODUCTION

Dental caries is the single most common chronic disease affecting children in the United States today[1]. Untreated dental caries can have significant adverse effects on systemic health and hinder a child’s ability to eat, speak, and learn. It is reported that 1.6 million school days are missed due to dental decay each year[2]. Newacheck et al. analyzed four years of National Health Interview Survey (NHIS) data from 1993 to 1996 and found dental care to be the greatest unmet health need among children.[3] Dental disease disproportionately affects poor and minority children in epidemic proportions. The National Institute of Dental and Craniofacial Research found that 25% of children account for 80% of dental caries.[4]

The American Association of Pediatric Dentistry (AAPD) has revised its position on first dental visits and now recommends that children establish a dental home by the end of the first year of age. However, many children will not have the benefit of such an early visit. This may be the result of limited access to a dental care provider or parent’s low perceived benefit of seeing dentists at an early age. Conversely, the American Academy of Pediatrics (AAP) currently recommends a minimum of seven routine visits to their pediatric primary care provider (PPCP) in the first years of life for routine physicals and vaccinations.[5] This provides an opportunity for PPCPs to perform basic oral health assessments, determine caries risk, provide referrals to dentists where necessary, and provide oral health guidance for young patients.
Included in the group of PPCPs are nurse practitioners. In the 1960s in response to a nationwide shortage of physicians, the role of the nurse practitioner (NP) was created to help meet the countries growing primary care health needs. NPs provide both primary and acute care, and are qualified to meet the majority of patient’s needs. Specialized educational programs for NPs have since developed and to date there are 16 NP educational programs in the United States that specialize in pediatrics.

In 2009, Kagihara et al noted that “Primary care health providers are uniquely positioned to play a significant role in the prevention of dental caries and are encouraged to complete certification courses in caries risk assessment, intervention, education, and referral.”[6] This article describes the importance of PCPPs having basic oral health knowledge and was directed towards NPs, confirming that NPs are taking steps to address the caries epidemic. A review of available literature regarding oral health education specifically for NPs is limited.

A survey of perspectives for physician assistant (PA) and NP self-perceived levels of skill in performing a set of oral health competencies showed that, overall, respondents agreed that the defined oral competencies were important skills for practicing PAs and NPs[7] The survey also found that fewer than half of the respondents felt competent in the defined skill areas. The author concluded that additional education of PAs and NPs was needed in the area of oral health.
The trend towards improving the oral health education of PPCPs is not limited to NPs. Past surveys of oral health education among pediatricians has shown that, in general, it is inadequate[8]. In addition, when surveyed, the second most common subspecialty area that general practice pediatricians chose in which they could have used additional education was oral health[9]. A survey of graduating pediatric medicine residents revealed that 73% of residents had less than 3 hours of education in oral health topics, with 35% claiming they had no education. Only 14% had any clinical observation with a pediatric dentist [10]. The survey also showed that the majority of residents felt that pediatricians should conduct basic oral health screenings.

Pierce et al showed that with only two hours of education, PPCPs could perform adequate identification of children with carious lesions and make proper referrals [11]. This study included one pediatric nurse practitioner who had already completed their degree. Pierce and colleagues concluded oral health screenings could be incorporated into a busy physicians schedule and that this would be a great benefit to children’s oral health.

**Literature on how to best improve primary care provider’s knowledge and behaviors specifically toward oral health examinations is limited.** A systematic review of the efficacy of educational interventions aimed toward primary care providers on the adoption of new knowledge and practices showed that formal continuing medical education and distributing education materials did not effectively change primary care provider’s behavior [12]. The study did suggest that interventions such as small group discussions, interactive workshops, and educational outreach visits were effective in increasing knowledge and improving behaviors. Although this study did not focus specifically on oral health topics, it suggests a
multi-component, interactive educational program could be an effective teaching method. The time commitment needed for this type of education may not be available to practicing PPCP.

On the other hand, incorporation of oral health education during an existing educational program may prove to be more feasible. In addition, oral health education may increase the likelihood that NPs will develop the habit of providing oral health examinations during the course of caring for their patients. Schaff-Blass et al showed that a multifaceted approach to improving pediatric resident’s knowledge of oral health was effective in improving resident’s confidence and willingness to provide treatment such as fluoride varnish [13]. A multifaceted approach to education for NPs may also increase confidence and lead to incorporation of oral health examinations.

This study intends to provide oral health education to pediatric nurse practitioner students at the University of California, San Francisco (UCSF). We predict that following a educational program including didactic education, simulation exercises in small groups, and clinical observation with a pediatric dentist, a pediatric nurse practitioner (PNP) student will improve their knowledge and skills in providing oral health assessments, oral health counseling, and referrals to a pediatric dental provider during routine well-child visits and will be more likely to incorporate these skills into their routine examinations of children.
MATERIALS AND METHODS

The first-year class of the Pediatric Nurse Practitioner (PNP) program at the University of California, San Francisco (UCSF) was chosen to participate in a multifaceted oral health education intervention. This intervention was incorporated into their curriculum and considered part of their pre-clinical and clinical education. A written questionnaire was completed prior to receiving and after completing the intervention. The questionnaire was used to assess the knowledge of dental specific oral health topics, as well as attitudes and behaviors toward providing basic oral health and dental-related services.

The study participants were students enrolled in a two-year NP program that specializes in pediatric care. The two-year program included six months of didactic education followed by 18 months of both didactic and clinical education. Students enrolled in the PNP program were registered nurses prior to their education. Each study subject completed a written consent form prior to being entered into the study. The study design as well as consent forms were approved by UCSF Committee on Human Research (Approval #H68200-35300-01).

Each study participant completed the first written questionnaire in November of 2009. After completing the intervention, the study participants were given an average of seven months prior to receiving the follow up questionnaire. Both the pre-intervention and post-intervention questionnaires were identical, with the exception that on the post-intervention questionnaire the PNPs were allowed a section to provide commentary on why they had not performed a specific practice. The PNPs completed the first questionnaire just prior to the
first component of the educational intervention. They were given unlimited time to complete the questions. The nature of the questionnaire was such that it could be completed in an average of ten minutes or less. All study participants completed the pre-intervention questionnaire at the same time and in the same room. The follow up questionnaire was completed in September of 2010 by 24 of the study participants. Six participants, who were not previously available due to their student schedule, completed the questionnaire one week later in a similar fashion.

The questionnaire was divided into four sections: demographics, knowledge, attitudes, and behaviors. Questions were partially adapted from survey instruments used in previously published studies on oral health interventions directed at primary care providers [13, 14]. The demographic section contained basic questions regarding age, sex, years of practice as an RN, whether the study subject has received education in oral health topics in the past, and what their intended area of practice is after graduation.

The patients were then asked 13 true or false questions in the knowledge section, including topics regarding fluoride, caries, and dental development. Questions were designed to test information taught in the American Academy of Pediatrics Oral Health Risk Assessment Training for Pediatricians and Other Child Health Professionals.

A total of 14 questions were then chosen to assess the student’s confidence and attitudes towards advising parents about oral health topics, as well as performing basic oral health services. The first ten questions were closed-ended questions designed to assess levels of
confidence using a Likert scale with the following answers: “very confident,” “somewhat confident,” and “not confident.” The remaining four questions assessed attitudes using a Likert scale with following answers: “strongly agree,” “agree,” “disagree,” and “strongly disagree.”

Finally, the patients were asked ten questions about their practice behaviors. These questions were designed to assess how often the students were performing services such as oral health examinations, applying fluoride varnish, and making appropriate referrals. Three questions allowed the students to pick on a graded scale with the choices “0-10,” “11-20,” “21-30,” “31-40,” and “>40.” The remaining answers in this section assessed how often specific tasks were completed during a child’s examination used a Likert scale with the following choices: “always,” “frequently,” “occasionally,” “rarely,” and “never.”

The multifaceted educational intervention was designed to include three components to be completed by all study participants. The first component consisted of a one-hour lecture, which was designed by the PNP Faculty and based on the First Smiles and AAP Curriculum[15, 16]. A one-hour skills simulation exercise to reinforce topics presented in the lecture was then completed by the participants a week later. The skills simulation included short videos available on the AAP website which provided basic education in examining children and applying fluoride varnish [17]. The study participants then practiced examination techniques as well as applying fluoride varnish to each other to become familiar with this product.
The final component of the educational intervention was a half day of observation at the UCSF Department of Pediatric Dentistry clinic. PNPs visited the dental clinic as one of their clinical rotations. The observation was conducted with the supervision of a pediatric dental resident, the primary investigator in this study. Prior to patients arriving at the clinic, the observation started with a review of the topics covered in the previous lectures. The PNPs were given the opportunity to review previously covered topics in depth and ask questions in an informal manner. Following the review, the study participants observed both the examination and treatment of patients. As this was a residency education program for pediatric dentists, the practitioners performing the examinations and treatment in the clinic were all pediatric dental residents. The age of the patients varied and the procedures involved included new patient examinations, periodic recall examinations, and typical restorative procedures seen in a pediatric dental clinic. Although it was not the goal of this project, some of the study participants performed examinations and/or applied fluoride varnish to the patients being seen in the clinic.

Following completion of both questionnaires, each study subject was assigned a random identifier and the data were analyzed without the individual names listed.
STATISTICAL ANALYSIS

Descriptive statistics were used to summarize the demographic characteristics of the participants and results for knowledge, attitudes and behaviors both before and after the education, including means and standard deviations for sum of scores in each domain (knowledge, attitudes and behaviors) and frequencies and proportions for categorical demographic variables and individual score for questions.

For the questions in the knowledge section, a subject got 1 for one question if s/he answered correctly or 0 if s/he answered not correctly. To examine if there is an overall change in knowledge after the education, we used Wilcoxon signed-rank test to compare the sum of scores in the knowledge section before and after the education [18]. We further used exact McNemar’s test to look into individual questions and see what individual questions had a change in the answer after the education [19, 20].

For the questions in the confidence section, a subject got 0 for one question if s/he answered “not confident”, 1 for “somewhat confident”, and 2 for “very confident.” In the attitude section, a subject got 0 for one question if s/he answered “strongly disagree”, 1 for “disagree”, 2 for “agree”, and 3 for “strongly agree.” In the behavior section, a subject got 0 for one question if s/he answered “0-10” or “never”, 1 for “11-20” or “rarely”, 2 for “21-30” or “occasionally”, 3 for “31-40” or “frequently”, and 4 for “>40” or “always.” To examine if there is an overall change in each section (confidence, attitude, behavior) after the education, we used Wilcoxon signed-rank test to compare the sum of scores in each section before and
after the education. To further examine what individual questions had a change in the answer after the education, we tested the marginal homogeneity over the categories before and after the education in each section (confidence, attitude, behavior) [21]

RESULTS

A total of 31 Nurse Practitioner Students were enrolled in the study. 30 students completed both the pre and post questionnaires as well as all facets of the educational intervention. For unknown reasons, one study subject failed to complete the original questionnaire and was excluded from the analysis.

Demographics

The majority of study participants, 18 (60%), responded that they were within the ages of 26-30. Of the remaining participants, 6 (20%) were 36 years or older, 3 (10%) were within ages of 31-35, and the remaining 3 (10%) were 25 years or younger. The study participants were predominantly female, with 28 (93%) females and only 2 (7%) males. The PNPs varied in the years of nursing experience they had prior to this study. The greatest number of participants, 12 (40%), had 1-3 years of experience. Of the remaining participants, 9 (30%) had between 4 and 6 years of experience, 4 (13%) had over 10 years of experience, 3 (10%) had no experience, and the remaining 2 (7%) had between 7 and 10 years of experience. The greatest number of study participants reported that they would be working in primary care or clinical settings after graduation, 17 (57%). The remaining 13 were divided between 9 (30%)
practicing in a hospital setting, 5 (17%) in a specialty clinic and none reported that they
would be working in school health setting. Only 6 (20%) responded yes when asked whether
they had received oral health education prior to the project.

Knowledge

A significant improvement was seen in the study subject’s knowledge of oral health topics.
On average the study participants answered 8.9 (68.5%) of the 13 knowledge questions
correctly prior to the education intervention. After the education intervention, the study
participants answered an average of 10.4 (80%) of the 13 questions correctly. This
improvement in scores was statistically significant (p < 0.01).

The study participants showed a numerical improvement in the number of correct answers
for all but one of the 13 knowledge questions (Table 1). When the difference was analyzed
within each question using exact McNemar’s test, the change was statistically significant in
only one case, question number nine (p<0.01). Question #9 asked whether non-dental health
professionals could be reimbursed for applying fluoride varnish to children’s teeth. On the
pre-test 19 (63%) participants answered correctly and on the post test 30 (100%) answered
correctly that they could indeed be reimbursed for applying fluoride varnish. The change
was marginally significant in questions 3 (p=0.07) and 6 (p=0.08). Question #3 asked if
xylitol is a carbohydrate that is not fermentable by oral bacteria. For question #3, the number
of correct answers improved from 18 (62%) to 25 (86%). Question #6 asked whether
ingesting fluoride while the teeth are forming (before eruption) helps prevent tooth decay.
For question #6, the number of correct answers changed from 10 (33%) to 18 (60%). Only one question showed a lower number of correct answers on the post test: question #1, pertaining to the average age of eruption of a child’s first tooth. Although the number of correct responses decreased from 17 (57%) to 13 (43%), this change was not statistically significant.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Number of Correct Answers</th>
<th>Pre</th>
<th>%</th>
<th>Post</th>
<th>%</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 First tooth eruption</td>
<td></td>
<td>17</td>
<td>57%</td>
<td>13</td>
<td>43%</td>
<td>0.34</td>
</tr>
<tr>
<td>2 Bacterial Transmission</td>
<td></td>
<td>26</td>
<td>87%</td>
<td>30</td>
<td>100%</td>
<td>0.13</td>
</tr>
<tr>
<td>3 Xylitol not fermentable</td>
<td></td>
<td>18</td>
<td>60%</td>
<td>26</td>
<td>87%</td>
<td>0.07</td>
</tr>
<tr>
<td>4 Xylitol kills bacteria</td>
<td></td>
<td>18</td>
<td>60%</td>
<td>26</td>
<td>87%</td>
<td>0.11</td>
</tr>
<tr>
<td>5 Fluoride prevents decay</td>
<td></td>
<td>26</td>
<td>87%</td>
<td>27</td>
<td>90%</td>
<td>1.00</td>
</tr>
<tr>
<td>6 Ingesting fluoride</td>
<td></td>
<td>10</td>
<td>33%</td>
<td>18</td>
<td>60%</td>
<td>0.08</td>
</tr>
<tr>
<td>7 Toothpaste 3 year old Fluoride prevents topically</td>
<td></td>
<td>18</td>
<td>60%</td>
<td>29</td>
<td>97%</td>
<td>0.79</td>
</tr>
<tr>
<td>9 Reimbursement</td>
<td></td>
<td>19</td>
<td>63%</td>
<td>30</td>
<td>100%</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>10 First dental exam</td>
<td></td>
<td>16</td>
<td>53%</td>
<td>18</td>
<td>60%</td>
<td>0.75</td>
</tr>
<tr>
<td>11 Remineralize white spots</td>
<td></td>
<td>13</td>
<td>43%</td>
<td>18</td>
<td>60%</td>
<td>0.30</td>
</tr>
<tr>
<td>12 Put to bed with a bottle</td>
<td></td>
<td>29</td>
<td>97%</td>
<td>30</td>
<td>100%</td>
<td>1.00</td>
</tr>
<tr>
<td>13 Frequent snacking</td>
<td></td>
<td>30</td>
<td>100%</td>
<td>30</td>
<td>100%</td>
<td>2.00</td>
</tr>
</tbody>
</table>
Confidence and Attitudes

There was a significant improvement in the confidence of the study participants toward providing advice to parents on oral health topics (Table 2). When looking at questions on confidence, the sum of scores measuring the confidence of each subject averaged 7.77 out of a possible 20 prior to the intervention. This average improved to 14.10 out of 20 after the intervention, and this change was statistically significant (p < 0.01). There was statistically significant change in all individual questions (p value between 0.004 and < 0.01). For the remaining questions, which measured attitudes toward advising parents about oral health topics during routine examinations, there was also a significant improvement. The sum of scores measuring attitudes prior to the intervention was 9.70 out of a possible 12. After the intervention the sum of scores, improved to 10.83. This change was statistically significant (p< 0.01). There was marginally significant change in Q2a (p=0.06) and Q2b (p=0.06) but no significant change in Q2d (p=0.49) and Q2e (p=0.57).
### Table #2

#### Confidence Questions

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hygiene</td>
<td></td>
<td></td>
<td>Oral Exams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>7</td>
<td>17</td>
<td>S</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>S</td>
<td>19</td>
<td>13</td>
<td>N</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Fluoride</td>
<td>V</td>
<td>4</td>
<td>Identify Caries</td>
<td>V</td>
<td>2</td>
</tr>
<tr>
<td>S</td>
<td>8</td>
<td>21</td>
<td>S</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td>N</td>
<td>17</td>
<td>2</td>
<td>N</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>Diet</td>
<td>V</td>
<td>8</td>
<td>Identify Pathology</td>
<td>V</td>
<td>0</td>
</tr>
<tr>
<td>S</td>
<td>18</td>
<td>6</td>
<td>S</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>N</td>
<td>3</td>
<td>0</td>
<td>N</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>Supplements</td>
<td>V</td>
<td>1</td>
<td>Evaluate Risk</td>
<td>V</td>
<td>3</td>
</tr>
<tr>
<td>S</td>
<td>9</td>
<td>20</td>
<td>S</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>N</td>
<td>19</td>
<td>1</td>
<td>N</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Dental Visits</td>
<td>V</td>
<td>4</td>
<td>Referral</td>
<td>V</td>
<td>4</td>
</tr>
<tr>
<td>S</td>
<td>19</td>
<td>6</td>
<td>S</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>N</td>
<td>6</td>
<td>0</td>
<td>N</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

V = Very Confident, S = Somewhat Confident, N = Not Confident

#### Attitude Questions

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment</td>
<td>SA</td>
<td>15</td>
<td>Counseling</td>
<td>SA</td>
<td>16</td>
</tr>
<tr>
<td>A</td>
<td>15</td>
<td>5</td>
<td>A</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>0</td>
<td>D</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SD</td>
<td>0</td>
<td>0</td>
<td>SD</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Referral</td>
<td>SA</td>
<td>10</td>
<td>Supplements</td>
<td>SA</td>
<td>15</td>
</tr>
<tr>
<td>A</td>
<td>14</td>
<td>6</td>
<td>A</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>D</td>
<td>5</td>
<td>2</td>
<td>D</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SD</td>
<td>0</td>
<td>0</td>
<td>SD</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree
Behaviors

10 of the 30 of the study participants failed to complete the final page of pre-intervention questionnaire as directed. It was concluded that these participants read the section titled “Outcome Questions” on the final page of the questionnaire, and then assumed that they did not need to complete this section until the follow up questionnaire was administered. This error was not discovered until after the PNPs had completed the first facet of the intervention. As a result, only the responses for the remaining 20 participants were used for the analysis in this section.

When the behavior section was looked at as a whole, the pre-intervention sum of scores for behaviors was found to be 29 out of a possible score of 36, with a significant increase to 14.8 on the post-intervention questionnaire. This difference was statistically significant (p < 0.001). When asked how many oral health examinations they had included in their routine well child visit, 83% of the participants fell into the category of 11-20 examinations performed or greater. 10 (33%) of the participants responded in “11-20,” (27%) selected “21-30,” 7 (23%) chose “0-10,” 4 (13%) chose “>40,” and 3 (10%) chose “31-40.” Although it was clear from the data that many of the desired behaviors were exhibited by the study participants, all of the participants chose the range of “0-10” when asked how many times they had applied fluoride varnish. This suggests that few, if any, of the study participants applied fluoride varnish to patients during the study period. There was significant change (p between 0.002 and 0.02) in all questions except for question #3 which asked how many fluoride varnishes had been applied during routine examinations.
DISCUSSION

With the exception of a few participants, the PNPs all had several years of experience as registered nurses. Interestingly, 80% of the group reported that they had not received any oral health education in the past. This percentage is considerably higher than the 35% of pediatricians who reported having received no education in a report by Caspary [10]. Since only 20% of the students had received oral health education during their education to become nurses, it may be prudent to consider whether to include oral health education as a requirement in nursing programs. This would add to the workforce of providers competent in oral health screening and treatment.

When looking at future practice plans of the participants, approximately 60% of the participants will be working in a primary care or clinical setting after graduation. These students are the primary target population of this intervention, as these primary care providers will be in a position to maximize the skills learned in this project. Regardless of the intended area of practice, all participants should benefit from the education and be able to utilize their skills as needed.

As a whole the PNPs did show a significant improvement in their ability to answer oral health knowledge questions from an average score of 8.9 to 10.4 out of 13 answered correctly. The relatively high level of correct answers prior to the intervention, and the consideration that only 20% of the participants reported having oral health education prior to
this study, suggests many of the study participants had a significant amount of oral health knowledge without having undergone formal education. It is also possible that some of the questions may have been too easy, and that the study participants were able to answer the questions with common sense knowledge. Regardless, an improvement in overall scores was seen on average 6 months after the education intervention was completed, suggesting that the overall amount of knowledge was retained for a significant period of time.

A quantitative improvement in the group’s score on all but one of the 13 questions was also seen, but when analyzed individually, the change was only significant in one question, #9. This question, which focused on whether non-dental health professionals could be reimbursed for applying fluoride varnish, was answered correctly by all of the study participants in the post-intervention questionnaire. The fact that all of the study participants understood that they can reimbursed for providing fluoride treatments should certainly be considered one of the major discoveries of this project.

When examining the subject’s level of confidence, a dramatic improvement was apparent after the intervention. The first seven questions which measured confidence when advising parents about their children’s oral health showed an 81% increase in the average sum of scores, which was statistically significant. This suggests that the level of confidence in the study participants nearly doubled after the intervention. When asked about advising parents on their children’s oral hygiene, dietary recommendations to prevent tooth decay, dental visits during infancy and childhood, and making the proper referrals to a dentist, the majority of study participants chose “very confident” after the intervention. Furthermore, with the
exception of question #1h “Identifying other signs of oral pathology,” where seven of the study participants still fell “not confident” after the intervention, the overwhelming majority of the study participants were at least “somewhat confident” in the remaining categories.

The last four questions in this section gauged attitudes toward including oral health examinations and counseling in their visits with children. A significant improvement was seen in the attitudes of the study participants as whole. For three of the questions, it was noteworthy that no study participants chose “disagree” or “strongly disagree” prior to the education intervention. These three questions specifically asked whether routine assessment for early signs of dental problems, counseling on caries prevention, and the prescription of fluoride supplements should be included in their examinations of children. This data suggests, prior to the intervention, our participants already had a high level of agreement toward including these topics in their examinations. Conversely, only one question, asking whether the participants should be referred to a dentist by one year of age, showed any participants that chose “disagree.” It should be noted that the number of participants choosing “disagree” was very small, with 5 participants responding that they disagreed in the pre-intervention questionnaire and 2 in the post-intervention questionnaire. It should also be noted that, for this question, when looking at the post-intervention results, 70% of the participants strongly agreed that children should be referred by one year of age, and the remaining 20% responded that they were in agreement. The high level of support for including these basic competencies in their examinations is in agreement with Bay et al’s report of NP and PA support of including these activities in their examinations [7]
The remaining behavioral category showed a statistically-significant improvement in the average sum of behavior scores after the intervention, although this calculation was completed after excluding 10 study participants who did not complete the behavioral section prior to the intervention. When looking at the group as a whole, without excluding those 10 participants, we found that, for the primary endpoint of including oral health examinations, 53% of the study participants had conducted more than 10 oral health examinations. For the remaining 47%, it is impossible to conclude whether they had conducted some examinations meaning less than 10 but more than zero, or zero examinations, as the range provided was from zero to 10. Nevertheless, our results indicate that the majority of the PNP students in this study did include oral health in their examinations of children at least some of the time.

Unfortunately, we found that, despite a significant portion of the education being directed at applying fluoride varnish, very few or none of the study participants applied fluoride varnish treatments during their examinations of children. The descriptive answers provided by the study participants in the post-intervention questionnaire confirmed our suspicion that either fluoride varnish was not available for them to use at their clinics, or that the practice of providing fluoride varnish treatments were not supported in the clinics where the study participants were getting their clinical education. In light of the fact that 100% of the study participants knew that they could be reimbursed for applying fluoride varnish, this result suggests that a systemic change in the primary care settings of the PNP students at UCSF would be necessary for the PNP students to regularly apply fluoride varnish.
A limitation of the study in regards to the behavior scores on the pre-intervention questionnaire concerns the previous practice habits of the study participants themselves. Because the pre-intervention questionnaire was administered during the didactic portion of their academic career, the participants had not previously practiced as NPs, and as such would not have been expected to have exhibited the behaviors prior to the intervention. Although the students would have certainly participated in various pre-clinical examinations of patients, we expected them to choose either “0-10” or “N” when asked how many behaviors they had completed. As expected, the vast majority claimed to have not exhibited the desired behaviors on the pre-intervention questionnaire with the exception of a few study participants who may have participated in examinations in some capacity prior to the study or who did not understand the question. We assumed that the sum of behavior scores would be near zero at the beginning of the project, and this assumption was indeed supported by our results. With this in mind, the substantial and statistically significant increase in the number of behaviors exhibited must be interpreted accordingly.

The primary limitation of this study is the absence of a comparative group for the study participants. Although it was suggested that a comparable PNP group could be found at a neighboring university, no suitable cohort was identified. Schaff-Blass and colleagues attempted to use closely located pediatric residency programs to compare the effectiveness of an oral health education intervention at the University of North Carolina [13]. They were unable to make substantial comparisons between the schools due to poor follow up by the neighboring schools, which were not receiving the intervention. This result suggests that
proper collaboration with a similar PNP program or programs would be necessary to provide a large enough study population to create groups that could serve as controls.

In addition to the lack of a comparison group, the study participants were not randomized with regard to whether they would receive the educational intervention. The possibility of results being due to factors outside the intervention itself cannot be eliminated. Due to the small number of students available for this study, it was determined that it would not be feasible to split the students into separate groups. Furthermore, it was determined that it would be unethical to prohibit a portion of the students from receiving the education intervention that was considered part of their educational curriculum. Nevertheless, the results of this study are still promising in light of the fact that only 20% of the students reported that they had received oral health education prior to this study. Also, to our knowledge, no other oral health education or interaction with dental professionals was provided by UCSF or the PNP educational program during the study period.

The study design also limited our ability to determine whether any facets of the educational intervention were more influential toward the results than other parts. We considered administering the questionnaire multiple times after each facet of the intervention to determine which facet of the intervention was most significant. Ultimately it was decided that after multiple attempts at the knowledge section of the questionnaire, the results might be biased due to the impact of “testing,” on the student’s familiarity with the questions. More importantly, as it has been suggested that a multi-faceted health education intervention may affect primary care providers practice behaviors, it was not the intention of this study to
choose one facet of the program over another. Further research, with a larger study sample, would be necessary to tease out the impact of each individual component.

Finally the nature of the questionnaire itself relied on self reporting of practice habits which can introduce reporting bias into the results.

It should also be noted that although the results of this study were very positive, exact duplication of this particular intervention may prove to be difficult. Specifically, the amount of time spent observing with a pediatric dental resident might be cost prohibitive in terms of human capitol. Had the study participants simply reported to the dental clinic and observed patient care without a review of the material and without the close guidance of a pediatric dental resident, the results may have been different.

CONCLUSIONS

Published reports of interprofessional collaborations between dentists and primary care providers suggest that feasible programs to improve the oral health competencies of PCPs, including PNPs, are being introduced at several universities [22, 23] There is a particular opportunity at UCSF, which is one of several learning institutions which have both dental and nurse practitioner students co-located, and as such provides an opportunity for dental school faculty and or students to provide education to nurse practitioners. This particular study utilized a pediatric dental resident to provide a portion of the educational intervention. Efforts to include interprofessional education of PCPs as core curriculum in a pediatric dental
residency program might help provide the necessary human resources needed for continued implementation of these educational programs.

In conclusion a significant improvement was seen in all categories examined in this study. We found that the majority of PNPs who participated in this intervention are now including examinations of oral health in their examinations. Our study suggests that a multi-faceted oral health education program may increase a PNP’s knowledge, improve confidence, and encourage them to include oral health in their examinations of children. The results of this study are very promising, and suggest that, with proper oral health education, pediatric nurse practitioners can indeed feel confident when conducting oral health examinations and make a significant contribution to helping reduce the rate of caries and periodontal disease.
REFERENCES


APPENDICES

A: INFORMED CONSENT
UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title:

This is a research study about Oral Health Training for Pediatric Nurse Practitioner Students. The study researchers are Jay Golivneaux DDS and Brent Lin DMD from the UCSF Department of Orofacial Sciences and Barbara Gerbert PhD from the UCSF Department of Preventative and Restorative Dentistry, and they will explain this study to you.

Participation in the research project is voluntary so please review the requirements for participation prior to making your decision. If you have any questions, you may ask the researchers.

You are being asked to take part in this study because you are a first year Pediatric Nurse Practitioner student who will be undergoing oral health training as part of your curriculum.

Why is this study being done?

The purpose of this study is to determine if after completing a training program that includes didactic training, simulation exercises in small groups and clinical observation with a pediatric dentist, a pediatric nurse practitioner student will feel more comfortable in providing oral health assessments, oral health counseling, and referral to a pediatric dental provider during routine well child visits and will be more likely to incorporate these skills into their routine exams of children.

How many people will take part in this study?

40 First year Nurse Practitioner Students.

What will happen if I take part in this research study?

- You will complete a brief 3-4 page survey requiring no prior preparation.
- You will complete a brief 3-4 page survey 6-8 months after the beginning of the project.

How long will I be in the study?

The study will last approximately 6-8 months from the beginning of your oral health training on Nov 24th.

Can I stop being in the study?

Yes. You can decide to stop at any time. Just tell the study researcher or staff person right away if you wish to stop being in the study.
Also, the study researcher may stop you from taking part in this study at any time if he or she believes it is in your best interest, if you do not follow the study rules, or if the study is stopped.

**What side effects or risks can I expect from being in the study?**

No side effects are expected from participating in this study.

**Are there benefits to taking part in the study?**

There will be no direct benefit to you from participating in this study. However, the information that you provide may help health professionals better understand interdisciplinary educational efforts directed at children’s oral health.

**What other choices do I have if I do not take part in this study?**

You are free to choose not to participate in the study. If you decide not to take part in this study, there will be no penalty to you. You will not lose any of your regular benefits, your grade will not be affected, your status as a student will not be effected and you can still get your education from our institution the way you usually do.

**Will information about me be kept private?**

Although demographic information about your class will be gathered for the final analysis, no personal information from you will be gathered. You will be given a unique identifier which will protect your identity and no risk to your privacy is anticipated.

**What are the costs of taking part in this study?**

You will not be charged for any of the study treatments or procedures.

**Will I be paid for taking part in this study?**

You will not be paid for taking part in this study.

**What are my rights if I take part in this study?**

Taking part in this study is your choice. You may choose either to take part or not to take part in the study. If you decide to take part in this study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you in any way.

**Who can answer my questions about the study?**

You can talk to the researcher(s) about any questions, concerns, or complaints you have about this study. Contact the researcher Jay Golinveaux at 415-310-8477.
If you wish to ask questions about the study or your rights as a research participant to someone other than the researchers or if you wish to voice any problems or concerns you may have about the study, please call the Office of the Committee on Human Research at 415-476-1814.

CONSENT

You have been given a copy of this consent form to keep.

PARTICIPATION IN RESEARCH IS VOLUNTARY. You have the right to decline to be in this study, or to withdraw from it at any point without penalty.

If you wish to participate in this study, you should sign below.

_________________________________________________________________________
Date                        Participant’s Signature for Consent

_________________________________________________________________________
Date                        Person Obtaining Consent
B: LETTER TO STUDENTS
October 21, 2009

Dear Nurse Practitioner Student,

We are asking all of the first year nurse practitioner students to participate in an important scientific research project.

The title of the project is:

**Oral Health Training for Pediatric Nurse Practitioner Students.**

Dental caries is the single most common chronic disease affecting children in the United States today. Untreated dental caries can have significant adverse effects on systemic health and hinder a child’s ability to eat, speak, and learn. It is reported that 1.6 million school days are missed due to dental decay each year.

**As a future nurse practitioner you are in a unique position to help with this problem.**

Although the American Association of Pediatric Dentists has revised its position on first dental visits and recommended that children establish a dental home by the end of the first year of age, many children will not have the benefit of such an early visit. This may be the result of limited access to a dental care provider or parent’s low perceived benefit of seeing dentists at an early age. Conversely a child will have attended several visits to their pediatric primary care provider (PPCP) in the first years of life, at a minimum for routine physicals and vaccinations. This provides an opportunity for PPCPs to perform basic oral health assessments, determine caries risk, provide referrals where necessary, and provide oral health guidance for young patients.

To participate in this project you will be asked to complete a survey prior to receiving a multifaceted educational program in oral health which includes: a lecture, skills clinic, and clinical observation. You will then complete a follow up survey approximately 6 to 8 months later. **Your participation in the education component of the study will be as part of your regular clinical and didactic training that you would already be receiving as part of your regular training and the time necessary to complete the survey will be minimal.**

By participating in this project, you will be able to help shape future efforts to educate pediatric primary care providers which may ultimately help decrease the amount of children with untreated dental caries.

Thank You,
Jay Golinveaux, DDS and the entire Research Team
C: QUESTIONNAIRE
Thank you for completing this questionnaire.

Please choose the best answer for each question:

1. What is your age group?
   a. 25 years or less
   b. 26-30
   c. 31-35
   d. 36 years of more

2. What is your sex?
   a. Male
   b. Female

3. How many years have you practiced as an RN?
   a. 1-3
   b. 4-6
   c. 7-10
   d. More than 10 years
   e. I have not been employed as a RN yet

4. During your nursing education, did you receive a lecture or seminar devoted to infant oral health?
   a. Yes
   b. No

5. What is your intended setting of practice following graduation?
   a. Clinic Setting
   b. Hospital Setting
   c. Specialty Clinic
   d. School Health Setting
   e. Primary Care

**Knowledge Based Questions – True/False**

1. **On average a child’s first tooth erupts between 9 months to 1 year of age**
   a) True
   b) False

2. The bacteria that cause dental decay can be transmitted from mother to child.
   a) True
   b) False
3. Xylitol is a carbohydrate that is **not** fermentable by oral bacteria.
   a) True
   b) False

4. Xylitol is a carbohydrate that has been shown to kill the oral bacteria which cause cavities.
   a) True
   b) False

5. Fluoride prevents tooth decay by making the teeth stronger.
   a) True
   b) False

6. Ingesting fluoride while the teeth are forming (before eruption) helps prevent tooth decay.
   a) True
   b) False

7. **Toothpaste containing fluoride should not be used to brush a 3 year old child’s teeth due to the risk of fluorosis.**
   a) True
   b) False

8. Fluoride prevents tooth decay when applied topically to the surfaces of teeth.
   a) True
   b) False

9. Non dental health professionals can be reimbursed for fluoride varnish applications.
   a) True
   b) False

10. A child’s first dental exam should occur by 3 years of age or when all primary teeth have completed eruption.
    a) True
    b) False

11. Chalky white spots on a child’s teeth can be remineralized with fluoride varnish.
    a) True
    b) False

12. Babies should **not** be put to bed with a bottle of juice or milk.
    a) True
    b) False
13. Frequent snacking with carbohydrates increases the risk of developing early childhood caries.
   a) True
   b) False

1. How CONFIDENT do you feel in advising parents of infants and toddlers regarding:

<table>
<thead>
<tr>
<th></th>
<th>Very confident</th>
<th>Somewhat confident</th>
<th>Not confident</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Their child’s oral hygiene?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Water fluoridation?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Dietary recommendations to prevent early childhood tooth decay?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Fluoride supplement during infancy/childhood?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Dental visits during infancy/childhood?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Examining teeth of infants and toddlers for tooth decay?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Identifying tooth decay in early childhood?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Identifying other signs of oral pathology?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Evaluating risk of tooth decay in infants and toddlers?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Deciding if a child needs referral to a dentist?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Do you AGREE or DISAGREE that the following should be part of routine well-child-care visits?

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Routine assessment for early signs of dental problems (e.g., dental decay, gingivitis) during the physical exam.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b.</td>
<td>Referral to a dentist by 1 year of age.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d.</td>
<td>Counseling on the prevention of dental problems (e.g., dental decay, gingivitis, trauma).</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c.</td>
<td>Prescription of fluoride supplements when indicated.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Outcome Questions**

1. Approximately how many routine physical exams have you performed over the past 3 months?

   1) 0-10
   2) 11-20
   3) 21-30
   4) 31-40
   5) > 40

2. Approximately how many Oral Health exams have you included in your routine examinations in the past 3 months?

   1) 0-10
   2) 11-20
   3) 21-30
   4) 31-40
   5) > 40
3. Approximately how many Fluoride Varnish applications have you administered as part of your routine examination to children in the past 3 months?

1) 0-10  
2) 11-20  
3) 21-30  
4) 31-40  
5) > 40

4. How often over the past 3 months did you perform the following tasks during a routine health exam?

<table>
<thead>
<tr>
<th></th>
<th>Always</th>
<th>Frequently</th>
<th>Occasionally</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Assess a child’s fluoride intake to determine the need for supplementation.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b. Prescribe a dietary fluoride supplement.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c. Discuss the use of fluoride toothpaste with parents.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d. Inquire if a child is taking the bottle to bed.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e. Counsel parents on the importance of regular dental visits.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f. Inquire about mother’s dental health.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g. Referred a high risk patient to a dentist.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
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[Signature]

6/10/11