

Evaluating Pulp Therapy Provided by Medicaid-participating Pediatric and General Dentists in Georgia from 2010-2019

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ABSTRACT

Background: The purpose of this study was to evaluate reimbursable pulp therapy trends in primary teeth performed by general and pediatric dentists.

Methods: Aggregate Medicaid claims data from 2010-2019 were obtained from the state of Georgia's Department of Community Health. Two different primary dentition pulp therapy rates were compared between general and pediatric dentists: procedures per provider and children treated per provider. Descriptive statistics, poisson regression, and correlational analysis were performed.

Results: Pulp therapy utilization for procedures per provider and children treated per provider decreased (Incidence rate ratio (IRR)=0.97, 95% confidence interval (CI): 0.95 to 0.99; IRR=0.97, 95% CI: 0.94 to 1.01, respectively). The rate differences between general and pediatric dentists were negatively correlated with the number of pediatric dentists.

Conclusions: The downward trend in pulp therapy utilization was largely correlated with an increased number of pediatric dentists. This increased access to providers likely contributed to improved oral health utilization.

Practical Implications: For a growing workforce, translating clinical guidelines into changes in quality of care may require changes to the reimbursement policy.

Keywords: Health services research; pulp therapy; Medicaid; access to care

BACKGROUND

The oral health of young children is on a positive trajectory as measured by fewer children having untreated caries and more children having preventive dental visits over the last decade (Dye et al., 2017; Centers For Disease Control and Prevention, 2019; National Center for Health Statistics, 2021). It seems plausible that the number of pediatric dentists contributes to these improvements. Through strong advocacy efforts and increased public funding, the number of residency programs and opportunities in pediatric dentistry has expanded (Legislative and Regulatory Fact Sheet, 2021; National Matching Services, 2021). This growing population of specialty providers enters the workforce with knowledge of the most up to date clinical guidelines, particularly minimally invasive and non-surgical restorative techniques.

General dentists also play an essential role in providing dental care to children. Currently, general dentists provide the majority of dental care to children (Surdu et al., 2019). However, their knowledge and exposure to a wide variety of pediatric experiences in dental school may preclude them from being optimally prepared to treat children (Rutkauskas et al., 2015; Casamassimo et al., 2014). Shifting demand so that pediatric dentists predominantly care for children <12-years old and general dentists care for adolescents is

positively associated with the number of dentists, both general and pediatric, and improves dental care for the underserved (Surdu et al., 2019).

Treatment planning and clinical decision-making differs between pediatric dentists and general dentists. General dentists are more likely to restore teeth with direct restorations while pediatric dentists frequently select full coverage restorations, and this remains largely unchanged over the last 30 years (McKnight-Hanes et al., 1991; Shelton et al., 2019). Most likely, this is due to pediatric dentists having more training and experience treating children with multiple restorative needs, as well as having advanced knowledge of treatment procedures for primary teeth, including the use of minimally invasive techniques (Meyer et al., 2020; Lee et al., 2013).

Studies continue to identify different factors that would promote and prohibit adopting minimally invasive techniques within a clinical practice (Crisp et al., 2021; O'Donnell et al., 2013). One key factor influencing dentists' decisions for using these techniques was financial considerations. As an example, providers were more likely to use minimally invasive techniques for privately insured or self-paying patients, which could reflect inadequate

reimbursement policies for non-traditional dental procedures (Crisp et al., 2021; Caffrey et al., 2021).

It remains unknown how changes in the pediatric dentistry workforce or practice guidelines have translated to clinical care on population levels. The primary objective of this study was to evaluate trends in reimbursable pulp therapy utilization over the last decade. Specifically, differences in treatment rates were compared between general and pediatric dentists within a single state's Medicaid program. Based on recent changes to clinical guidelines and changes in the dental workforce, we hypothesize that pulp therapy rates in primary teeth have decreased.

METHODS

The Institutional Review Board determined this study to be exempt from further review based on the use of existing and de-identified data. A retrospective claims analysis was completed using aggregate administrative billing claims requested from the state of Georgia's Department of Community Health, Office of Health Analytics and Reporting. This office oversees reporting for the state's Medicaid program. Data were requested from January 1, 2010, to December 31, 2019. De-identified annual reports were supplied to the study team.

Dataset Construction

Data used to create the annual summaries was limited to primary teeth identified in claims with a tooth number code "A" through "T" (FDI classification 51 to 85). The unit of observation was provider type—general dentist and pediatric dentist. Observations consisted of endodontic procedure counts on primary teeth identified by Current Dental Terminology (CDT) codes, the number of unique children with a claim for an endodontic procedure, and the provider's billing taxonomy. The CDT codes included:

- D3220 – therapeutic pulpotomy excluding final restoration
- D3221 – pulpal debridement to include primary and permanent teeth
- D3230 – pulpal therapy anterior primary tooth
- D3240 – pulpal therapy posterior primary tooth

The procedure code for indirect pulp therapy (D3120) was not included because it is not a covered service in the state of Georgia dental fee schedule. The National Uniform Claim Committee (NUCC) codes were used to categorize provider taxonomy. Codes for General Dentist were limited to “122300000X – Dentist” and “1223G0001X - Dentist - General Practice”. Codes for Pediatric Dentist were limited to “1223P0221X - Dentist - Pediatrics Dentistry (Pedodontics)”.

Statistical Analysis

The primary outcome of interest was primary dentition pulp therapy utilization rate for each provider type: general and

pediatric dentists. Two different pulp therapy rates were calculated for comparison.

1. A "procedures per provider" rate equaled the number of primary dentition pulp procedures divided by the number of providers who filed pulp therapy claims for that year.

2. A "children treated per provider" rate equaled the number of children receiving primary dentition pulp therapy divided by the number of provider who filed pulp therapy claims for that year.

Descriptive statistics and student t-tests with unequal variance summarized the data. Poisson regression was used to compare each of the outcome rates over time, adjusting for provider type and the enrolled member-to-dentist ratio. Incident rate ratios (IRR) were reported. Model fit was verified with deviance and Pearson goodness-of-fit statistics. A significant IRR was noted if the 95% confidence interval (CI) did not contain the value=1.

In a secondary analysis to explain the rate differences between general and pediatric dentists identified in annual trends, a correlation analysis was used. The rate difference between general and pediatric dentists was calculated by subtraction and then was plotted against the number of active pediatric dentists for each observation year. Pearson correlation analysis was completed to assess how much of the rate differences between general and pediatric dentists could be explained by the number of active pediatric dentists. Analysis was completed using Stata 15.1 (STACORP, LLC., College Station, TX, USA), and the level of significance was set at alpha=0.05.

RESULTS

A data summary can be found in **Table 1**. For dentists who billed for pulp therapy in the primary dentition, the number of general dentists remained relatively constant (range: 769 in 2010 to 702 in 2019, with upward and downward variation in between), whereas the number of pediatric dentists increased by 57% over the study period (range: 292 in 2010 to 459 in 2019, with sustained increases over the period). Pediatric dentists had significantly higher primary dentition pulp therapy utilization rates for both metrics (procedures per provider and children treated per provider) compared to general dentists. However, there were significantly more general dentists who filed endodontic claims for primary teeth than pediatric dentists.

Regression outputs for each outcome can be found in **Table 2**. The procedure per provider rate significantly decreased by 3% per year over the study period (IRR=.97, 95% CI: .95 to .99). Pediatric dentists had a significantly higher procedure per provider rate than general dentists (IRR=1.39, 95%CI: 1.04 to 1.85). Figure 1 demonstrated the procedure per provider rate changes over the study period, helping to visualize the annual trends.

Table 1

Descriptive summary of primary dentition pulp therapy data from 2010 to 2019 in the state of Georgia Medicaid program.

Variable	General Dentist	Pediatric Dentist	p-value*
Active dentists participating in Medicaid	757.2 (39.7)	420.1 (67.8)	<.001
Pulp Procedures	31,220.1 (3868.9)	28,565.2 (2354.1)	.08
Children receiving pulp procedures	15,552.5 (1655.5)	13,203.6 (1131.4)	.002
Pulp Therapy rate (procedures per provider)	41.3 (5.2)	69.4 (10.6)	<.001
Pulp Therapy rate (children per provider)	20.6 (2.3)	31.9 (3.7)	<.001
Member:Dentist ratio**	1753.2 (107.7)	3222.7 (479.7)	<.001

*According to student's t-test with unequal variance

**Ratio of Enrolled children to dentists providing pulp therapy in the primary dentition
Cells contain mean (SD) unless otherwise noted.

Table 2.

Results of Poisson regression examining changes in primary dentition pulp therapy -rates from 2010 to 2019 in the state of Georgia Medicaid program_

Outcome: Procedures per provider	IRR	SE	Z score	P value	95% CI
Year	.97	.01	-2.67	.008	.95 to .99
Pediatric Dentist (Ref: General)	1.39	.20	2.21	.03	1.04 to 1.85
Member:Dentist ratio	1.00	.00	1.44	.15	1.00 to 1.00
Outcome: Children per provider					
Year	.97	.02	-1.51	.1	.94 to 1.01
Pediatric Dentist (Ref: General)	1.32	.28	1.30	.2	.87 to 2.01
Member:Dentist ratio	1.00	.00	.82	.4	1.00 to 1.00

*Abbreviations: IRR=Incidence rate ratio; SE=Standard error; CI=Confidence interval; Ref=Reference

The primary dentition pulp therapy rate of children treated per provider similarly decreased by 3% per year over the study period; however, this change was not statistically significant (IRR=0.97, 95%CI: .94 to 1.01). Again, pediatric dentists had higher children treated per provider rates than general dentists (IRR=1.32, 95%CI: .87 to 2.01). Figure 2 demonstrated the children treated per provider rate changes over the study period.

In secondary analysis, the annual trends for both rates were explored with correlation analysis. The rate differences between pediatric and general dentists showed a strong negative correlation with the number of pediatric dentists

(Procedures per provider, $r = -.89$, $p < .001$; and Children treated per provider, $r = -.82$, $p = .002$). As the number of pediatric dentists increased, both pulp therapy rates decreased. This indicated that the differences observed between general and pediatric dentists across all three rates was directly correlated to the significant increase of pediatric dentists in the state.

DISCUSSION

This retrospective claims study evaluated changes in reimbursable pulp therapy for primary teeth treated by general and pediatric dentists in the state of Georgia in the

last decade. Overall, a decreasing trend was noted for both the number of primary dentition pulp therapy procedures per provider and children treated per provider. The rate differences between general and pediatric dentists were strongly negatively correlated with the increasing number of pediatric dentists in the state of Georgia, which primarily explained the decreasing trends. The growth of pediatric dentists coincides with expanded licensure pathways via acceptable board exams in Georgia (Official Code of Georgia, 2021). A recent workforce study also outlines the overall increased supply of pediatric dentists across the country, mirroring the Medicaid participation numbers reported in the present study (Surdu et al.,2019).

The present findings compare favorably with improvements in access to care and preventive utilization in the state of

Georgia. According to the Centers for Medicare and Medicaid Services 416 reports for the state of Georgia, preventive oral health service utilization among children increased from 39% in 2010 to 49% in 2019. Overall dental utilization (including diagnostic, preventive, restorative, and surgical care) among children also increased from 42% to 52% in the last decade (CMS-416 report) (Centers for Medicare and Medicaid Services, 2021). Preventive service utilization is often used as a quality measure for health programs and third parties (Pediatric Measures User Guide, 2021). In light of the present findings, perhaps comparing inverse changes in preventive versus pulp therapy utilization could provide additional insight into how programs are elevating the quality of the oral health care delivered to its pediatric beneficiaries.

Figure 1

Annual primary dentition pulp therapy rate (procedures per provider) for general and pediatric dentists from 2010 to 2019 in the state of Georgia Medicaid program

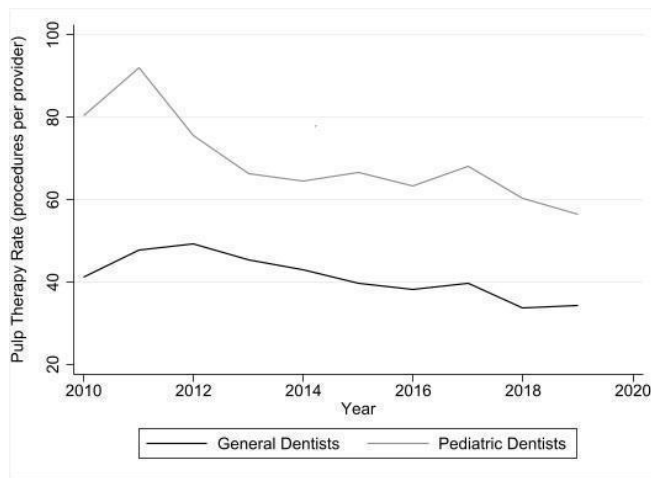
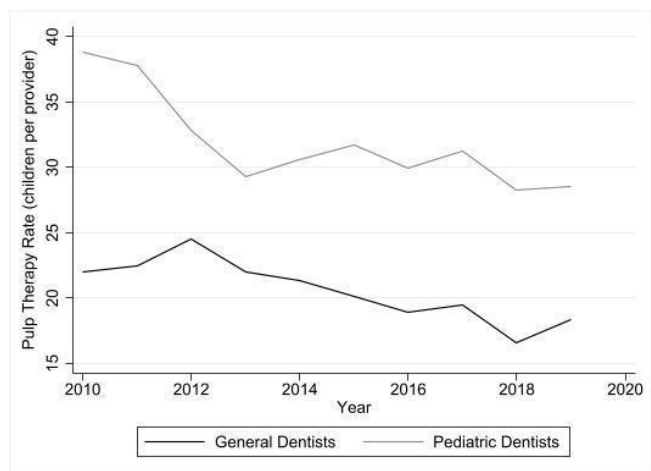


Figure 2

Annual primary dentition pulp therapy rate (children treated with pulp therapy per provider) for general and pediatric dentists from 2010 to 2019 in the state of Georgia Medicaid program



The findings highlight the importance of increased provider participation in Medicaid programs to improve access to care and utilization. As more children experience increased access to dental care and preventive utilization, the need for extensive restorative procedures such as pulp therapy may decrease as confirmed by the present analysis. Increased utilization may lead to earlier detection of caries lesions, and subsequently earlier treatment before pulp therapy would be indicated. For continued improvements in provider participation in Medicaid, states could explore ways to bolster engagement such as higher reimbursement rates and other incentives such as loan repayment programs and tax credits (Arevalo et al., 2020). Increasing reimbursement rates and reducing administrative burden can be effective where provider density and participation is low (Chalmers et al., 2017; Hughes et al., 2005).

In comparison of pediatric dentists, general dentists overall had a lower utilization rate of pulp therapy in the primary dentition. Due to their additional training, pediatric dentists may feel more comfortable in selecting the traditionally accepted pulpotomy as their choice of vital pulp therapy rather than indirect pulp therapy (IPT) (Bowen et al., 2012; Yepes et al., 2020; Dunston et al., 2008). Said a different way, it may be that general dentists refer young patients with deep caries and more complex procedures to the pediatric dentist. A relatively recent study found that general dentists were willing to attempt IPT on primary teeth, perhaps due to inadequate training or lack of confidence performing a technique-sensitive pulpotomy (Bowen et al., 2012). The present findings could support some of these suspicions. The pediatric clinical experience in pre-doctoral dental education is largely inadequate within the dental school building itself (Casamassimo et al., 2014). Community-based rotations and volunteer experiences offer the most opportunity to apply clinical skills to pediatric patients (Spiritoso et al., 2015). In a 2015 survey assessing predoctoral preparation in primary tooth pulp therapy, the majority of program directors found first year residents to be inadequately prepared to perform pulpotomy and indirect pulp caps upon starting a residency program (Rutkauskas et al., 2015). The inadequacy of pediatric experiences in dental school may reasonably lead to inexperience diagnosing and treatment planning primary teeth with deep carious lesions. Educating and training dentists on best practices and clinical guidelines for pediatric dentistry should begin at the predoctoral level and be sustained throughout their clinical practice. Providing tools and resources to recent graduates may lead to improved confidence and self-efficacy in treating children which ultimately improves quality and access to dental care.

Historically, the pulpotomy procedure was the standard of care for primary teeth with reversible pulpitis. Current clinical guidelines, however, indicate the success rate of IPT to be comparable and sometimes preferable to pulpotomies. In 24-month studies, IPT has shown to have a success rate of 94% compared to 83% of pulpotomies, depending on the pulpal medicament. As guidelines and recommendations for pulp therapy in primary teeth shift towards IPT over conventional pulpotomy, the downward trends are likely to

continue (Seale et al., 2008). Translating these guidelines to widespread clinical practice takes a long time especially when reimbursement policy does not support minimally invasive techniques, as shown by the slow pace of change noted in the present study.

The limitations to this study stem from the use of secondary data. Our main focus was on reimbursable pulp therapy rates among Medicaid enrolled providers in Georgia. By using Medicaid claims to analyze pulp therapy trends, the clinical decision making behind each provider's treatment planning cannot be determined. Moreover, clinical caries data was not available in the claims. The use of aggregate data did not allow more detailed analysis to control for provider-level factors such as training, years of experience, and attitudes/beliefs towards emerging techniques. Other unknown variables at the individual child level were not included, such as barriers to care or changes to oral health behaviors that may affect the presence and severity of disease, which ultimately could affect the need for pulp therapy. The use of provider taxonomy also introduced selection bias in analysis since it is possible that some providers could have switched from general dentists to pediatric dentists. Unfortunately, this study is significantly limited in measuring trends in IPT utilization rates and how that has changed or is related to the observed changes in reimbursable pulp therapy procedures. While it would have been ideal to measure the utilization of IPT, the indirect pulp cap procedure code (D3120) is not reimbursable by Medicaid in the state of Georgia. Perhaps reimbursement for IPT would encourage more utilization of this pulp therapy. Designing reimbursement policies to translate contemporary IPT guidelines into practice while also minimizing potential for fraud, waste, and abuse carries significant challenges, specifically determining the threshold that defines IPT. Although this study is comprehensive in studying pulp therapy trends over the last decade, it is limited to using Georgia Medicaid claims data. The results may not be generalizable to other regions or states with different Medicaid administration structures (i.e. managed care versus fee-for-service), as well as to privately insured children. Future pulp therapy trend research should examine a nationally representative sample of pediatric and general dentists, including comparisons between public and private insurance.

CONCLUSION

Changes in pulp therapy utilization were inversely related to changes in preventive service utilization. The noted increase in the number of pediatric dentists corresponded to improved access to care and quality of care as measured by decreased pulp therapy utilization rates in a state Medicaid dental program. The challenges of translating professional guidelines into daily clinical practice may require different approaches to education, training, reimbursement and measurement.

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