

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

Elliot R. Shulman, DDS, MS; Wesley G. Howard, MPH; Gina Sharps, RDH; Stanley Wearden, PhD

Introduction

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

Review of the Literature

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

National health organizations, such as the American Academy of Pediatrics and the AAPD, have recognized the need for early oral health care for children, suggesting their first dental visit should take place no later than 1 year of age.^{7,8} Dentists or dental hygienists graduating before this became the standard of care

in 2002 may not be as likely to see children under the age of 3. Continuing education (CE) programs, such as "Points of Light" in Michigan and others like "ABCD" in Washington, have been initiated in several

Abstract

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

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

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

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

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

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

states to increase the access of young children for oral health care and to assess the knowledge gap. While dental service utilization has increased 21 to 25% for children under age 6,⁹ the data does not specifically discuss children aged 1 to 2 years old. In fact, published data from the U.S. Department of Health and Human Services documents that parents only reported that 10% of their children aged 1 year old and 24% of children aged 2 years had a preventive dental care visit as in 2003.¹⁰

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

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

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

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

Methods and Materials

The First Smiles Program

The First Smiles CE Program was developed in West Virginia by the authors to increase access by educating dentists, dental hygienists and assistants on the importance of identifying children suffering from early childhood caries (ECC), and to promote inclusion of the age 1 dental visit in their practice. The program was funded through the Benedum Foundation. Developed as a 4 hour CE program, First Smiles

was designed to provide a practical and realistic approach to enable the oral health team to become more comfortable in handling young children, to identify risk factors of ECC and to understand the appropriate areas of prevention. The program focused on infant/toddler oral health needs, promotion and disease prevention. First Smiles programs were held at 4 initial sites and were offered at no cost to all oral health professionals and staff in their dental society's region. The program received institutional review board approval from West Virginia University prior to its initiation. Participants completed a pre-test prior to the program, reviewing oral health knowledge and the anticipatory guidance and services they provide for young children. A true/false and yes/no format were selected for simplicity and time efficiency.

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

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

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

Results

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

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

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

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

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

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

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

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

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

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

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

Discussion

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

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

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

* Sig at $p < .0001$

**Sig at $p < .05$

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

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

* Sig at $p < .005$

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

to their office policy rather than by their ability to prescribe.

Lastly, less than 50% of participants utilized fluoride varnish, which is only slightly better than the 44% that Fiset et al found in data from Washington State in 1997.¹⁸ Although their study was performed on adults, they concluded that the limited use was probably due to the cost of the product. The cost may indeed be the reason, but the authors suggest that it may also be that the product has not yet been approved by the Federal Drug Administration for caries reduction. The use of fluoride varnish is an evidence-based practice endorsed by the American Dental Association Symposium held in 2006 and the Association of State and Territorial Dental Directors in 2007.^{19,20} These recommendations should be followed by all oral health professionals.

When comparing the pre- and post-test out-

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

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

*Sig at $p < .001$

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

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

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

group is the education of the public. Parents need to understand the need for early oral health care in dental offices and the positive effect it can have on their child's oral health.

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

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

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

Numerous studies exist in the literature that successfully demonstrate the effect of multiple interventions and interactive CME sessions on behavior outcomes.²³⁻³⁰ Of particular note is a comprehensive updated Cochrane review conducted by Forsetlund et al in 2009.³¹ They reviewed an additional 81 CE meetings and workshops that studied the effects on professional practice and health care outcomes that were published from 1999 to 2006. They concluded that educational meetings by themselves are not an effective method for producing changes in complex behaviors. The best method was one that included interactive and didactic formats. They presented no conclusion on the optimum number of interventions required to make a significant impact on professional practices.

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

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

This current study does have its limitations. It is important to take into consideration that the First Smiles program was free to participants. This may have encouraged some individuals to attend in

order to obtain CE hours at no cost, even though they had little interest in the topic presented. The authors found the participants to be engaging and appreciative for First Smiles, which was confirmed by the overwhelming positive program evaluations. Another limitation was the use of yes/no or true/false questions. Further discrimination would have been able to be done if a graduated scale, such as a Likert scale, was used.

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

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

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

Conclusion

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

Elliot R. Shulman is an associate clinical professor and Interim Director, Division of Pediatric Dentistry. Wesley G. Howard was a graduate student in Public Health at the time of the study and is now a dental student. Gina Sharps is a registered dental hygienist. Stanley Wearden is Professor Emeritus of Statistics, Department of Statistics. All authors work at the West Virginia University School of Dentistry, Morgantown, West Virginia.

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