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School screening and parental reminders in increasing dental care for children in need: a retrospective cohort study

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Abstract

Objective—To assess follow-up dental care received by children given baseline screening and referrals as part of an ongoing clinical trial.

Methods—A retrospective study with two cohorts of kindergarten children who had baseline and follow-up (nine months later) dental exams was used. The parents/caregivers of children with routine restorative or urgent needs at baseline received a referral letter and telephone reminders to seek care for their child. Children with referrals were evaluated at follow-up exam for the receipt of care. A baseline caregiver questionnaire provided information on the individual and family characteristics of the children.

Results—A total of 303 children had dental exams at both time periods. At baseline, 42% (126/303) received referrals and among the referred group 19% (24/126) received follow-up care. A greater proportion with urgent referrals (10/30, 33%) received care than those with routine referrals (14/96, 15%). Baseline dmft and DMFT was similar between children who did/did not receive follow-up care ($P=0.178$ and 0.491 respectively). Children receiving referrals had caregivers with less education, higher Medicaid participation, fewer routine care visits, poorer self-rating of teeth, and a higher proportion of children reporting tooth pain. Children without receipt of follow-up care had caregivers who were more likely to report not visiting a dentist within the last five years and a greater number of missed days from work due to tooth problems.

Conclusion—The rate of dental utilization was low even with school screening, referral and parental reminders among poor, largely minority inner-city kindergarten children.

Keywords

school children; dental caries; referrals; follow-up care

Introduction

School based dental screening has been endorsed by the World Health Organization (WHO) to facilitate early detection and timely intervention (1). This is seen as an antidote to prevalent parental views about lack of need for preventive care or treatment of children's decayed but asymptomatic baby teeth (2–5). More recent studies in the United Kingdom has failed to demonstrate the effectiveness of screening and formal criteria for referral process in increasing rates of follow-up care compared to two control methods among six to eight year old children with and without dental disease (6–7). A linear relationship between social

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deprivation and attendance was also not found (7). A related qualitative study by the same group found the school examination process was acceptable to parents and staff, but the procedure for follow-up of positively screened children was judged inadequate (8). In contrast, other previous studies with follow-up of referred children (9–11) reported significant increases in dental attendance among those with dental disease. However, the utilization rate was still low even with free dental care and other complex factors were thought to be involved in the receipt of follow-up care (11). The prevalence of dental disease in the primary dentition was in excess of 50% among the children in these European and Asian studies (6, 10, 11).

To our knowledge, there are no U.S. studies of the effectiveness of school screening and referral. According to a 2008 Association of State and Territorial Dental Directors report, there are laws in 12 U.S. states mandating dental screening of school-aged children before school entry. However, the laws do not require tracking and evaluation of children who receive referrals (12). Such empirical data are necessary to discern the rates of follow-up care in screened positive children in low-income communities in order to facilitate planning of feasible interventions to reduce disparities. A study by Milgrom and colleagues of American inner-city, elementary school children from low-income families found utilization of dental care unrelated to oral health status. Instead a series of behavioral and social factors was associated with the use of care (5). The rationale for this investigation is the paucity of U.S. data that clarify factors associated with the success of school screening and referral. Thus, the objective of this study was to assess the follow-up dental care received by children given school-based dental screening and referrals, and to determine child and caregiver characteristics associated with those who did and did not receive follow-up dental care.

Methods

Study Design

The study employed a retrospective cohort design utilizing data collected as part of an ongoing randomized clinical trial. The exposure was whether or not the child received baseline referral, and the outcome was evidence of follow-up care in the referral positive children. The protocol was approved by the Institutional Review Board of University Hospitals Case Medical Center, and written informed consent was obtained from the parent/caregiver of the child.

Population

Three hundred and eighty five kindergarten children (5–6 years) participated in an on-going community-based clinical trial in five inner-city elementary schools in Cleveland, Ohio. The study is testing the effectiveness of xylitol versus placebo containing gummy bears in preventing dental caries. The children were enrolled in the 2007–2008 and 2008–2009 school years. All of the parents/caregivers were English speaking. From these two cohorts of kindergarten children, the current study focused on only the children who were given a restorative or urgent care referral at the beginning of school year (baseline) dental exam in September, and also had a study related follow-up dental exam nine months later at the end of kindergarten school year in May.

Characteristics of the Children and Caregivers

At baseline, the primary parent/caregiver of the child, i.e. the person who signed the consent form, was asked to complete a questionnaire on age, ethnicity, education, occupation, marital status, dental behavior, access, and insurance status for both caregiver and child. Using the conceptual model of Grembowski and colleagues (13) as a guide, the following individual and family level variables were utilized:

- Structure, is the environment surrounding the child (Caregiver: age in years, number of children <18 years living at home, marital status categorized as married vs. not married, highest level of education completed, employment status categorized as full-time, part-time, or not working);
- History, is the characteristics of past dental behavior and oral health (Child: routine vs. problematic dental visits, frequency of dental visits categorized as once/year vs. less often than once/year; and Caregiver: routine vs. problem-based or symptom-driven dental visits, frequency of dental visits as for the child, rating of oral and general health on a five point scale of poor to excellent, number of days missed from work due to tooth problems); and
- Expectation is based on expected rewards such as avoiding future dental problems exceeding the costs of care in terms of money and time (child: Medicaid or private dental insurance coverage as yes or no, having one particular dentist for care, complaint of tooth pain categorized as never/rarely versus sometimes/often; caregiver: Medicaid or private dental insurance coverage).

The questions were adapted from the National Health and Nutrition Examination Survey III (NHANES III) and the Detroit Dental Health Project (14).

Caries Examination

The dental examination utilized the International Caries Detection and Assessment System (ICDAS) criteria (15, 16). Dental caries, existing sealants and fillings, and missing teeth due to caries were recorded. The children were examined visually using portable dental units with compressed air, a portable light and a front plane mirror. The ICDAS method uses an ordinal scale for lesions which ranges from 0 (sound tooth with no visible decay) to 6 (extensive decay with dentin visible on 50% of the tooth surface), and every tooth was assessed after being air dried. No probing was used following the ICDAS procedures. The total decayed (ICDAS lesion code 3), missing (ICDAS tooth code for missing due to caries), and filled (ICDAS filling code 3 (not including sealants) for primary (dmft) and permanent teeth (DMFT) were calculated for each child. All dental examiners were calibrated against a gold standard examiner with an inter-rater Kappa of 0.69–0.92 and intra-rater Kappa of 0.81–0.92 in the ICDAS criteria (17) at baseline and follow-up exams. At follow-up, the examiners did not have access to the results of the initial examination.

Referral Process

Referrals for follow-up dental care were given to children with routine restorative or urgent care needs. The referrals were based on ICDAS lesion codes. Extensive lesions (ICDAS lesion code 5) accompanied by an abscess and/or pain in any tooth, or severe trauma to tooth were considered urgent. All other ICDAS lesion codes of 3 (localized enamel breakdown, distinct and extensive cavity) in any primary and/or permanent tooth were classified as routine restorative for which the child needed pediatric dental care.

Children given referrals for care were sent home with a referral letter, which gave contact information for the local dental clinic willing to treat the children. The letter contents included: presence/absence of caries; oral hygiene (excellent, good, poor) assessed on plaque build-up; referral care (pediatric dentist, general dentist, urgent); importance of seeing the dentist even if the child is caries free, and contact information to University/Hospital dental clinics (Fig. 1). Referrals to a general dentist were seldom used except when children had early lesions (ICDAS codes 1 and 2). Children who did not have routine or urgent needs also received the same letter to take home but without checking the referral care options.

Parents/caregivers of children needing urgent care were called immediately to inform the parent about the dental exam findings and urge the parent/caregiver to take the child to the emergency room, dental clinic or to their regular dentist. The staff members used the referral letter as a script. The parents were called at least a minimum of three times by the study staff and a log was maintained to document the calls. The urgent care list was also given to the school nurse to ensure further follow-up calls with the caregiver. The principal of the school was notified to call the caregiver if they had been unresponsive to previous calls from study staff and nurse.

Outcome Measure

After the follow-up examinations were completed at the end of the school year, the children who had received referrals were categorized as having received follow-up care if at the follow-up exam they had any ICDAS filling code of 1 to 9 (sealants, restorations, crowns etc.) where no filling had previously been charted or had extraction of the teeth where decay had previously been charted. The children with baseline referrals, who had no visible new fillings or evidence of extractions for decay were categorized as not having received follow-up care.

Statistical Analysis

Descriptive statistics were used to describe the characteristics of the children and parents/caregivers. At baseline, two-sample t-tests were used for caries status variables (dmft, DMFT) to compare the children who received referrals and those who did not, and among the referral group of children, those who received follow-up care versus without. Child and parent/caregiver characteristics were compared for children with and without referral, and for children with and without follow-up care using t-tests for continuous and chi-square for categorical variables. Significance was assessed at $P = 0.05$. All analyses were computed using SPSS statistical software (Version 17).

RESULTS

Population Characteristics

The study population consisted of 385 kindergarten children (5 to 6 years, 96 percent African-American, equal proportion male and female, >95% free/reduced cost school lunch participation), recruited as cohort 1 (2007–2008 school year) and cohort 2 (2008–2009 school year). A total of 303 of the 385 children (79%) had complete ICDAS dental examination data at both baseline and follow-up (160 in Cohort 1 and 143 in Cohort 2). The remainder did not have complete data at both time points. Twenty-nine were absent for the dental examination, three children were study drop-outs, and 50 children transferred out of the school district and were unavailable. Selection bias was minimal as the subjects who had complete ICDAS data were similar to those with incomplete data in the extent of caries, and majority of caregiver characteristics. Those with incomplete ICDAS data had significantly higher proportion with baseline and restorative referrals, higher proportion of caregivers with high school education, and lower full time employment.

Baseline Examination and Referral

Approximately 42% of the children received baseline referral, while 58% did not at the beginning of the school year in September (Table 1). Only 19% of the referred children had received care at the follow-up dental exam in June (Table 1). A significantly higher proportion of urgent care versus routine restorative care referrals received follow-up care (Table 1). Table 2 gives the decay levels at baseline for children who received referrals. Table 3 indicates that the baseline comparison of children with and without follow-up care

was similar for individual components as well as summary dmft scores. At baseline, few kindergarten children had permanent teeth; and because of this, the findings on permanent teeth are not reported in Tables 2 and 3.

Caregiver Characteristics

A total of 259 (85%) out of 303 caregivers responded to the caregiver questionnaire, and 77% (98 out of 126) of the caregivers in the referred group. Even among those who responded to the questionnaire, not all questions were answered by the caregivers as given in Table 4. In general, the caregivers of the children were less than 30 years of age, 96 % African-American, 85 % with only high school education, and 81 percent unmarried single status. Most of the children (89 %) lived with at least one biological parent; 11 % were cared for by a grandmother or others.

Table 4 indicates the following results among the children who received referrals versus those who did not: (1) Among the structural factors, caregivers whose children were referred had a lower proportion with high school education and full-time employment; (2) Among the historical factors, the caregivers whose children were referred reported less routine care dental visits, a higher proportion with fair to poor teeth, and a lower proportion of children with routine care dental visits; and (3) Among the expectation factors, a greater proportion of those with referrals had caregivers covered by Medicaid and a larger proportion reported children with complaints of tooth pain. Other structural, historical, and expectation factors did not help explain differences between the two groups.

Table 4 indicates that among the children who did not receive follow-up care, a significantly greater proportion of caregivers had no dental visits during the past five years and greater number of missed days due to tooth problems. The predominant reason for lack of dental visits in five years was the lack of perceived dental problems, followed by the absence of dental insurance or transportation, dental treatment perceived as too expensive, symptoms went away, problems scheduling a dental visit due to child care problems, and being busy. The other caregiver characteristics were similar between the care received and not received groups.

DISCUSSION

The study provides valuable insights into the process of follow-up care when children are screened positive for dental caries at school. Subsequent follow-up examinations at school facilitated the objective documentation of the receipt of care that few studies are enabled to do. We have been unable to find any other school-based prevention trials in the U.S. that reported the extent of follow-up care received among children following dental screening.

Services are available in the study community for children served by Medicaid and the referral letters contained information on how to access these services. Yet, our results indicate that in this predominantly Medicaid population of kindergarten school children only 19% of the children given baseline referrals sought and received necessary treatment in a nine month time interval. Most disconcerting was that only 10 of 30 children given urgent care referrals received care even after repeated reminders and calls from the study staff, school nurse and teachers. These results have led others to argue that screening is a political intervention that is ineffective (18).

The caries rate in the primary dentition of our sample (42%) far exceeds the 28% reported among two to five year olds nationally (19). Further, the extent of dental decay was approximately three times higher in our study children compared to the national average of 0.72 and 1.01 teeth reported for African-American and low-income children respectively

(19). One explanation for the increased disease in our sample could be the significantly lower than high school education and lower prevention-oriented dental visits among the caregivers of children with referrals compared to those without referrals. These results are consistent with a prior study of low-income African-American caregivers of young children which found that increased caregiver education and routine care dental visits was associated with decreased caries (20).

Our results are consistent with a large-scale clinical trial in the United Kingdom and confirm that school screening does not stimulate subsequent dental visits (6–8). Similar to the UK study we used objective criteria and formal rules for referral and the child received an examination to ascertain whether care had been provided. As in the UK and Asian studies, care was essentially free as the children in this study were eligible for EPSDT (Early and Periodic Screening, Diagnostic, and Treatment) under Medicaid. However, the child could have visited a dentist without receiving the necessary treatment, which we were unable to check. A recent study of children covered by Medicaid found a significant group of children served by providers that gave diagnostic and preventive care but not restorative care (21). Our survey results show the majority of caregivers in our sample had only a high school education, and lacked awareness of the importance of the primary dentition. This may have played a role in low rate of care.

While care was available in the community, there is only one private dentist and one community dental clinic. There are, however, dentists and clinics--including the University dental clinic-- accepting Medicaid patients within a short distance. While the supply of dentists and clinics in this community may not be ideal, our study results point to the need to create awareness regarding such resources.

In contrast to previous work (5, 13) relatively few variables from the different constructs of Structure, History and Expectation were significantly related to children receiving baseline referrals. In particular routine care preventive visits were reported to be lower in caregivers and children indicating that a regular source of dental care is not available for this population. In a large Medicaid population-based study in Washington State, only 38% of the caregivers of young children had a regular source of dental care, and those with a regular source of dental care had higher education, dental insurance, income, and an increased supply of dentists and safety net clinics (22). Our results follow the same pattern, in that caregivers of the children who were given referrals significantly had lower education, full-time employment, increased caregiver and child Medicaid participation. Additionally, caregivers' regular access to dental care has been related to increased dental utilization in the children (23, 24). It is important for low-income caregivers to have regular access and receive preventive services as this translates to better oral habits, access, and reduced exposure of cariogenic bacteria to their children (25).

The children who did not receive follow-up care for various reasons were documented in this study. Overall, the data point to the caregiver's lack of understanding of the importance of routine care dental visits, chronicity of dental conditions, lack of insurance and understanding of dental benefits covered under Medicaid for children, perceived treatment expense, problems accessing care, and transportation and child care problems. Some of these reasons were also cited by a prior focus group study of caregivers of Medicaid enrolled children (2). Parent/caregiver education has found to be significantly associated with a regular source of dental care, which in turn can increase the likelihood of dental visits in low-income children (23, 24).

Our results have identified several family-level modifiable factors for future studies and they include: increasing caregiver dental knowledge by enhancing the importance of a caries-free

primary dentition, routine care visits, and the infectious and chronic nature of dental caries; awareness of dental benefits and access through Medicaid; and awareness of dentists and dental clinics in the community. For low-income populations initially these factors may be addressed through care-coordination. A recent study of care-coordination with telephone calls and caregiver education improved attendance modestly in an urban Medicaid pediatric dental clinic (26). But, family centered care coordination studies are minimal in dentistry, and thus innovative care-coordination approaches are needed for low-income populations to reduce disparities. Further, appropriate interventions could be developed for caregivers using the common sense model of self-regulation (CSM) to view and manage caries as a chronic disease as has been demonstrated with diabetes and asthma (27).

In spite of the importance and legal requirements for school screening in the U.S., little evaluation has been carried out. Both the results and limitations of this first retrospective study should provide the impetus for prospective work in this area. The study employed best practices cited in the literature but did not test alternatives. A strength of the study was that it focused on a predominantly African American population with high need. Nevertheless, the number of children in the "care received" group was small, which was further reduced due to the lower number of questionnaires that were completed as part of the parent study. Data on background factors was based on self-report. The results should be followed up in other disparity populations and use additional methods to validate parent/caregiver information. Children with incomplete data because they moved out of the district had a higher proportion of referrals. These children may or may not have received dental care which we were unable to track and thus the study estimates may be biased high or low.

Conclusion

The study provides confirmation that in the U.S. dental utilization is low even with school screening, a referral letter, and reminder calls for those children who need care. Additional work is needed addressing other individual, family and community level factors in order to make such efforts more successful.

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To the guardian of _____ :

Thank you for taking part in our dental study. We conducted a visual dental exam on _____ in which we evaluated the presence of caries (cavities), the oral hygiene (cleanliness assessed from plaque buildup), and applied fluoride varnish. We would like to provide you with the following summary of our clinical examination:

Caries (Cavities):

- ☐ None.
- ☐ Present. We recommend further dental treatment.

Oral Hygiene (Cleanliness):

- ☐ Excellent.
- ☐ Good. Oral hygiene is satisfactory.
- ☐ Poor. Oral hygiene is in need of improvement. We recommend improved brushing and hygiene habits.

Referral:

- ☐ Pediatric Dentist
- ☐ General Dentist
- ☐ Urgent Care

If any checked box above indicates that your child needs further dental treatment, please take the results to your child's dentist, and seek treatment. Even if none of the boxes above are checked it is important to take your child to the dentist at least once each year. Always share any results that you receive from our project with your child's dentist.

If your child does not have a dentist and needs further dental treatment, you can contact the Pediatric Dental Clinic at Case School of Dental Medicine at (216) 368-6185 or the Tapper Pediatric Dental Clinic at University Hospitals at (216) 844-3080. Thank you for your participation in this important project.

Figure 1.
Parent referral letter

Table 1

Rates of Referral and Follow-up Care in Study Children

Baseline Referral	% (n) of Referral	Received Follow-up Care* % (n)	Did Not Receive Follow-up Care* % (n)
Urgent Care	10% (30)	33% (10)	67% (20)
Routine Restorative Care	32% (96)	15% (14)	85% (82)
No Care	58% (177)	†	†

* Significant differences between the urgent and routine restorative referral groups in the rates of follow-up care at p-value = 0.022

† Receipt of follow-care could not be assessed objectively from dental exams if children did not have need for care

Table 2

Differences between children with and without baseline referrals in decayed, missing, and filled primary teeth

	Referral (n = 126) Mean (S.D.)	No Referral (n = 177) Mean (S.D.)	<i>p-value</i>
Decayed primary teeth	3.17 (2.59)	.10 (.54)	.000 *
Missing primary teeth	.10 (.47)	.02 (.17)	.051
Filled primary teeth	.61 (1.55)	.66 (1.97)	.813
dmft	3.88 (3.00)	.78 (2.07)	.000 *

* significant at $p < .05$

Table 3

Baseline differences between children with and without follow-up care in decayed, missing, and filled primary teeth

	Received Care n= 24 Mean (SD)	Did not receive care N=102 Mean (SD)	<i>p-value</i>
Decayed primary teeth	3.50 (3.92)	3.09 (2.19)	.624
Missing primary teeth	.08 (.28)	.11 (.51)	.819
Filled primary teeth	1.04 (2.46)	.51 (1.25)	.313
dmft	4.63 (3.82)	3.71 (2.77)	.178

Table 4
Caregiver and Child differences between children with and without baseline referrals/with and without follow-up care

BASELINE	n	No Baseline Referral	Baseline Referral	p-value	n	Received Care	Did Not Receive Care	p-value
STRUCTURE								
Caregiver: Mean age (years)	259	29.3± 16.6	26.4± 17.8	.183	105	21.4± 20.0	27.5± 17.3	.193
% high school edn.	237	90%	79%	.022 *	94	81%	78%	.786
% single marital status	249	82%	81%	.861	100	88%	80%	.470
% employed full-time	248	50%	33%	.009 *	100	33%	35%	.190
HISTORY								
Caregiver: % annual dental visits	245	68%	59%	.710	98	71%	57%	.716
% routine dental visits	247	78%	65%	.030 *	98	71%	64%	.615
% no dental problems as reason for no visits in past 5 years	91	44%	47%	.111	34	0.0%	49%	.036 *
Number of missed days due to tooth problems	207	.11± 0.6	.30± 1.3	.208	91	.00± 0.0	.36± 1.4	.040 *
% with fair to poor condition of teeth	250	35%	41%	.022 *	100	41%	44%	.912
Child: % routine dental visits	237	95%	84%	.005 *	95	94%	82%	0.293
EXPECTATION								
Caregiver: % Medicaid past month	245	65%	77%	.046 *	96	71%	79%	.482
% private dental insurance in past month	236	53%	59%	.373	92	69%	57%	.369
Child: % Medicaid past month	245	83%	85%	.767	97	75%	86%	.248
% private dental insurance in past month	236	63%	62%	.874	95	53%	64%	.390
% with one particular dentist for care	240	65%	57%	.196	93	65%	55%	.477
% with complaint of	244	5%	21%	.000 *	98	24%	21%	.909

BASELINE	n	No Baseline Referral	Baseline Referral	p-value	n	Received Care	Did Not Receive Care	p-value
tooth pain								

* Significant at $P < 0.05$