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RESEARCH ARTICLE

Adoption of New Oral Health Interventions in Primary Care: Qualitative Findings



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Introduction: This is the first study to use the Common-Sense Model of Self-Regulation theory for oral health interventions in pediatric practices. The objective of this qualitative study was to assess adoption and implementation of theory-based multilevel oral health interventions, by clinicians (pediatricians and nurse practitioners) participating in a cluster randomized clinical trial, to create an oral health toolkit for widespread dissemination into pediatric practices.

Methods: Semistructured interviews were conducted at the conclusion of the cluster randomized clinical trial with 21 clinicians from 9 practices participating in the intervention arm. Clinicians in this arm received Common-Sense Model of Self-Regulation theory-based education and resources to deliver oral health interventions to parents/caregivers and document in electronic medical record. Semistructured interview questions were based on the Diffusion of Innovations Theory, assessing adoption and implementation. The interviews were coded using NVivo (QRS International) software. Main themes were identified using a thematic analysis approach.

Results: Five themes identified from the interviews included strengths of theory-based oral health training for clinicians, oral health resources to improve quality of care, considerations for efficient future implementation, financial considerations, and parent benefits and challenges. Clinicians found that the theory-based training and resources increased knowledge and confidence when addressing oral health with parents and required only ≤ 2 minutes in their workflow with no financial consequences. Clinicians reported an increase in oral health awareness among parents but suggested an overall need for more pediatric dentists.

Conclusions: The Common-Sense Model of Self-Regulation theory-based education and resources were well received by clinicians and perceived to be beneficial without adverse impact on workflow or practice finances. An online toolkit is planned because these oral health interventions can be successfully implemented and delivered in medical settings.

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INTRODUCTION

Dental caries (cavities, tooth decay), the leading childhood chronic disease, disproportionately affects children from disadvantaged and racial/ethnic minority backgrounds.¹ According to the U.S. national data, the prevalence of caries experience (past and existing cavities) in primary teeth of children aged 2–5 years is higher among those below poverty level (34%) than among those above (16%).¹ The national prevalence of untreated decay (existing cavities) in primary teeth for this age group is 10% but is over 2 times higher in racial/ethnic minorities and low-income groups.¹ In Northeast Ohio, caries experience and untreated decay are 49% and 42%, respectively, among Medicaid-enrolled children, much higher than the national rates.² Although there has been an overall decrease in the prevalence of caries experience and untreated decay among the U.S. pediatric population, disparities still exist among minority families and under-resourced communities.³ Medicaid-enrolled preschoolers attend more pediatric well-child visits (WCVs) (63%) than preventive dental visits (38%).^{4,5} A recent study indicates that dentists are reluctant to see children aged ≤ 3 years despite American Academy of Pediatric Dentistry (AAPD) guidance for dental visits starting at age 1 year.^{6,7}

Owing to the disparate dental care gaps among young children, the American Academy of Pediatrics (AAP) recommends that dental homes be established for children at age 1 year, and pediatricians provide oral health (OH) guidance and dental referrals.^{8,9} In 2021, the U.S. Preventive Services Task Force updated the recommendation for primary care clinicians to apply fluoride varnish with primary tooth eruption and prescribe fluoride supplementation at age 6 months for those with fluoride deficiency in water supplies.^{10,11} Such interventions in the medical setting are vital for providing preventive OH services to those that face barriers to dental access.^{12,13} AAP surveys indicate that despite increases from 2008 to 2018 in the proportion of pediatricians who applied fluoride varnish (3% vs 19%), fewer expressed confidence in their ability to identify caries.¹³ Lack of education and confidence can be a barrier when implementing OH into primary care.¹⁴ In a study with multispecialty physicians, residents, and nurses, only 16% reported adequate coverage of dental topics in their medical training.¹⁵

The Common-Sense Model of Self-Regulation (CSM) framework can be effective in educating clinicians on the chronicity of dental caries.¹⁶ CSM has been used previously to successfully help patients self-manage chronic disease such as diabetes and cardiovascular disease.^{17–19} The CSM theory is a psychological framework of cognitive and emotional perceptions of disease.²⁰ The

domains of CSM include identity (signs and symptoms of caries), cause (bacteria, risk factors), control (dental hygiene and visits), consequences (missing school days, financial), and timeline (chronicity, progression from baby to permanent teeth).^{16,20} When a patient develops a more accurate perception of the disease, this can lead to coping (e.g., intention to visit the dentist) and then behavioral change (e.g., going to the dentist).^{16,20}

Because theory-based medical interventions are increasingly adapted for OH, there is an opportunity to introduce these new approaches into medical settings.²¹ Pediatric Providers Against Cavities in Children's Teeth was a cluster randomized clinical trial (cRCT) designed to test the effectiveness of multilevel interventions at the practice level (electronic medical record [EMR] documentation of OH questions) and clinician level (CSM theory-based didactic and skills training with resources) to increase clinicians' knowledge and self-efficacy to communicate CSM-based OH facts to parent/caregivers (referred to as parent in the remaining parts of this paper) at WCVs.¹⁶ This is the first study to use the CSM theory in pediatric practices.¹⁶ Focus groups conducted in preparation for the cRCT with clinicians and staff in 2 pilot pediatric practices not participating in the cRCT were used to refine plans for implementation, anticipate barriers, identify needed resources, and assess the acceptability of proposed interventions.¹⁶ The results of this cRCT show a 34% significant increase in dental utilization and 16% reduction in mean untreated decay among the children in intervention arm compared with those among children in the control arm (unpublished data). Owing to evidence showing effectiveness of the intervention arm, individual semistructured interviews were conducted with participating clinicians (pediatricians and nurse practitioners) to explore their perceptions and experiences after conclusion of the cRCT. The purpose of this study was to assess the determinants (utilizing Roger's Diffusion of Innovations framework)²² influencing intervention arm clinicians' adoption and implementation of the multilevel intervention so that it may be utilized as a toolkit for future widespread dissemination.

METHODS

Study Design

Eighteen practices and 63 clinicians (pediatricians, $n=54$; nurse practitioners, $n=9$) in Northeast Ohio were enrolled in the cRCT to improve dental utilization among Medicaid-enrolled children aged 3–6 years attending WCVs. The practices were randomized into 2 arms (9 per arm). The intervention arm clinicians ($n=28$) initially received theory-based OH didactic

education and skills training on the basis of the CSM prior to recruitment of child–parent dyads during November 2017 through November 2018. A booster training as a refresher to the original training was conducted approximately 1 year later from October 2018 through December 2019. In addition, clinicians received educational resources (training manual, flip chart, and pocket card) to use throughout the trial to communicate the OH facts (on the basis of CSM domains), a dental prescription (informal referral) for parents to take their children to the dentist, and a list of Medicaid-accepting dentists. The clinicians in this arm were also trained to document 4 questions in EMR (*Does the child have white or brown spots?*, *Did the child go to the dentist in the past 12 months?*, *Did the provider communicate OH facts to caregiver?*, and *Did the provider give the caregiver a prescription to take child to the dentist and list of Medicaid-accepting dentists?*).

The cRCT was conducted from September 2017 through July 2022. Semistructured interviews were completed with participating pediatric clinicians from February to July 2022 because practices finished study visits. Clinicians were contacted by telephone and/or email to complete the interview. To minimize recall bias, providers were sent the content of the education to review prior to the interview. This report conforms to the Joanna Briggs Institute Checklist for Qualitative Research.²³ The IRB of University Hospitals Cleveland Medical Center approved the study protocol (IRB Number 08-15-37). Written consent was received from clinicians prior to participating in the structured interview.

Study Population

Of the 28 intervention arm clinicians enrolled in the study, 21 clinicians completed the semistructured interviews. Seven clinicians did not participate owing to retirement, changing practice, or illness. Interviews were conducted in person ($n=15$) or over Zoom ($n=6$). Participants had no prior contact with the trained interviewer during the original cRCT. In-person interviews were conducted at the clinician's practice in a private area.

Data Collection

Clinicians' sociodemographics were collected at baseline of the cRCT with a questionnaire including age (years), sex (female or male), ethnicity (Hispanic/Latino, not Hispanic/Latino, and unknown), race (Black/African American, Caucasian, and other), type of medical degree (MD/DO or MNP/DNP), work experience (years), and formal OH education (no training, medical/nursing school, during residency, and post-residency).

Semistructured Interview

Eight interview questions with probes were based on the 5 characteristics (relative advantage, compatibility, complexity, trialability, and observability) of Roger's Diffusion of Innovations Theory to better understand adoption of the intervention.²² Under relative advantage, clinicians were asked to compare the training with other professional websites, evaluate their satisfaction with the curriculum, and report whether the information could be successfully delivered to parents. The compatibility question was designed to understand the barriers and enablers to implementation and whether the OH intervention met their quality-of-care goals. For complexity, clinicians were asked about the simplicity of implementing the intervention. Trialability questions were to evaluate any adjustments in productivity and patient load during implementation. Clinicians were asked to reflect on patient benefits and quality improvements for observability.²² Semistructured interview questions based on Roger's Diffusion of Innovations theory can be found in the [Appendix File](#) (available online).

Interviews were audio recorded and kept on a password-protected computer. Field notes were taken by the interviewer and kept in a secured, locked cabinet. Audio recordings and field notes were deidentified.

Statistical and Thematic Analysis

Recordings were transcribed by 4 members of the research staff and verified by 2 members. Transcripts were deidentified and kept on a password-protected computer. Thematic analysis was used, which offered a theoretically flexible way to analyze qualitative data.²⁴ Thematic analysis phases outlined by Braun and Clarke were used as a framework for the analysis.²⁴ Because data were transcribed and subsequently verified, the transcription and field notes were reviewed by a research staff member experienced in qualitative research. Prior to coding, all 3 coders familiarized themselves with the data and noted ideas and possible codes. Next, coding was completed with an inductive and deductive approach in NVivo Release 1.0 (QRS International). Themes were driven by the characteristics of Roger's Diffusion of Innovations Theory domains. Deductive coding was completed initially on the basis of the questions and characteristics of the theory ([Appendix File](#), available online). Inductive coding was subsequently used as unplanned topics/themes began to emerge from the data.²⁴ Preliminary themes were created by each coder and reviewed as a group (both within the adoption characteristics and newly emerging themes). Triangulating clinician interview data by 4 study members provided insight into the finalized themes. Quotes were

chosen and finalized by those 4 members to best illustrate each theme.

Descriptive statistics (frequencies, mean, and SD) were used to characterize the sample of intervention clinicians who participated in the semistructured interview. Any data that were incomplete within the survey were categorized as missing and not included in the overall frequencies. Descriptive statistical analysis was conducted using tidyverse packages in R, Version 4.2.2 (R Group for Statistical Computing), and RStudio, Version 2022.12.0 (Build 353).

RESULTS

Semistructured interviews lasted 15–32 minutes, with an average of 21 minutes. The characteristics of the participating clinicians are shown in Table 1. They were predominantly female, non-Hispanic, Caucasian, and pediatricians. The clinicians had a mean age of 45.7±9.5 years, and the mean duration of work experience was 14.9±9.0 years. Clinicians reported that their OH

Table 1. Clinician's Sociodemographics and Characteristics-Sociodemographic Variables

	Intervention arm (n=21)
Age, years, mean (SD)	45.71 (9.54)
Sex, n (%)	
Female	17 (81.0)
Male	4 (19.0)
Race, n (%)	
Asian	2 (9.5)
Black	2 (9.5)
Hawaiian/Pacific Islander	0 (0.0)
More than one race	0 (0.0)
Unknown	1 (4.8)
White	16 (76.2)
Ethnicity, n (%) ^a	
Non-Hispanic/Latino	17 (94.4)
Unknown	1 (5.6)
Medical degree, n (%)	
MD/DO	17 (81.0)
MNP/DNP	4 (19.0)
Years worked as PCP, mean (SD)	14.86 (9.03)
Formal oral health education, n (%)	
During medical/nursing school	6 (28.6)
During medical/nursing school and residency	4 (19.0)
During residency	3 (14.3)
No training	8 (38.1)
After residency	0 (0.0)

^aFor ethnicity, 3 respondents had missing values. PCP, primary care physician.

training was mainly received in medical/nursing school. Approximately 38% reported no formal OH training.

Five themes and the major findings are shown in Table 2, and clinician comments are provided for each characteristic in Table 3. Below, the results for the 5 themes are summarized under each characteristic of the Diffusion of Innovations framework.

Theme 1 was strengths of theory-based OH training for clinicians, which included gaining knowledge, developing a routine to deliver OH facts, and gaining confidence to discuss OH. Furthermore, the didactic training filled an educational gap, and 62% found the CSM-based information better or comparable with other professional websites. Clinicians reported incorporating the newly learned OH facts into WCVs, and they described the education as well organized, concise, and resourceful (pictures, facts card).

In terms of knowledge, clinicians reported learning the importance of baby (primary) teeth, when dental visits should begin, how to identify white and brown spots, long-term consequences, oral hygiene recommendations (including fluoride), caries development, and the asymptomatic nature of oral disease. Clinicians stated that skills training with standardized patients allowed them to practice and develop a routine to discuss OH with parents. More than 80% (n=17) of the clinicians reported that their training gave them confidence when discussing OH. They also preferred in-person training, with their most frequent con being time and most frequent and pro being personal interaction, including hearing and asking questions (Table 2). Some clinicians suggested online training to provide more flexibility and convenience.

Theme 2 was OH resources to improve quality of care in the clinician's practice. Clinicians reported 2 main enablers: intervention resources (flip chart, facts card, list of dentists) and incentives (dental goodie bags, cash given for study time compensation). Clinicians used resources such as the facts card to deliver OH information, the flip chart for visualization of healthy teeth versus cavitated teeth and healthy foods, and lists of dentists to send home with parents. Incentives cited by clinicians that helped with implementation included tooth brush and tooth paste for children, cash for parents, Continuing Medical Education (CME), and Maintenance of Certification (MOC) credits earned by clinicians after training and implementation. The most reported barrier was time for study-related activities, which interfered with the clinician's workflow (in addition to patient timeliness) (Table 2). In addition, 2 providers reported no-shows as a barrier to receiving OH education.

Theme 3 was considerations for efficient future implementation into practice settings. Pediatric clinicians

Table 2. Five Themes for CSM Theory–Based Intervention Clinician Training Using Roger’s Diffusion of Innovations Theory

Diffusion of innovations characteristic	Theme	Major findings
Relative Advantage	Theme 1: Strengths of theory-based oral health training for clinicians	+ Gaining OH knowledge + Developing a routine to deliver OH facts + Gaining confidence to discuss OH + In-person training provided personal interactions – Time to train
Compatibility	Theme 2: OH resources to improve quality of care	+ OH intervention resources: pocket card with theory-based facts, flipchart for visual reference, list of Medicaid-accepting dentists, education manual + Incentives (parent cash, patient goodie bag with toothbrushes, clinician-CME/MOC credits) – Time for study activities
Complexity	Theme 3: Considerations for efficient future implementation	+ OH theory-based intervention was simplistic enough for busy practice settings + Minimal time needed to deliver OH facts (1–2 minutes) – Logistics for study activities – No shows for appointment
Triability	Theme 4: Financial considerations	+ OH intervention was not cost prohibitive + Did not interfere with productivity – Workflow/Patient flow slowed due to study surveys
Observability	Theme 5: Parent benefits and challenges	+ Increased OH awareness – Dentists not using ADA age guidelines – Lack of pediatric dentists – Lack of reputable pediatric dentists

Notes: + indicates enabler to intervention, and – indicates barriers.

ADA, American Dental Association; CME, Continuing Medical Education; CSM, Common-Sense Model of Self-Regulation; OH, oral health; MOC, Maintenance of Certification.

reported that the OH interventions were simple enough to implement, and most clinicians needed only 1–2 minutes to deliver the OH facts to parents (Table 2). Clinicians reported that logistics (time and space) required for study-specific activities (surveys and oral examinations) were potential sources of disruption to patient flow. However, because these activities were purely for research purposes and research staff would not be present for future dissemination, clinicians anticipated that no other optimizations would be needed for efficient implementation of the multilevel intervention package in other sites. Ninety percent of the clinicians continued to deliver the OH facts to parents after the completion of the study, whereas the other 10% continued to deliver them with modifications.

Theme 4 was financial considerations for primary care practices implementing OH interventions. Clinicians reported that implementation did not decrease their productivity, except 1, who reiterated patient flow issues resulting from research-specific activities. Clinicians did not reduce the number of patients owing to study visits. The implementation of OH interventions was not considered cost prohibitive by the clinicians (Table 2).

Parent benefits and challenges was Theme 5. Eighteen of the 21 interviewed clinicians felt that OH awareness

increased in their practice. Clinicians reported that parents were more aware of dental hygiene and the need for dental care. Many clinicians stated that the OH information was imperative for overall health (Table 3). Three challenges that clinicians observed were pediatric dentists not using AAPD age guidelines for dental visits, lack of pediatric dentists, and reputable pediatric dentists (Table 2). Clinicians could not recommend dentists owing to the lack of collaboration between the practices, many rural areas not having pediatric dentists, and lists of Medicaid-accepting dentists needing continual updating. Some clinicians mentioned that patients reported challenges scheduling dental appointments during the pandemic, and parents were concerned about the quality of care from dentists (no call back for appointments, not compliant with AAPD age recommendations for seeing a dentist) (Table 3).

DISCUSSION

The primary goal of this study was to assess adoption and implementation determinants from intervention-arm clinicians to develop a toolkit for dissemination into pediatric practices. The OH toolkit for pediatricians incorporates the clinician’s input for the (1) theory-based

Table 3. Intervention Clinician Quotes According to the Characteristics of Roger's Diffusion of Innovation Theory

Diffusion of innovations characteristic	Theme	Clinician quote
Relative advantage	1	"...but the whole importance of why baby teeth are important in terms of the bacteria hanging out waiting to attack the adult teeth. I mean logically it makes total sense, but I don't know why it didn't click until we actually heard that." (P27)
	1	"...gives a little more confidence in what you're sharing with them that they might take it more seriously." (P32) "I also think that, if you are confident of what you're talking about and what you're saying... I think it makes them more apt to go to the dentist..." (P60)
	1	"I would say the part that was most new to me and helped emphasize the importance of dental health is the long-term consequences from poor dental health." (P4)
Compatibility	2	"I think talking about it, giving them resources, giving them places to go, has maybe increased their ability to go." (P60) "I would go through the actual flipchart they had and show the kids the pictures and have them pick out healthy foods from the pictures." (P58)
	2	"It's nice just to have the list of the dental providers in this area." (P62)
	2	"There are times when it takes a little bit [of] extra time... if you're waiting for [the research staff] to finish their assessment before you go in" (P26) "Definitely the barrier was the no-shows." (P61)
Complexity	3	"I still will talk about the importance of dental visits and having a dental home early on at 12 months. Indeed there are pediatric dentists out there who will see patients that young. I think that is important. I absolutely plan on talking about this with my patients." (P14)
Trialability	4	"So no we never really changed our schedule around it. So... it was not cost prohibitive." (P4)
Observability	5	"I think it's good for the patient, it's easy, more comprehensive." (P26)
	5	"There's one pediatric dental office, which is totally backed up and not getting people in well." (P28)

Notes: Pediatricians kept the same participant number in this study as cRCT. cRCT, cluster randomized clinical trial.

curriculum and (2) resources. First, the majority of clinicians who received the theory-based training reported an increase in confidence when delivering OH information and the ability to identify white and brown spots in patients at WCVs, making the clinician more equipped to meet AAP recommendations to include preventive OH measures.²⁵ A 2020 systematic review concludes that interprofessional education used in some studies has improved OH knowledge and skills but that there is also lack of available OH education for nondental providers,²⁶ reinforcing the need for theory-based OH education for primary care providers. Previous studies have shown an improvement in OH for kindergarteners when utilizing preventative OH services with nondental clinicians, further reinforcing the need for widespread dissemination of OH education and resources.²⁷ Difficulty in identifying oral diseases by primary care clinicians can be resolved with appropriate OH training as shown in this study¹² and as suggested in a study where practical demonstrations of an OH examination are warranted.²⁸ Clinicians retained vital information such as the importance of primary teeth and chronicity of dental caries even after the conclusion of the trial. As part of the OH toolkit, the CSM theory-based

education will be made available as an online course with didactic and skills video, including a pre- and post-test quiz. After the completion of the required modules of the toolkit, a completion certificate will be generated for each clinician participating in the online course.

Second, the theory-based resources and incentives were perceived as enablers to implementation by the clinicians. All pediatricians in the intervention arm found the curriculum and resources useful for patients and delivered the OH information even to those not in the study. Dentist lists, dental supplies, the OH facts pocket card, and the flip chart were all utilized when engaging patients or parents. Clinicians did perceive the resources to be straightforward, with a few suggesting that the facts pocket card be pared down. These intervention resources (OH facts pocket card, flip chart, and dentist list template) will be included in the toolkit, which can be downloaded electronically. A practice champion would be needed to periodically update the list of dentists and facilitate the production of dental supplies for patients.

The most complex issue for implementation was patient/workflow disruptions due to study activities

(e.g., surveys). In fact, implementation of the OH intervention was simple and concise and generally took 1–2 minutes of the clinician's time with the parents. Future implementation in other practices is thus expected to be simple, with minimal impact on the clinician's time; to not be cost prohibitive; and to not interfere with productivity. Parent challenges discovered in the study included finding available and reputable pediatric dentists who will see children at age 1 year, which reinforces the importance of maintaining dentist lists.

A final consideration is that providers may consider applying for CME for the didactic education and skills training and MOC credits for quality improvement initiatives, which were an important incentive for clinicians to implement the OH interventions.

Limitations

One strength of the study was that the clinicians were unfamiliar with the interviewer because the interviewer was not involved in the cRCT activities. Therefore, there were no preconceived expectations from the interviewees, making it less likely to have changed their behavior and answers.²⁹ Another strength is that the interview questions were based on the Diffusion of Innovations Theory, which provides a framework to better understand the determinants of implementation and adoption.²² The theoretical framework is beneficial for adopting new clinical behaviors such as OH interventions in primary care settings and understanding why or why not adoption occurred.³⁰

One limitation was that not all participating clinicians in the intervention arm were able to contribute, but most clinicians (75%) completed the semistructured interview, making it unlikely that nonparticipants would substantially change these findings. Recall bias could be a limitation because clinicians were discussing experiences from up to 2 years prior to the interviews. To minimize recall bias, the content of the education was sent to clinicians before interviewing. An additional limitation may be social desirability bias because clinicians may have reported answers that they felt were more acceptable. This could provide less accurate or incomplete responses.²⁹ To lessen the rigidity of the semistructured interviews,³¹ additional comments were encouraged during and after the predetermined questions.

CONCLUSIONS

As pediatric clinicians incorporate OH into WCVs, education is needed to give clinicians the confidence to identify, offer preventive measures (fluoride varnish), and educate about oral disease. Clinicians gained confidence from the CSM theory-based curriculum and resources

to identify white and brown spots and discuss the chronic progression of dental caries with parents. The intervention took minimal time without a decrease in patient load, and the revised OH EMR prompts were beneficial at follow-up visits. Clinicians should be encouraged and incentivized by receiving CME and/or MOC credits for their training efforts.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.focus.2024.100214.

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