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Oral Health Education for Pediatric Nurse Practitioner Students

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Abstract

Purpose: The aim of this study is to evaluate whether an interdisciplinary, multifaceted oral health education program delivered to pediatric nurse practitioner students at the University of California, San Francisco, would improve their knowledge, confidence and attitudes, and behaviors regarding the provision of oral health assessments, consultations, referrals, and services to young children during well-child visits.

Methods: Thirty pediatric nurse practitioner students were enrolled in the study. Participants completed a written survey before and after receiving an interdisciplinary educational intervention that included didactic education, simulation exercises, and clinical observation by a pediatric dental resident.

Results: Between preintervention and postintervention, a significant improvement was seen in the pediatric nurse practitioners' knowledge of oral health topics ($p < 0.001$), confidence when providing oral health counseling ($p < 0.001$), and attitudes about including oral health counseling in their examinations ($p = 0.006$). In the postintervention survey, 83% of the subjects reported having incorporated oral examinations into their well-child visits.

Conclusions: Our study suggests that providing an interdisciplinary oral health educational program for pediatric nurse practitioner students can improve their knowledge, confidence, attitudes, and behaviors regarding the incorporation of oral health-care services during routine well-child visits.

INTRODUCTION

Dental caries is the most prevalent chronic disease in children in the United States today.^{1, 2}

Caries prevention is especially challenging for children aged 2 to 5 years, which is the only age group that displayed an increased caries prevalence between the periods 1988–1994 and 1999–2000 in the National Health and Nutrition Examination Survey.¹ Furthermore, the caries distribution is skewed since 80% of tooth decay is found in 25% of children, large numbers of whom live in low-income households and lack access to dental care.² The incidence of untreated dental caries is high in these children and can have significant adverse effects on their systemic health as well as impact their ability to eat, speak, and learn.^{1, 2} It has also been reported that 1.6 million school days are missed annually for reasons related to dental decay.³

Dental caries is a transmissible infectious disease, and early prevention service to combat it can provide a lifelong benefit to children's oral health. Caries can develop in children as early as 10 months of age, and by 3 years, 25% of children enrolled in the Women, Infants, and Children (WIC) program have developed caries.⁸ However, early intervention, such as maternal use of xylitol gums at infancy, has significantly reduced caries causing bacteria colonization and caries in children up to age 10.^{9, 10} Children who had had early preventive dental visits or counseling had significantly fewer caries lesions and dental expenses than those who had not received them.^{11–14} Therefore, providing early prevention and oral health-care services is critical for promotion of children's oral health.

Although the American Association of Pediatric Dentistry recommends that all infants have established dental homes by age 1,¹⁵ many children do not have one by that age. Recent studies reported that only 2% of children had had a dental visit by age 1.^{16–19} The incidence increased to 11% by age 2 and to 26% by age 3.¹⁸ The average age of a child at his or her first

1 dental visit was 4 years in the U.S.¹⁶⁻¹⁹ Factors contributing to the low rate of access to oral
2 health care in young children include: a shortage and maldistribution of dentists, especially
3 those who treat Medicaid or State Children's Health Insurance Program (SCHIP) recipients;
4 cultural and societal barriers; and parents' limited English proficiency and lack of health literacy.
5 These barriers are especially predominant in children with disparities who live in low
6 socioeconomic conditions or are recent immigrants.²⁰⁻²³

16 In contrast, most infants have a well-established medical home at an early stage of life.¹⁹

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19 ²⁴ Therefore, nondental primary-care providers (such as family physicians, pediatricians,
20 physician assistants, and nurse practitioners) are in a unique position to play a role in promoting
21 oral health in young children and to compensate for the shortage of dentists. The American
22 Academy of Pediatrics (AAP) recommends that children have a minimum of seven routine visits
23 to their pediatric primary-care providers in the first years of life. These visits can provide a
24 valuable opportunity for pediatric primary-care providers to perform basic oral health
25 assessments and prevention service, to provide oral health-care guidance to parents of infants,
26 and to refer infants, especially those at high risk, to dentists for early oral preventive care.
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39 Pediatric nurse practitioners have been an important component of pediatric primary-care
40 provision since the 1960s, the beginning of a nationwide shortage of pediatricians that continues
41 today.²⁵ Currently there are approximately 100 pediatric nurse practitioner educational programs
42 in the U.S.²⁶ As vital pediatric primary-care providers, pediatric nurse practitioners are uniquely
43 positioned to play a significant role in the promotion of oral health in children.
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52 Although studies have shown that incorporating caries prevention into pediatric well-child visits
53 significantly improves infants' access to oral preventive services and reduces their caries
54 prevalence,^{12, 14} recent studies have also shown that pediatric primary-care providers and
55 pediatric nurse practitioners lack competence in performing oral health assessment and
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1 providing counseling for children.²⁸⁻³¹ These results indicate that pediatric health care providers
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3
4 need additional oral health education.
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8 There has been limited research done on incorporating oral health education into pediatric
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10 nurse practitioner educational programs although a few studies have investigated oral health
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12 education programs aimed at improving pediatric primary-care providers' knowledge of,
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14 attitudes toward, and behaviors concerning oral health examinations. Adding an interdisciplinary
15
16 oral health educational intervention to an existing program is feasible and may encourage
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18 pediatric nurse practitioners to provide oral health consultation, referrals, and preventive
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20 services to children during well-child visits.
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26 The aim of this study is to evaluate whether oral health education, which would include didactic
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28 education, simulation exercises, and clinical observation of a pediatric dentist, delivered to
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30 pediatric nurse practitioner students at the University of California, San Francisco, (UCSF)
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32 would improve their knowledge, confidence, attitudes, and behaviors regarding the provision of
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34 oral health assessments, consultations, referrals, and services to young children during well-
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36 child visits.
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43 **MATERIALS AND METHODS**

44 45 46 **Study Design**

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49 The study was approved by the UCSF Committee on Human Research (Approval #H68200-
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51 35300-01). All of the first-year students enrolled in the pediatric nurse practitioner program at
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53 UCSF were recruited to participate in an interdisciplinary, multifaceted oral health educational
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55 intervention in 2009. A written consent form was obtained from each subject. This intervention
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57 was incorporated as part of the students' preclinical and clinical educational curriculum. A
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1 written survey was administered before and 5-9 months after the completion of the educational
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3 intervention. The survey assessed their knowledge of oral health topics as well as their
4
5 confidence, attitudes toward and behaviors of providing oral health services. The changes in
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7 their knowledge, confidence, attitudes and behaviors on providing oral health services were
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9 compared before and after the education intervention.
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12 **Study Participants**

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18 The study participants were enrolled in a two-year pediatric nurse practitioner program that
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20 includes six months of didactic education followed by 18 months of both didactic and clinical
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22 education. These students had been registered nurses before beginning the program.
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25 **Oral Health Educational Intervention**

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30 The interdisciplinary, multifaceted educational intervention included three components. First, a
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32 one-hour lecture developed by the pediatric nurse practitioner faculties based on the First
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34 Smiles and American Association of Pediatrics (AAP) curricula was given.^{32, 33} A week later, a
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36 one-hour skills simulation exercise was administered to reinforce the topics presented in the
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38 lecture. The skills simulation included short videos available on the AAP website that provided
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40 basic instruction in examining children and applying fluoride varnish.³⁴ The participants then
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42 practiced examination techniques and applied fluoride varnish on each other's teeth.
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48 The third component was a half-day observation session at the UCSF Pediatric Dentistry Clinic
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50 as part of the students' clinical rotations; this was supervised by a pediatric dental resident, Jay
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52 Golinveaux. The observation began with a review and question-and-answer session on
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54 previously covered oral health topics. The students next observed regular oral examinations
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56 and dental treatments of children aged 0 to 3. Some participants performed dental
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58 examinations and applied fluoride varnish on these children's teeth.
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Data Collection

Each participant completed the preintervention survey in November of 2009 and a follow-up survey in October of 2010. Their clinical practice session began in January 2010. All participants completed the three components of oral health education intervention between January and May 2010. The preintervention and the postintervention surveys were identical except that on the postintervention survey the respondents were asked to explain their reasons for not providing a specific service.

The survey had four sections: demographics, knowledge, confidence and attitudes, and behaviors (Table 1). The questions were adapted from survey instruments that had been used in previously published studies on oral health interventions directed at primary-care providers.^{35,}

³⁶ Each study subject's survey was assigned a random identifier, and the data were analyzed anonymously.

Statistical Analyses

Descriptive statistics, including means and standard deviations for the sum of scores in each domain, frequencies and proportions for categorical demographic variables, and individual scores for questions, were used to summarize the demographics of the participants and their survey responses for knowledge, confidence, attitudes and behaviors before and after receiving the education.

In the oral health knowledge section, one score was given for each question answered correctly, and a score of 0 was assigned for each one answered incorrectly. In the confidence section, answers were scored as 0 for *not confident*, 1 for *somewhat confident*, and 2 for *very confident*.

In the attitudes section, answers were scored as 0 for *strongly disagree*, 1 for *disagree*, 2 for *agree*, and 3 for *strongly agree*. In the behavior section, answers were scored as 0 for a

1 response of 0–10 or *never*, 1 for a response of 11–20 or *rarely*, 2 for a response of 21–30 or
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4 *occasionally*, 3 for a response of 31–40 or *frequently*, and 4 for a response of >40 or *always*.

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7 A Wilcoxon signed-rank test was used to determine whether there had been an overall change
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9 in the sum of each participant's scores in each section (confidence, attitude, behavior) after she
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11 or he had received the education. In order to investigate any change in responses to the
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13 individual questions after the education, the exact McNemar's test³⁷ was used for dichotomous
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15 response in the knowledge section; the marginal homogeneity over the multiple categories of
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17 response before and after the education was tested with the Bhapkar test³⁸ in the confidence,
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19 attitude, and behavior sections.
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24 25 **RESULTS**

26 27 28 **Subject Demographics**

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32 A total of 31 students were enrolled in the study. Thirty students completed both the
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34 preintervention and postintervention surveys as well as all of the components of the
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36 intervention. One subject failed to complete the baseline survey and was excluded from the
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38 analysis.
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43 The subjects' demographic data are presented in Table 2. Sixty percent of participants were
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45 between the ages of 26 and 30, and 93% were female. Most participants had between one and
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47 six years of prior nurse experience. Seventeen (57%) of the subjects reported a preference for
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49 working in primary care clinical settings after graduation, and the remaining reported a
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51 preference for working in a hospital or specialty clinic. Only six (20%) stated that they had
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53 received oral health education before participating in the study.
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57 58 **Oral Health Knowledge**

Measures of the participants' oral health knowledge before and after the intervention are presented in Table 3. After the intervention, a significant improvement was seen in the subjects' overall knowledge of oral health topics (mean (median) sum of scores = 8.9 (9.0) and 10.3 (10.0) respectively before and after the intervention, Wilcoxon signed-rank test, $p < 0.001$). In the postintervention survey, eight questions were answered correctly by more than 85% of the participants. Specifically, 94% of the subjects answered the question on reimbursement for fluoride-varnish treatment by non-dental health care professionals correctly, demonstrating a significant improvement over their preintervention responses (62%) (exact McNemar's test, $p = 0.003$). However, only between 33 and 57% of subjects correctly answered the questions regarding the systemic effect of fluoride, fluoride use for children under age 3, age of a child's first dental visit, and remineralization of the early carious lesions.

Confidence in and Attitudes on Providing Oral Health Service during Well-Child Visits

The subjects' confidence in their ability to provide oral health service was low at preintervention. However, in the postintervention survey, there was significant improvement in their overall level of confidence (see Table 3, mean (median) sum of scores = 7.8 (7.0) and 14.1 (13.5), respectively, out of 20 questions answered before and after the intervention, $p < 0.001$). A significant improvement was also noted in participants' responses to each question in the confidence section in the postintervention survey (Bhapkar test, $p < 0.01$).

In the preintervention survey, most participants demonstrated an overall positive attitude toward providing oral health services during well-child visits. Only five participants did not agree about providing dental referrals for infants by age 1. Nevertheless, a significant improvement in participant scores overall was evidenced in the postintervention responses (Wilcoxon signed-rank test, $p < 0.01$). There were no significant improvements in participants' attitudes toward

1 incorporating counseling about dental prevention and prescribing fluoride supplements ($p >$
2
3 0.49) into the well-child visits.
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7 **Behaviors in Providing Oral Health Service in Well-Child Visits**

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11 Because the participants were at the didactic phase of their education during the preintervention
12 survey with no chance of participating in clinical practice at that time, their behavior regarding
13 oral health care was only evaluated in the postintervention survey. Eighty-three percent of the
14 participants stated that they had performed more than 10 dental examinations during their
15 routine well-child visits (Table 4), a response that was well mirrored in the number of routine
16 well-child visits reported by the participants. In addition, the majority of the participants reported
17 that they frequently or always inquired about the feeding habits of the children and emphasized
18 the importance of regular dental visits during their routine well-child examinations although
19 fewer than half of the participants reported that they frequently or always made a dental referral
20 for high-risk patients. Assessment of the need for and prescription of fluoride supplements or
21 consultation on the use of fluoride toothpastes was not done frequently by more than two-thirds
22 of the participants. The participants reported that they very rarely inquired about the parents'
23 oral health during their routine well-child examinations (Table 4). All of the participants reported
24 having applied fluoride varnish in between 0 and 10 cases, indicating that few, if any, fluoride
25 varnish applications were performed by participants. The participants' descriptive answers
26 revealed that fluoride varnish had not been available in the clinics where they had practiced.
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49 **DISCUSSION**

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55 Our study focused on evaluating the effectiveness of an interdisciplinary oral health educational
56 program, including didactic education, simulation exercises, and clinical observation of a
57 pediatric dentist, delivered to pediatric nurse practitioner students on their knowledge,
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1 confidence, attitudes, and behaviors regarding the incorporation of oral health assessments,
2 consultations, preventive treatments, and referral services during routine well-child visits.
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8 **First, we assessed the students' previous oral health educational experiences,**
9 **knowledge, confidence, and attitudes about oral health care before they received the**
10 **intervention.** Interestingly, only 20% of the group reported that they had received any oral
11 health education in the past, which is considerably lower than 65% reported for pediatric
12 residents.³¹ Our study showed that although the participants had adequate knowledge of some
13 aspects of oral health care, such as cariogenic feeding habits and the role of fluoride in caries
14 prevention, a significant number of them lacked knowledge in several important aspects, such
15 as recommendation of children for the first dental visit by age 1, the hazardous effect of fluoride
16 ingestion, and the fact that non-dental health care providers could be reimbursed for fluoride
17 varnish application. These areas of lack of knowledge about oral health care are similar to the
18 findings in previous studies of primary pediatric providers or pediatric residents.^{23, 35, 36, 39}
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37 **It was not surprising to find that the majority of the participants were not confident to**
38 **provide oral health assessments, consultations, preventive treatments, and referrals,**
39 **although almost all had positive attitudes and were willing to provide these services**
40 **during their practice.** These findings also agree with those of previous studies of pediatric
41 residents, medical students, pediatric primary-care providers, and pediatric nurse
42 practitioners.²⁸⁻³¹ As reported previously, lack of knowledge and confidence may act as barriers
43 to prevent pediatric primary-care providers from providing oral health care services to young
44 children.^{23, 35, 36, 39} All participants in our study indicated that they were planning to work in a
45 primary care hospital or specialty clinic after graduation. Adequate oral health education to
46 these students will enable them to provide efficient oral health consultations, preventive services,
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1 and proper referrals after graduation as well as boost the workforce of pediatric medical
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4 providers who are competent in providing oral health care services to young children.
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8 **In the postintervention survey, we observed a significant improvement in the students'**
9 **knowledge, confidence, attitudes, and behaviors concerning oral health care.** More than
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11 85% of the subjects correctly answered 8 out of 13 knowledge questions, including those in
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13 areas such as reimbursements to non-dental health care providers for administering fluoride
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15 varnish treatments, maternal transmission of caries-causing bacteria, the preventive effects of
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17 xylitol use, the side effects of fluoride ingestion, and the benefits of having young children brush
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19 their teeth with fluoride toothpaste. Since the postintervention survey was conducted between
20
21 five and nine months after the students had completed the training course, the findings suggest
22
23 that they retained the knowledge gained during their education. There was also a significant
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25 (81%) increase in the average sum of the students' scores that measured their confidence in
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27 their ability to advise parents about their children's oral health. The students' level of confidence
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29 nearly doubled after they participated in the intervention. Significant improvement was also
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31 evident in their attitudes toward incorporating oral health care services during routine well-child
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33 visits, even though the majority had already indicated in the preintervention surveys that they
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35 had positive attitudes about these practices.
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46 **The most exciting result was the finding that 84% of participants reported actively**
47 **incorporating oral health service as a part of their routine well-child visits.** A majority of
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49 the participants (about 80%) frequently inquired about children's feeding habits and discussed
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51 the importance of regular dental visits with parents during the well-child examinations. This
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53 result suggests, with adequate knowledge and confidence, the majority of the participants would
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55 be motivated and would apply their knowledge of oral health care to provide oral health
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1 assessments, consultations, preventive treatments, and referrals for children during routine well-
2 child visits. The provision of these services by pediatric nurse practitioners could enhance the
3 workforce to improve oral health care to young children, especially to those who do not have a
4 dental home but have an established medical home.
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12 **Despite the significant overall improvement in participants' knowledge and confidence in**
13 **oral health care, we still observed areas of weakness at postintervention.** Between 40 and
14 57% incorrectly answered questions about mechanism of fluoride use in caries prevention or
15 timing of a child's first tooth eruption. These weak areas were consistent with the areas in which
16 respondents were less confident on. Lack of knowledge and confidence in these areas may also
17 explain the low number of participants who included the assessment and prescription of fluoride
18 supplements and consultation on fluoride toothpaste use in children during well-child exam.
19 These weak areas of knowledge were similar to those reported in two other studies on pediatric
20 dental residents.^{23, 35} Future studies should incorporate mechanisms to specifically generate
21 feedback from students about these areas in order to seek effective ways to strengthen and
22 improve curriculum content.
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42 **It was disappointing to find that despite the significant amount of knowledge and the**
43 **enthusiasm gained regarding fluoride varnish treatment and its benefits for oral health,**
44 **very few if any of them were able to apply fluoride varnish during their practice because**
45 **either it was not available in the clinic where they practiced.** An organizational change to
46 support and encourage fluoride varnish application at all pediatric clinic settings is necessary so
47 that clinicians can provide this important preventive dental service.
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1 **There were also some limitations in the study.** One limitation was the absence of a control
2 group. Due to our limited resources, we could not identify enough subjects to have a control
3 group. It also would have been unethical not to provide the educational intervention considered
4 part of their curriculum to some of the students. Schaff-Blass and colleagues attempted to
5 compare the effectiveness of an oral health educational intervention at the University of North
6 Carolina with the other pediatric residency programs located nearby as control groups.³⁶ They
7 were unable to make a justified comparison of their program to the other programs due to poor
8 follow-up of the neighboring schools control groups. Therefore, future study will need proper
9 collaboration with similar pediatric nurse practitioner programs to identify a large enough study
10 population to serve as controls and to ensure proper administration and follow-ups of surveys.
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27 Also, our study's reliance on participants' self-reporting on their practice habits may have
28 introduced some reporting bias. Future study using objective measurements of actual oral
29 health-care services provided with treatment codes would greatly enhance the validity of the
30 study.
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39 **In summary, our study demonstrates that incorporating an interdisciplinary, multifaceted**
40 **oral health educational curriculum in a pediatric nurse practitioner program can**
41 **successfully improve students' knowledge, confidence, attitudes, and behaviors**
42 **regarding the inclusion of oral health assessments, consultations, preventive treatments,**
43 **and referrals during routine well-child visits.** These results support the successes of two
44 multidisciplinary educational programs in improving the knowledge, confidence, attitudes, and
45 behaviors of pediatric residents reported by Schaff-Blassa et al. and Mouradian et al.^{23, 36}
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Interdisciplinary education between the pediatric dental and medical education programs should

1 be the model of future education for pediatric primary care providers and can play an important
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3 role in improving oral health in children.
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6 This project is one of many examples of interdisciplinary teaching and practice initiatives that
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8 has led to a recently established Center for Innovation in Interprofessional Healthcare Education
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10 at the University of California San Francisco.
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14 15 **CONCLUSIONS**

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19 Our study investigated whether an interdisciplinary oral health educational curriculum that
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21 included didactic education, simulation exercises, and observation in a pediatric dental clinic
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23 delivered to pediatric nurse practitioner students at UCSF would improve their knowledge,
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25 confidence, attitudes, and behaviors in providing oral health assessments, consultations,
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27 referrals, and services to young children during well-child visits. The preintervention survey
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29 results clearly demonstrate the students' lack of knowledge and lack of confidence to provide
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31 oral health-care services, although the majority had positive attitudes about providing the
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33 services. The results demonstrated that incorporating this curriculum into the program had
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35 successfully improved the students' knowledge, confidence, attitudes, and behaviors concerning
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37 the incorporation of oral health services during their routine well-child visits. Incorporation of oral
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39 health education program into the curriculum of pediatric nurse practitioner programs could help
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41 to increase the workforce for oral health care services to young children, especially those who
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43 do not have access to an established dental home.
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49 50 **ACKNOWLEDGEMENT**

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Table 1. Survey Questions for Pediatric Nursing Students for the Oral Health Educational Intervention Study

Demographic Questions:

- 1. What is your age group
 - a. 25 years or fewer
 - b. 26–30 years
 - c. 31–35 years
 - d. 36 years or more
- 2. What is your sex?
 - a. Male
 - b. Female
- 3. How many years have you practiced as a registered nurse?
 - a. 1–3
 - b. 4–6
 - c. 7–10
 - d. More than 10 years
 - e. I have not been employed as a registered nurse 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 the ages of 9 months and 1 year.
- 2. The bacteria that cause dental decay can be transmitted from mother to child.
- 3. Xylitol is a carbohydrate that is not fermentable by oral bacteria.
- 4. Xylitol is a carbohydrate that has been shown to kill the oral bacteria that cause cavities.
- 5. Fluoride prevents tooth decay by making the teeth stronger.
- 6. Ingesting fluoride while the teeth are forming (before eruption) helps prevent tooth decay.
- 7. Toothpaste containing fluoride should not be used to brush a 3-year-old child’s teeth due to the risk of fluorosis.
- 8. Fluoride prevents tooth decay when applied topically to the surfaces of teeth.
- 9. Nondental health professionals can be reimbursed for fluoride varnish applications.
- 10. A child’s first dental exam should occur by 3 years of age or when all primary teeth have completed eruption.
- 11. Chalky white spots on a child’s teeth can be remineralized with fluoride varnish.
- 12. Babies should not be put to bed with a bottle of juice or milk.
- 13. Frequent snacking with carbohydrates increases the risk of developing early childhood caries.

Confidence and Attitude Questions

- | | | | | |
|--|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. How CONFIDENT do you feel in advising parents of infants and toddlers regarding | Very confident | Somewhat confident | Not confident | |
| a. Their child’s oral hygiene? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| b. Water fluoridation? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| c. Dietary recommendations to prevent early childhood tooth decay? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| d. Fluoride supplement during infancy/childhood? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| e. Dental visits during infancy/childhood? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| f. Examining teeth of infants and toddlers for tooth decay? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| g. Identifying tooth decay in early childhood? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| h. Identifying other signs of oral pathology? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| i. Evaluating risk of tooth decay in infants and toddlers? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| j. Deciding if a child needs a referral to a dentist? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | |
| 2. Do you AGREE or DISAGREE that the following should be part of routine well-child-care visits? | Strongly Agree | Agree | Disagree | Strongly Disagree |
| a. Routine assessment for early signs of dental problems (e.g., dental decay, gingivitis) during | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

the physical exam

- | | | | | |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| b. Referral to a dentist by 1 year of age | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Counseling on the prevention of dental problems (e.g., dental decay, gingivitis, trauma) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Prescription of fluoride supplements when indicated | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Behavior 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 examinations 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?
- | | Always | Frequently | Occasionally | Rarely | Never |
|---|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| a. Assess a child's fluoride intake to determine the need for supplementation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| b. Prescribe a dietary fluoride supplement | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| c. Discuss the use of fluoride toothpaste with parents | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| d. Inquire whether a child is taking a bottle to bed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| e. Counsel parents on the importance of regular dental visits | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| f. Inquire about a mother's dental health | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| g. Refer a high-risk patient to a dentist | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
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Table 2. Subject Demographics

		Numbers of subjects (%)
Age		
	25 years old or younger	3 (10%)
	26–30 years old	18 (60%)
	31-35 years old	3 (10%)
	36 years old or older	6 (20%)
Gender		
	Female	28 (93%)
	Male	2 (7%)
Years of experience prior the study		
	no experience	3 (10%)
	1–6 years	21 (70%)
	> 7 years of experience	6 (20%)
Future working plan after graduation		
	primary care clinic	17 (57%)
	hospital or specialty clinic	13 (43%)
Prior formal oral health education		
	Yes	6 (20%)
	No	24 (80%)

For Review Only

Table 3. Oral Health Knowledge of Pediatric Nurse Practitioners Before and After

Oral Health Educational Intervention

Questions	Number of Correct Answers				P-Value*
	Pre-test		Post-test		
	Subject #s	%	Subject #s	%	
1 On average a child's first tooth erupts between 9 months and 1 year of age.	13	43%	17	57%	0.344
2 The bacteria that cause dental decay can be transmitted from mother to child.	28	93%	30	100%	0.219
3 Xylitol is a carbohydrate that is not fermentable by oral bacteria.	18	60%	25	83%	0.065
4 Xylitol is a sugar substitute that has been shown to kill the oral bacteria that cause cavities.	18	60%	24	80%	0.109
5 Fluoride prevents tooth decay by making the teeth stronger.	28	93%	29	97%	1.000
6 Ingesting fluoride while the teeth are forming (before eruption) helps prevent tooth decay.	20	67%	12	40%	0.077
7 Toothpaste containing fluoride should not be used to brush a 3-year-old child's teeth due to the risk of fluorosis.	12	40%	10	33%	0.791
8 Fluoride prevents tooth decay when applied topically to the surfaces of teeth.	27	90%	28	93%	1.000
9 Nondental health professionals can be reimbursed for fluoride varnish applications.	21	70%	30	100%	0.003
10 A child's first dental exam should occur by 3 years of age or when all primary teeth have completed eruption.	14	47%	12	40%	0.754
11 Chalky white spots on a child's teeth can be remineralized with fluoride varnish.	13	43%	18	60%	0.302
12 Infants should not be put to bed with a bottle of juice or milk.	30	100%	30	100%	1.000
13 Frequent snacking with carbohydrates increases the risk of developing early childhood caries.	30	100%	30	100%	1.000

- Exact McNemar's test was used for pre- and post- comparison for each individual question.

Table 4. Confidence, Attitudes and Behavior of Pediatric Nurse Practitioners about Providing Oral Health Service Measured before and after Oral Health Educational Intervention.

	Preintervention (n=30) (Subject #s (%))			Postintervention (n=30) (Subject #s (%))			P-value*		
	very confident	slightly confident	not confident	very confident	slightly confident	not confident			
Confidence Questions									
Consult on child's oral hygiene	8 (27%)	19 (63%)	3 (10%)	17 (57%)	13 (43%)	0 (0%)	<0.01		
Consult on water fluoridation	3 (10%)	9 (31%)	17 (59%)	6 (21%)	23 (79%)	0 (0%)	<0.01		
Dietary consult on caries prevention	8 (27%)	19 (63%)	3 (10%)	24 (80%)	6 (20%)	0 (0%)	<0.01		
Consult on fluoride supplement in infancy	2 (7%)	8 (27%)	20 (66%)	9 (30%)	20 (67%)	1 (3%)	<0.01		
Consult on dental visits in infancy/childhood	5 (17%)	19 (63%)	6 (20%)	23 (77%)	7 (23%)	0 (0%)	<0.01		
Perform oral exam on infants and toddlers	3 (10%)	13 (43%)	14 (47%)	8 (27%)	22 (73%)	0 (0%)	<0.01		
Identify early childhood tooth decay	3 (10%)	13 (43%)	14 (47%)	8 (27%)	21 (70%)	1 (3%)	<0.01		
Identify other signs of oral pathology	0 (0%)	14 (37%)	16 (53%)	5 (17%)	18 (60%)	7 (23%)	<0.01		
Refer a child to a dentist	3 (10%)	19 (63%)	8 (27%)	12 (40%)	18 (60%)	0 (0%)	<0.01		
	Preintervention (Subject #s (%))			Postintervention (n=30) (Subject #s (%))				P-value*	
Attitude Questions									
	strongly agree	agree	disagree	strongly disagree	strongly agree	agree	disagree	strongly disagree	
Assess early signs of dental problems during the physical exam	15 (50%)	15 (50%)	0 (0%)	0 (0%)	25 (83%)	5 (17%)	0 (0%)	0 (0%)	0.06
Refer children aged 1 to a dentist	10 (33%)	15 (50%)	5 (17%)	0 (0%)	21 (70%)	7 (23%)	2 (7%)	0 (0%)	0.06
Consult on dental preventions	16 (53%)	14 (47%)	0 (0%)	0 (0%)	21 (70%)	9 (30%)	0 (0%)	0 (0%)	0.49
Prescription of fluoride supplements	15 (50%)	15 (50%)	0 (0%)	0 (0%)	20 (67%)	10 (33%)	0 (0%)	0 (0%)	0.57
	Postintervention (Subject #s (%))								
Behavior Questions									
	0–10 cases	11–20 cases	21–30 cases	31–40 cases	>40 cases				
Perform routine physical exams over past 3 months	7 (23%)	10 (33%)	8 (27%)	3 (10%)	2 (7%)				
Perform oral exams in past 3 months	5 (17%)	10 (33%)	8 (27%)	3 (10%)	4 (13%)				
Apply fluoride varnish applied in past 3 months	30 (100%)	0	0	0	0				
How often performed the following tasks during a routine exam over past 3 months									
Assess a child's fluoride intake for the need of supplementation	1 (3%)	8 (27%)	6 (20%)	7 (23%)	8 (27%)				
Prescribe fluoride supplements	0 (0%)	5 (17%)	2 (7%)	5 (17%)	18 (60%)				
Discuss fluoride toothpaste use with parents	4 (13%)	6 (20%)	9 (30%)	3 (10%)	8 (27%)				
Inquire about a child's use of a bottle in bed	12 (40%)	13 (43%)	5 (17%)	0 (0%)	0 (0%)				
Counsel parents on the importance of regular dental visits	11 (37%)	12 (40%)	5 (17%)	0 (0%)	2 (7%)				
Inquire about mother's dental health	1 (3%)	2 (7%)	5 (17%)	14 (37%)	8 (27%)				
Refer high-risk patients to a dentist	5 (17%)	6 (20%)	5 (17%)	4 (13%)	10 (33%)				

* Bhapkar test was used for pre and post comparison for each individual question.