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BRIEF COMMUNICATION

Age of first dental visits: A benefit of the pediatric medical home

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Abstract

Objective: This retrospective cohort study compared differences in age one dental visit use and age at first dental visit according to fluoride varnish receipt at the pediatric medical home.

Methods: Enrollment and claims data were used from Partners For Kids, a pediatric accountable care organization covering Medicaid-enrolled children living in 47 of 88 counties in Ohio. The main outcomes were having an age one dental visit and the mean age at first dental visit. Descriptive statistics and bivariate comparisons were applied.

Results: Among 17,675 children, 2.8% had an age one dental visit. The mean age at first dental visit was 4.8 years. Children who received fluoride varnish from their medical home (12% of study population) were significantly younger at their first dental visit (4.1 vs. 4.9 years, $p < 0.001$).

Conclusion: Despite longstanding recommendations for the age one dental visit, very few Medicaid-enrolled children in Ohio had one. The pediatric medical home lowered the age of first dental visit.

KEYWORDS
fluoride, health services research, pediatric dentistry, preventive health services

INTRODUCTION

The pediatric medical home represents a model of care that incorporates continuous quality improvement, family-centered care, and care coordination to improve pediatric health [1, 2]. Successful medical homes engage families and develop strong referral networks to obtain the best health outcomes [2, 3]. Researchers and third parties often operationalize the medical home based on survey items such as usual source of care, access to referrals, receiving care coordination, and family-centered care [3]. One interpretation of a pediatric medical home would be having a defined or attributed provider for well-child visits who can coordinate specialty care as needed. Theoretically, this would include early referral to a dentist for the professionally recommended age one dental visit [4].

Especially in instances when access to dentists is difficult, the United States Preventive Services Task Force recommends physicians apply fluoride varnish at well-child visits [4, 5]. State-level program evaluations show that children who received fluoride varnish from their medical home, as well as those who had earlier first dental visits had fewer dental caries-related treatment visits [6–10]. However, fluoride varnish applied in the medical home and the age one dental visit are underutilized services. Less than 10% of children receive fluoride varnish from their medical home [11], and less than 20% of children had an age one dental visit [12]. The mean age for first dental visits is 3 years old [12].

In Ohio, dentists and patients have long acknowledged that having Medicaid insurance is a significant barrier to receiving dental care for young children [13,14]. Ohio ranked second worst in the United States for

pediatric dental Medicaid utilization in 2021 [15]. Health systems can play an important role for improving pediatric preventive oral health service use, and value-based care models, such as accountable care organizations, have the potential to amplify the oral health benefits of the pediatric medical home. Partners For Kids (PFK) is a large pediatric accountable care organization that serves as a fourth party to the patients, Medicaid, and Medicaid Managed Care Plans. Through contractual relationships with Medicaid and the Medicaid Managed Care Plans in Ohio, PFK assumes financial responsibility for the health care administered to more than 470,000 children ages 0–18 enrolled in Medicaid managed care plans in 47 (of 88) counties in Ohio. PFK applies value-based care concepts that support pediatric medical homes through quality improvement projects, care coordination activities, and physician incentives [16]. One way PFK operationalizes the medical home is by using provider attribution and practice-level well-child visit quality measures to support physician incentives. Using well-child visit quality measures for children ages 0–30 months, year over year, approximately 55% of PFK-enrolled children have a medical home, which aligns with national estimates using slightly different operational definitions [3,17]. PFK has demonstrated success delivering high quality health care in ways that lower costs for the system [16].

In 2022, the organization began developing an oral health program. This study was part of the project planning process to identify opportunities for oral health intervention within the medical home. The primary objective was to evaluate the age of first dental visits. Specifically, the analysis compared differences in age one visits, age at first visit, and subsequent dental utilization between children who did and did not receive fluoride varnish from their medical home.

METHODS

The Nationwide Children's Hospital Institutional Review Board approved this study with waivers of informed consent and HIPAA authorization. We followed the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for this retrospective cohort study.

Dental claims data were obtained from PFK. Only children ages 0–5 continuously enrolled between the years 2017–2021 with a dental procedure claim were included ($N = 17{,}675$). This means that all included children had at least one dental visit by age 5 during the study period. Children ages 0–5 with lapses in coverage ($N = 65{,}815$) were excluded since they could not be accurately assessed on the primary outcomes.

Child demographic information collected from claims included age at visit, sex (male vs. female), race (African American, Asian, Native American, White, and Other/Unknown), Medicaid enrollment criteria (disability-based, adoption-based, and income-based), and rurality assigned to the county of residence according to rural–urban continuum codes (collapsed into two categories: metropolitan vs. non-metropolitan) [18]. Dental procedure codes (Current Dental Terminology), billing organization, and encounter dates were also collected from claims to define dental visits.

The primary outcomes were whether the child had an age one dental visit (yes vs. no for a dental visit at or before 12 months of age) as well as the child's age in years at the first dental visit. Secondary outcomes included dental utilization for three visit types identified by dental procedure codes and billing organization: caries-related treatment visits (Current Dental Terminology [CDT] codes D2000-D2999, D7111, D7140, or D7210), dental general anesthesia visits (Current Procedure Terminology [CPT] 41899 plus 00170 on same date of service or CDT D9420), and dental-related emergency department visits (CPT 41899 with a claims flag used internally by PFK to identify emergency department claims) as described in previous work [19,20].

Analysis was stratified by whether children received fluoride varnish at their medical home (CPT code 99188). Children who had CPT 99188 were defined as "yes," and children who did not were defined as "no." All demographic data were complete for all subjects except for race. When race was missing, it was categorized with the group "Unknown." Descriptive statistics were used to summarize demographics, a generalized linear regression adjusted for child demographics was used to compare the mean age at first dental visit, and Chi-square tests of independence were used to compare secondary dental utilization differences. The mean age at fluoride varnish application during medical well-child visits was reported. No specific sensitivity analysis was completed due to few instances of multiple fluoride varnish applications at well-child visits. All analyses were performed in SAS (version 8.1; SAS Institute). Statistical significance was set at alpha = 0.05.

RESULTS

Among 17,675 included children (or 21% of children in the age group covered by the organization), 12% received fluoride varnish from their medical home (Table 1). White children had the lowest frequency of receiving fluoride varnish from their medical home (8%), as did those from non-metropolitan counties (8%). Of the 2082 that received fluoride varnish from their medical home, only 308 (14.8%) had two or more applications at medical well-child visits.

Overall, 2.8% of children had an age one dental visit, and the mean age at first dental visit was 4.8 years (Table 2). Children who received fluoride varnish from their medical home had a significantly younger age at their first dental visit than children who did not (4.1

TABLE 1 Demographic summary and comparison between children receiving and not receiving fluoride varnish at a well-child visit.

	Received fluoride varnish at a well-child visit				
	No		Yes		
	N	Row %	*N*	Row %	Total
Total (*N*)	15,593	88.2	2082	11.8	17,675
Sex[a]					
Female	7500	88.0	1022	12.0	8522
Male	8093	88.4	1060	11.6	9153
Race[a]					
African American	4508	85.4	769	14.6	5277
Asian	469	81.1	109	18.9	578
Native American	112	86.2	18	13.9	130
Unknown	1420	78.2	396	21.8	1816
White	9084	92.0	790	8.0	9874
Medicaid enrollment category					
Disability	444	89.9	50	10.1	494
Adoption/foster care	161	92.0	14	8.0	175
Income-based	14,988	88.1	2018	11.9	17,006
Rurality[b]					
Metro	10,903	86.8	1664	13.2	12,567
Nonmetro	4690	91.8	418	8.2	5108

[a]Sex and race identified in claims as reported by the participant during Medicaid enrollment; missing race categorized as "Unknown."
[b]Rurality assigned by Rural Urban Continuum Classification codes.

TABLE 2 Dental outcomes children receiving and not receiving fluoride varnish from their medical home (*N* = 17,675).

	Received fluoride varnish at medical home					
	No (*n* = 15,593)		Yes (*n* = 2,082)		Overall	*P*-value
Primary outcomes	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	
Age at first dental visit[a]	4.9 (1.9)	4.9, 5.0	4.1 (1.7)	4.0, 4.2	4.8 (1.9)	< 0.0001
	N	% (column)	*N*	% (column)	Total	
Had an age one dental visit[b]	350	2.2%	152	7.3%	502	< 0.0001
Secondary outcomes[b]						
Caries-related treatment visits	9179	58.9%	829	39.8%	10,008	< 0.0001
Dental general anesthesia visits	168	1.1%	13	0.6%	181	0.05
Hospital emergency department visits	508	3.3%	71	3.4%	579	0.71

Abbreviations: CI, Confidence interval; SD, Standard deviation.
[a]*P*-values obtained by general linear regression model adjusting for demographic differences.
[b]*P*-values obtained by chi-square tests of independence.

vs. 4.9 years, $p < 0.001$, Table 2). When fluoride varnish was applied at well-child visits, the mean age of application was 3.1 years. Children who received fluoride varnish from their medical home were significantly less likely to have a caries-related treatment visit (39.8% vs. 58.9%, $p < 0.0001$). Nearly 99% of children who received fluoride varnish at their medical home had their caries-related treatment visit after the fluoride varnish application during a well-child visit. No significant difference existed between the two groups when comparing dental general anesthesia visits ($p = 0.05$) or dental-related emergency department visits ($p = 0.71$).

DISCUSSION

This retrospective cohort study highlights a greater than 3-year discrepancy between professionally recommended and realized first dental visits for Medicaid-enrolled children in Ohio. By receiving fluoride varnish within the medical home, children were able to connect to a dentist

almost an entire year earlier. Theoretically and empirically, this earlier intervention point was associated with fewer caries-related treatment visits. The benefits of the medical home for improving dental utilization outcomes in the present study are speculative but might include the medical home directly influencing dental care seeking behaviors, or the medical home having functional dental referral networks to support early intervention.

Similar studies

The current study aligns with existing literature showing 10% of Medicaid-enrolled children received fluoride varnish from medical professionals [11]. The results also support previous research suggesting the receipt of fluoride varnish within the medical home is associated with fewer dental caries-related treatment visits [6, 7]. The results diverge from previous work in that the mean age at first dental visit was more than 1 year older in the current study (4.8 years) compared to national estimates (3.6 years) [21], and far fewer children met the age one dental visit recommendation (2.8%) compared to national estimates (20%) [12].

Study significance

The key finding from this analysis was that children receiving fluoride varnish from their medical home had their first dental visit occur nearly 1 year earlier than children who did not receive fluoride varnish from their medical home. Pediatric medical homes were important bridges to help children and families achieve earlier first dental visits. Preventive oral health services delivered within the medical home were also associated with fewer dental caries-related treatment visits. However, overall delivery of fluoride varnish within the medical home was low, potentially demonstrating the challenges associated with integrating oral health services and referrals within the medical home.

Study shortcomings and strengths

This study is biased by its strict inclusion criterion of 5 years of continuous enrollment, which may lead to overestimates of the true age one visit prevalence if those without continuous coverage only seek acute care [22]. Additionally, the geographic catchment of PFK is primarily rural and Appalachian, which limits the generalizability of the findings. The motivation for parents to schedule a first dental examination may be prompted by school enrollment requirements imposed by school districts, but the current study design and datasets cannot answer this question. We cannot ignore low dental Medicaid reimbursement rates in Ohio as another limitation. Despite these limitations, the percent of children receiving fluoride varnish at well-child visits was externally valid and similar to national estimates [11]. The study period included the pandemic peak year, 2020, when many dental offices were temporarily closed. Other studies have documented the drop in utilization returning to normal volumes by 2021 [23-25], and one study of commercial claims suggests that children ages 0–5 had higher dental expenditures during the peak pandemic [24]. Annual dental visit data for children ages 0–5 obtained from Centers for Medicare and Medicaid Services 416 reports for Ohio show a drop in use in 2020, but a rebound in 2021 consistent with other studies [26]. For decades now, lack of access to Medicaid-participating dentists has been a primary driver for utilization in Ohio [13,14], and the pandemic was unlikely to be a significant negative driver for first dental visits.

Future directions

The early success of true medical-dental integration efforts like embedding dental hygienists into primary medical care teams warrants future study as an intervention to deliver preventive oral health services earlier in a child's life [27], but scope of practice regulations and reimbursement policy may limit the widespread implementation of integration efforts. PFK recently partnered with a federally qualified health center to pilot a dental hygienist integration project to improve preventive oral health service utilization for children ages 0–30 months. As an accountable care organization, PFK can test value-based payment associated with medical-dental integration efforts. Additional future study could evaluate the effect of school enrollment requirements on the age at first dental visits.

CONCLUSIONS

Dental utilization for children with Medicaid in Ohio is difficult and delayed when compared against professionally recommended periodicity schedules. Receiving fluoride varnish in the context of a medical home was associated with having an earlier first dental visit and fewer dental caries-related treatment visits. Focused efforts to integrate preventive medical and dental care in early childhood hold promise for improving pediatric oral health.

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CONFLICT OF INTEREST STATEMENT

The authors declare no financial or other potential conflicts of interests with respect to the authorship and or publication of this article.

DATA AVAILABILITY STATEMENT

Jin Peng and Beau D. Meyer had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. The data used for this analysis were made available through a Data Use Agreement with Partners For Kids, a pediatric accountable care organization established by Nationwide Children's Hosptial. The statements in this manuscript are solely the responsibility of the authors and do not necessarily represent the view of Partners For Kids or Nationwide Children's Hospital.

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