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Quantitative Pediatric Vision Screening in Primary Care Settings in Alabama

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Abstract

Purpose—Alabama Medicaid reimburses “objective” vision screening (VS), i.e. by acuity or similar quantitative method, and well child checks (WCCs) separately. We analyzed the frequency each service was obtained.

Methods—Claims for WCC and VS provided between 10/1/2002 and 9/30/2003 for children ages 3–18 years, and summary data for all enrolled children, were obtained from Alabama Medicaid. We used univariate analysis followed by logistic regression to explore the potential influence of factors (patient age, provider type, and provider’s volume of WCCs) on the receipt of VS at preschool ages.

Results—Children receiving WCCs were 55% African-American, 40% white, and 5% other. Percentages of children with WCC claims were highest at 4 years (57%) and thereafter declined to 30% at 6–14 years and to less than 10% at 18 years. Nearly all VS (>98% at each age) occurred the same day as the WCC. Pediatricians provided 68% of all WCCs. Multivariate analysis, after adjusting for nesting of preschool patients within provider, showed the odds of VS were increased by patient age (5 years vs. 3 years OR=3.57, $p<0.0001$), non-physician provider type (non-physician vs. pediatrician OR=1.80, $p=0.0004$) and high WCC volume (at or above vs. below the median number (N=8) of WCC per provider per year (OR=7.11, $p<0.0001$)). Because VS rates were high when attendance to WCC visits was low, few enrolled children received vision screening at any age (6% at age 3, 13% at age 4, and a maximum of 20% at age 5).

Conclusions—National efforts to reduce preventable vision loss from amblyopia are hampered because children are not available for screening and because providers miss many opportunities to screen vision at preschool age. Efforts to improve vision screening should target pediatrician-led practices, since these serve greater numbers of children.

Keywords

preschool; well child care; vision screening

The American Academy of Pediatrics (AAP) recommends well child checks (WCCs) frequently during the first 2 years of life, then annually beginning at 24 months (except at ages 7 and 9 years).¹ Vision screening is recommended by the AAP² in the newborn period and at all subsequent WCCs by history and physical examination (called “subjective” methods in the primary care literature) and by quantitative (“objective”) methods beginning at age 3 years.

Several quantitative methods are recommended for “objective” testing of visual acuity and binocular vision. The primary care practitioner is advised to select the “most sophisticated test the child can perform”.²

In Sweden, early detection of vision problems, using a combination of “subjective” methods beginning in infancy and visual acuity screening beginning at 4 years, the same general strategy recommended by the AAP, has decreased the prevalence of amblyopia (acuity 20/60 or worse) from 2% to 0.2%.³ The vast majority of Swedish children (>99%) attend the visual acuity screening, which is administered by nurses at Child Health Care Centers.⁴

In the United States, Medicaid programs are designed to offer comprehensive health care to low income children and are required to provide WCCs to all enrolled children aged birth - 21 years. Each state determines eligibility standards, (in Alabama, based on family income equal to the federal poverty levels), scope of services, and reimbursement policies^{5,6}. Like most other states,⁷ Alabama Medicaid’s EPSDT (Early and Periodic Screening, Diagnosis, and Treatment) program adopts existing AAP recommendations for preventive care¹ and vision screening², and reimburses for annual visits from ages 24 months and older. Recommended procedures at the WCC include measurement of height, weight, head circumference, blood pressure, hearing and vision screening, developmental and behavioral assessment, physical exam, immunizations, and counseling (“anticipatory guidance”).¹ The average WCC visit lasts about 20 minutes.⁸⁻¹⁰ For children aged 2 years and younger, an average of 8.4 minutes is spent on the physical exam (4.9 minutes by physicians and 3.5 minutes by nurses), 1.9 minutes discussing immunizations (physicians only), 1.6 minutes giving vaccinations (nurses only) and 9.5 minutes giving “anticipatory guidance” (physician only).⁸ Vision screening prior to age 3 would be by “subjective” methods (history, external exam, assessment of fixation and alignment and observation of red reflex), which is billed together with the WCC.² There are no comparable data for children aged 3 to 5 years, and no known data showing how much time is spent on objective vision screening for children aged 3 and above, which in Alabama can be billed as a separate procedure.

Previous research using national surveys and claims data suggests that at least 50% of children do not receive recommended WCC services, either because children do not attend the visit or because the visit does not include all recommended procedures.^{7,10-12} Limited data are available to show how many children receive objective vision screening. Olson et al¹³ reported that only 15% of Medicaid enrolled children aged 1-5 years had their vision screened in 1994-96, but the authors did not define “vision screening” nor explain how data were collected. The National Ambulatory Medical Care Survey, which is based on a nationally representative sample of physicians who report procedures they performed during office visits, estimated that 11% -17% of children with public or private insurance received visual acuity screening.¹⁰ When vision screening practices of providers are examined through surveys or practice-based projects, studies indicate that providers are more likely to screen visual acuity at older ages; however, most studies did not attempt to determine the percentage of available children who were screened.¹⁴⁻¹⁷ Volunteer practices participating in the Pediatric Research in Office Settings (PROS) group reported screening vision in 38% of 3-year old, 71% of 4 year old and 81% of 5 year old children during the study period.¹⁸

Although most insurance carriers do not reimburse separately for vision screening, Alabama Medicaid does offer a separate reimbursement for “objective” vision screening, defined on their website as “visual acuity, photorefractive, or their equivalent.” Tracking the procedure code offers another approach to determine how frequently vision is screened using quantitative techniques in primary care settings in Alabama. A recent national study reported that 8% of pediatricians nationwide screened vision with photorefractive or autorefractive¹⁵; thus, the majority of objective screening is likely to be with a test of acuity.

The purpose of our study was to use administrative claims data to determine how many children enrolled in Medicaid in the state of Alabama receive well child checks and vision screening services in the primary care setting. Secondary purposes were to determine whether age of the child, type of provider or provider's volume of WCCs was related to vision screening.

METHODS

Claims filed for WCCs and vision screenings for enrolled children were obtained from Alabama Medicaid for all children ages 3 through 18 years who were seen between 10/1/2002 and 9/30/2003. All claims were included, regardless of whether they were paid by Medicaid. From these data, we determined the number of children who received WCCs and vision screens at each age. Children were first categorized by age, and then duplicate claims per child were removed (duplications due to filing errors, or to receiving a duplicate WCC from another provider); thus, we counted only one claim per child. Database analysts at Alabama Medicaid provided the number of enrolled children per year of age, by gender and race/ ethnicity, using information from enrollment forms. "Medicaid enrolled" children were those with completed enrollment forms who were determined by the Alabama Medicaid Agency to be eligible to receive services.

We used the claims data and enrollment numbers provided by Medicaid to determine the percent of enrolled children receiving WCCs and vision screening. In addition, we compared the dates of service for the WCC and the vision screening to see how many occurred together.

Providers of WCCs were categorized as pediatrician, family physician, "other MD," "non-MD," or "clinics," the latter including Federally Qualified Health Centers (FQHC), Rural Health Clinics (RCH), and County Health Departments. Providers were categorized according to their primary specialty reported in the Directory of Physicians in the United States 2006 (American Medical Association, 2006). If the provider was not listed, the first alternative source was the Blue Cross / Blue Shield on-line provider directory; next we used other internet sources, and finally we used the self-reported specialty on the Medicaid provider enrollment form. If multiple specialties were listed by Medicaid, we selected one based on the following hierarchy: first, pediatrician was used if listed; if not, then family practice if listed; if neither of these, then internist if listed; if none of these, then general practice if listed; and if none of these four were listed, then the physician was designated "other MD". Claims that were identified only with a clinic were counted under clinics, while claims filed by an individual were counted according to the individual's specialty, even if the individual delivered care within a clinic setting.

We further examined claims filed for preschool children by dividing the providers into two groups according to the median number of WCCs (N=8) filed per provider per year for children aged 3 and 4-years. We conducted a series of sensitivity analyses to determine if our results changed based on the cut point (between 5 and 10 WCCs) but found no appreciable differences.

This project was approved by the UAB Institutional Review Board for Human Use and the Alabama Medicaid Agency.

Statistical Analysis

We calculated descriptive statistics of the demographic characteristics of children ages 3-18 enrolled in Alabama Medicaid. For children ages 3 to 5 we compared age and vision screening services using a Cochran-Armitage test for trend.²⁰ To examine the association of provider type and vision screening services, we used the Chi-square statistic for categorical variables. To further explain the nature of any differences observed, we used logistic regression.

We considered the child to represent a repeated measurement of physician performance and developed a generalized estimating equation multivariable logistic regression model with vision screening as the dependent variable and an exchangeable correlation structure²¹. Important 2-way interactions between age and provider type and provider type and provider volume were examined. The c statistic, a measure of a logistic regression model's ability to discriminate (in this case, between children who receive vision screening and children who don't), was used to assess model validity. This statistic ranges from 0 to 1, with higher values indicating greater discrimination. All analyses were conducted using SAS version 9.0.²²

RESULTS

In the total sample, 347,329 children ages 3-18 years were enrolled in Alabama Medicaid during the study period and 114,288 claims were filed for well child visits. Demographic characteristics of the preschool population (ages 3-5 years) are presented in Table 1. Preschool children in the claims data set who received WCCs were similar to the enrolled population, with 53% being African American and 49% being female.

Attendance at Well-Child Visits

Figure 1 shows that the rate of attending WCCs was highest at age 4 years (57%). Attendance rates declined with age: 49% attend a WCC at ages 3-5 years, 30% attend at ages 6-14 years, 19% attend at ages 15-18 years; however, by age 18 years, fewer than 10% attend. Only 33% of enrolled children, averaged across ages 3-18 years, received a WCC.

Vision Screening

The vast majority of claims for vision screening (> 98% at all ages) had the same day of service as the EPSDT visit. There were only 12 children in the data set with more than one vision screening claim during the observation period. For children between the ages of 3 and 5, a significant trend in the relationship between age and vision screening services was observed ($p < 0.0001$). Specifically, the percentage of children attending the WCC who received vision screening was lowest (12%) at age 3 years, roughly doubled to 23% at 4 years, doubled again to 47% at 5 years, and then stabilized at an approximate rate of 50% at 6 years and beyond (see Figure 1). Considering all children ages 3-18 years who attended the WCC, 42% had a claim filed for vision screening.

Because attendance to well-child visits was low when vision screening rates were highest, few enrolled children had claims for objective vision screening at any age: 6% at 3 years, 13% at 4 years, and a maximum of 20% at 5 years (see Figure 1). Considering all enrolled children, including those who did not attend the WCC, only 14% aged 3 to 18 years had a claim filed for vision screening.

Preschool Well Child Checks and Vision Screening by Provider Type

On average, 381 pediatricians, 201 family physicians, 54 "other" physicians, 96 non-physicians and 76 clinics filed claims for WCCs at each year of age from 3 to 5 years. Most "other" physicians listed internal medicine (31) or general practice (10) as their primary specialty. Most non-physicians were nurse practitioners (102) or physician's assistants (10). Table 2 shows the number of claims for WCCs and vision screenings filed by the various provider types. Pediatricians filed the most claims at each age from 3 to 5 years, accounting for 68% of all WCCs. In contrast, non-physicians filed 13% of claims, family physicians 11%, clinics 6% and other MDs filed only 2% of claims. The percent of children receiving vision screening at the well child visit varied with provider type. In this analysis, we determined screening rates of each individual provider, and found that clinics had the lowest rates at each age, and non-physicians had the highest rates at each age. The strength of this variation by provider type

was assessed using the chi-square test for categorical variables which indicated an association between vision screening services and provider type ($p<0.0001$, Table 3). Univariate analysis showed that non-physicians were more likely to screen than the next highest provider (OR 1.78 compared to pediatricians, $p<0.0001$) and that pediatricians were more likely to screen than all other physician providers and clinics (Table 3); however the latter finding disappeared after adjusting for child age and provider volume.

After multivariable adjustment and accounting for patients within provider not being statistically independent from each other, the previously observed relationship between physician providers and vision screening services was no longer significant (Table 4); however, patients of non-MDs were still more likely to receive vision screening services than patients of pediatricians (OR=1.80 $p=0.0004$). The relationship between age and vision screening services remained; children were more likely to have vision screening at age 5 versus 3 years (OR=3.57, $p<0.0001$). Additionally, patients of higher volume providers (upper half of the distribution according to the median split) were 7 times more likely to receive vision screening services than patients of low volume providers ($p<0.0001$). Analyses were repeated using cutpoints of 5 through 10 well child visits to define high-volume providers; however, there were no appreciable differences. The final model showed very high discrimination with a value of 0.856.

Finally, our analysis of individual provider's screening rates showed high variability within all provider types, which is further explored in other publications.^{23,24}

DISCUSSION

Our study suggests that quantitative vision screening in primary care settings occurs almost exclusively during the well child visit in Alabama, yet vision screening is billed at less than half the visits for school-aged children, and significantly less frequently at preschool age. Our data suggest that failure to attend a well-child visit was the primary reason for missed vision screening among school-aged children. Furthermore, we identified many missed opportunities for vision screening, especially at preschool age. The potential of our current health care system to detect risk factors for amblyopia is therefore limited by provider behavior as well as by failure of parents to seek preventive care. Without a substantial improvement in screening rates, the US cannot match the reduction in preventable vision loss achieved in other countries.

Although children covered by Alabama Medicaid have significantly fewer doctor visits compared to children in some other states,⁶ an analysis of claims for WCCs submitted by each state to the Centers for Medicare and Medicaid Services in 2003 does not show large differences in rates of attending WCCs. Averaged across the United States, attendance rates were 46% for 3-5 years, 26% for 6-9 years, 28% for 10-14 years, 22% for 15-18 years, and 13% at ages 19-20 years⁷. Data obtained from the Medical Expenditure Panel Survey also show good agreement with our WCC rates: a nationally representative sample of parents report that 51.4% of children aged 3 to 5 years, 33.6% aged 6-12 years and 35.2% aged 13-18 years had a visit for "well child, general check-up or immunization or shots" during a one-year observation period, without large differences for children with private (46%) vs. public (44%) coverage.¹¹ Various methods have been developed to determine rates that procedures are conducted or diagnoses are determined.²⁵ None is perfect, but all agree that many children miss preventive care services.^{6,7,10-13,25-28}

Rates of objective vision screening based on routinely collected claims data have not been previously reported. Our data are consistent with studies showing that providers are more likely to screen older preschool children.¹⁴⁻¹⁸ For instance, recent surveys have reported that up to 38% of pediatricians^{14,15,17} and 36% of family physicians¹⁶ report beginning routine visual

acuity testing at age 3 years, with percentages increasing to at most 79% by both provider types at age 5 years¹⁴⁻¹⁷. Yet, we show that fewer children actually have a claim for vision screening at each age compared to the percentages of providers who report providing the service. Also, our estimates are much lower than those reported by volunteer pediatricians participating in the PROS study;¹⁸ perhaps due to differences in the method of data collection, to office practices of participating pediatricians versus the entire pool of providers we included, or to differences in office practices during monitored versus routine settings.

Our analysis showed that children who get WCCs from a non-physician were more likely to have vision screening. However, non-physicians provide far fewer services. Thus, attempts to improve vision screening rates in the population overall cannot succeed without successfully targeting and improving rates in pediatrician led practices. Higher vision screening rates were achieved by some groups (non-physicians and high volume providers) and therefore are possible in primary care settings. Providers who saw fewer than 8 preschool patients per year filed less than 8% of WCC claims at ages 3 and 4 years; thus improving vision screening rates in these practices would not have much effect at the population level.

Concerns for inadequate vision screening of preschool children living in the United States are not new. In 1983, Erhlich estimated that only 21% of preschool children received some type of vision screening;²⁹ our data show no improvement since then. Recent reviews of state-specific approaches reveal persisting, wide variation in the ages targeted, methods, goals and training recommended for screening, with few states actually requiring implementation of the program they endorse.^{30,31} A task force commissioned by the Maternal and Child Health Bureau and the National Eye Institute noted the lack of data demonstrating the validity of currently available screening methodologies, the effectiveness of existing vision screening programs, and the adequacy of outcomes data for children screened.³² A subsequent attempt to evaluate preschool vision screening using a standard protocol developed by expert consensus revealed that none of the participating primary care practices had the recommended preschool acuity test prior to entering the study. Community programs successfully screened higher percentages of children, especially at age 3 years, and had significantly higher referral rates. Overall, children were more likely to receive treatment if they were screened in community versus primary care practices.¹⁴

Currently, the accuracy of vision screening in primary care settings has not been established. The Vision in Preschoolers (VIP) Study assessed commonly used preschool vision screening tests and found two successful strategies that could be implemented in primary care office settings: visual acuity using single, surrounded Lea figures at 5 feet or autorefraction, the latter ideally combined with a test of stereopsis to improve detection of strabismus.^{33,34} The VIP study showed that results of visual acuity testing varied by test and by examiner: the simplified version of the Lea test at 5 feet, had the highest sensitivity for amblyopia (0.87) and strabismus (0.79) of any single test.³³ In pediatric settings, preschool vision screening would normally be assigned to a staff member after informal “on the job” training. Each full time pediatrician (1.0 FTE, or full time equivalent) employs a median of 0.72 registered nurses, 0.39 licensed practical nurses and 0.75 medical assistants; thus, PVS is likely to be done by a person with 1-4 years of undergraduate medical education.³⁵ Unfortunately, funding was not approved to evaluate PVS in primary care office settings, and the American Academy of Pediatrics has not updated its 2003 guidelines to incorporate these newer approaches.

Community based preschool vision screening programs exist, but no known program reaches significant proportions of the preschool population overall. Preschool vision screening is available to children attending Head Start and may occasionally be available in other community settings. Head Start is a national (US) program that promotes school readiness by enhancing the social and cognitive development of children through the provision of

educational, health, nutritional, social and other services to enrolled children and families.³⁶ While there are no data showing the coverage of these programs, their existence may influence screening behavior of primary care physicians, if the physicians trust other sources to provide adequate vision screening.

Nearly all Medicaid eligible children report having a “usual source of medical care” and 75% see a doctor each year.⁶ In the United States, the “usual source of care” would be one of the provider types we mentioned. Care is delivered most frequently at private practices or health centers. Unlike most other countries, there is no other network that captures significant numbers of children at preschool age, except for the child’s primary medical provider.³⁷ However, these providers have a number of competing priorities at each well child visit,¹ as well as significant time limitations to perform all recommended procedures.^{8,38} Changing health care systems and provider behavior is difficult,³⁹⁻⁴² and currently, there have been only limited attempts to understand the barriers or facilitators of preschool vision screening or to improve compliance with recommendations to screen children at every WCC.⁴³⁻⁴⁶

Considering that amblyopia is the most common cause of vision impairment in children,⁴⁷ there is an urgent need to convince primary care providers that universal, periodic vision screening is an achievable priority. Our data, which are in accord with national trends, show that attendance to WCCs peaks at age 4 years (57% of eligible children), thus preschool methods are appropriate when the majority of children are available for objective vision screening. Detection at 4 years has advantages including less time required for patching therapy,⁴⁸ and better acuity outcome for children with severe amblyopia.⁴⁹ After school entry, fewer children attend WCCs, reducing the likelihood that their amblyopia will be detected at all in the primary care setting. School based vision screening should not be discouraged, however, since many older children can benefit from spectacle correction and amblyopia treatment, although treatment may be more prolonged and the percent of children responding drops each year after age 7 years.⁵⁰

Limitations of This Study

Because our analysis was based on claims data, there are several important limitations. Claims data may underestimate the true rate of vision screening.⁵¹ Providers who filed at least one claim for vision screening may be inconsistent in filing the code. It is possible that providers do not file claims for failed attempts to screen vision, and this would be expected to happen more often at younger ages. Our estimates of receipt of WCCs are based on specific codes for that procedure, which may or may not capture all well child visits. However, our counts agree with reports to the Centers for Medicare and Medicaid Statistics already referenced, as well as with data from the National Ambulatory Medical Care Survey which has been externally validated by the Pediatric Research in Office Settings group.⁵² Moreover, our choice of codes allowed us to determine a valid denominator for a rate of vision screening since >98% of PVS claims at each age were filed along with the codes we chose. Our study is also limited to Medicaid enrollees in one state, possibly raising concerns for generalizability. However, 37% of American children were enrolled in Medicaid at some point during the 2004 fiscal year,⁵³ and 30% of children seen in primary care practices participating in the National Ambulatory Medical Care Survey from 1999-2002 were covered by Medicaid,¹⁰ so this study may be applicable to a large proportion of children.

Unlike many other states, Alabama’s Medicaid program reimburses separately for quantitative vision screening, thus allowing calculations of vision screening rates based on administrative data. Few other insurance plans offer this reimbursement, and providers who never filed a claim might not know that Alabama Medicaid uses the separate code, or they may not consider the reimbursement (\$5 in Alabama) worth the effort. Finally, our data provide only a snapshot of services occurring during one fiscal year; had we extended the time frame, we may have found

that higher rates of children eventually receive vision screening but less frequently than recommended.

Our study only captures vision screening in the primary care setting. Other community-based programs such as Head Start may reach more children; however, their impact on screening rates is difficult to determine since there is no coordination between vision screening in primary care and community settings. Some children may be screened in one or both settings, while other children are not screened at all. There is a state-wide program in Alabama to screen children attending public school kindergarten classes, and this program might influence provider behavior. Information from other states with and without comprehensive screening programs might demonstrate markedly different vision screening rates.

Finally, our data cannot assess the technique used in screening or the quality of the screening; nor can we determine whether an individual child was referred, examined or treated. While we have examined vision screening by physician provider type, we realize that most screening would be provided by non-MD staff in physician led practices.

CONCLUSIONS

Our data demonstrate low rates of quantitative vision screening in the primary care setting for children, especially at preschool age, in the State of Alabama. Our review of the literature suggests that inadequate preschool vision screening is a national problem. While most children attend WCCs at younger ages and obtain care from physician led practices, the odds of receiving quantitative vision screening are higher for older children and for those who obtain care from non-physician providers. Many changes must therefore be made to existing practices to improve vision screening for all children in primary care settings. Efforts to translate existing knowledge about amblyopia and appropriate preschool vision screening methods, along with continued efforts to develop better methods that can be completed quickly in the primary care setting, are urgently needed to equip physicians and other primary care providers to detect children with risk factors for amblyopia.

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Well Child Checks (WCCs) and Vision Screening (VS)

Figure 1.

Triangles show the percentage of enrolled children with a claim for a well child checkup (WCC) during the period studied (fiscal year 2003). Circles show the percentage of children with a claim for vision screening (VS), among children with a WCC. Squares show the percentage of enrolled children with a claim for VS.

Table 1

Demographic characteristics of children ages 3-5 years enrolled in Alabama Medicaid.

	Children Enrolled		Claims Filed for WCC	
Race/Ethnicity				
African-American	43,417	50.3%	22,505	53.1%
White	36,891	42.8%	17,069	40.3%
Hispanic	3,512	4.1%	1,676	4.0%
Other and Unknown	2,427	2.8%	1,157	2.7%
Gender*				
Male	43,811	51%	21,719	51%
Female	42,394	49%	20,653	49%
Total	86,247		42,407	

WCC = well child check

* Gender was unknown for 42 enrolled and 35 children receiving WCC

Table 2

Services by Provider Type for children ages 3–5 years

	Pediatricians	Non Physicians	Family Physicians	Clinics	Other MDs
3 years					
Children with WCCs	10152	1896	1605	884	328
Children with vision	1226	381	141	25	17
VS Rate	12%	20%	9%	3%	5%
4 years					
Children with WCCs	11238	2033	1865	1014	354
Children with vision	2799	690	312	62	38
VS Rate	25%	34%	17%	6%	11%
5 years					
Children with WCCs	7982	1578	1250	653	252
Children with vision	3812	1096	479	156	79
VS Rate	48%	69%	38%	24%	31%

WCC = Well-child check

VS = Vision screening

Table 3

Odds Ratios (OR), 95% confidence intervals (CI), and p-values for preschool vision screening services comparing pediatricians to other provider types

Covariates	OR	95% CI	P-value
Other MDs vs. Pediatricians	0.46	(0.38, 0.56)	<0.0001
Clinic vs. Pediatricians	0.29	(0.25, 0.33)	<0.0001
Non Physicians vs. Pediatricians	1.78	(1.68, 1.89)	<0.0001
Family Physicians vs. Pediatricians	0.68	(0.63, 0.73)	<0.0001
C-statistic	0.581		

Table 4

Multivariable Odds Ratios (OR), 95% confidence intervals (CI), and p-values for preschool vision screening services.

Covariates	OR	95% CI	P-value
Age 5 vs. Age 3	3.57	(3.14, 4.06)	<0.0001
Age 4 vs. Age 3	1.54	(1.54, 1.39)	<0.0001
Other MDs vs. Pediatricians	0.71	(0.45, 1.13)	0.15
Clinic vs. Pediatricians	0.74	(0.44, 1.25)	0.27
Non Physicians vs. Pediatricians	1.80	(1.30, 2.50)	0.0004
Family Physicians vs. Pediatricians	1.02	(0.76, 1.36)	0.90
High Volume vs. Low Volume	7.11	(5.88, 8.59)	<0.0001
C-statistic	0.856		

High volume providers defined as those performing at least 8 WCC per year for children ages 3-5 years

Multivariable models are adjusted for age and provider volume and statistically corrected for children attending the same provider not being statistically independent.