Trends in Pediatricians' Developmental Screening: 2002–2016

Paul H. Lipkin, MD,[a] Michelle M. Macias, MD,[b] Briella Baer Chen, MHS,[a] Daniel Coury, MD,[c] Elizabeth A. Gottschlich, MA,[d] Susan L. Hyman, MD,[e] Blake Sisk, PhD,[d] Audrey Wolfe, MPH,[f] Susan E. Levy, MD, MPH[g]

abstract

BACKGROUND: Current guidelines from the American Academy of Pediatrics recommend screening children for developmental problems by using a standardized screening tool and referring at-risk patients to early intervention (EI) or subspecialists. Adoption of guidelines has been gradual, with research showing many children still not being screened and referred.

METHODS: We analyzed American Academy of Pediatrics Periodic Survey data from 2002 (response rate = 58%; N = 562), 2009 (response rate = 57%; N = 532), and 2016 (response rate = 47%, N = 469). Surveys included items on pediatricians' knowledge, attitudes, and practices regarding screening and referring children for developmental problems. We used descriptive statistics and a multivariable logistic regression model to examine trends in screening and referral practices and attitudes.

RESULTS: Pediatricians' reported use of developmental screening tools increased from 21% in 2002 to 63% in 2016 ($P < .001$). In 2016, on average pediatricians reported referring 59% of their at-risk patients to EI, up from 41% in 2002 ($P < .001$), and pediatricians in 2016 were more likely than in 2002 to report being "very likely" to refer a patient with global developmental delay, milestone loss, language delay, sensory impairment, motor delays, and family concern to EI.

CONCLUSIONS: Pediatricians' reported use of a standardized developmental screening tool has tripled from 2002 to 2016, and more pediatricians are self-reporting making referrals for children with concerns in developmental screening. To sustain this progress, additional efforts are needed to enhance referral systems, improve EI programs, and provide better tracking of child outcomes.

[a]*Neurology and Developmental Medicine, Kennedy Krieger Institute, Baltimore, Maryland;* [b]*Division of Developmental-Behavioral Pediatrics, Medical University of South Carolina, Charleston, South Carolina;* [c]*Nationwide Children's Hospital, Columbus, Ohio;* [d]*Research, American Academy of Pediatrics, Itasca, Illinois;* [e]*Department of Pediatrics, University of Rochester, Rochester, New York;* [f]*Massachusetts General Hospital, Boston, Massachusetts; and* [g]*Division of Developmental Pediatrics, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania*

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Address correspondence to Paul H. Lipkin, MD, Kennedy Krieger Institute, 707 N Broadway, Baltimore, MD 21205. E-mail: lipkin@kennedykrieger.org

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WHAT'S KNOWN ON THIS SUBJECT: Current guidelines recommend screening children for developmental problems by using standardized, validated measures and including referral to early intervention and subspecialists. Adoption of guidelines into practice has been gradual; previous research shows many children are not screened or referred.

WHAT THIS STUDY ADDS: From 2002 to 2016, the percentage of pediatricians reporting standardized tool use for developmental screening increased from 21% to 63%. In 2016, on average pediatricians referred 59% of their at-risk patients to early intervention, up from 41% in 2002.

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Early detection and subsequent actions are central to referral for treatment and care for the estimated 15% of US children with a developmental disability.[1] Children who receive early intervention (EI) (services for children with disabilities from birth up to 5 years, as defined by US federal law) often experience improved long-term outcomes.[2,3] Over the past decade, the American Academy of Pediatrics (AAP) has made important strides in implementing standardized developmental screening in routine well-child visits, with rates of screening increasing over time.[4] However, the most recent AAP screening guidelines have not yet been uniformly embraced.[4,5]

In 2001, an AAP policy statement called for pediatricians to screen all children for developmental disorders during routine well-child visits.[6] However, only 23% of pediatricians in 2002 reported using a standardized developmental screening tool, citing lack of time, staff, and reimbursement as barriers.[6] To improve screening rates, in 2006 the AAP released guidelines calling for developmental surveillance at every visit and use of a standardized screening tool at the 9-, 18-, and 24- or 30-month well-child visits.[6–8] By 2009, the reported rate of standardized screening tool use doubled to nearly 48%.[4] The Ages and Stages Questionnaire (ASQ),[9] Parents' Evaluation of Developmental Status (PEDS),[10] and the Modified Checklist for Autism in Toddlers[11] were widely adopted along with greater use of nonstandardized checklists. Studies employing various methods for evaluating screening practices have documented increases in screening rates. In the National Survey of Children's Health, parents reported that ~20% of children received standardized developmental screening in 2007 and ~30% received it in 2016 but with significant geographic variation (ranges: 10.7%–47.0% and 17.2%–58.8%, respectively).[12,13] In a randomized controlled trial to determine the effectiveness of screening in identifying developmental delays at 4 university-affiliated, urban practices, electronically reported screening rates ranged from 81% to 88% in nearly 1400 children <30 months old, with electronic supports and office staff support being provided to the clinician.[14]

In addition to promoting the use of standardized and validated screening measures, the 2006 AAP guidelines called for referral of children who failed screening to EI and comprehensive evaluation. However, rates of referral have varied.[5,15–17] For example, studies have found inconsistencies in pediatric referral rates and patterns based on sex, parent-reported behaviors, race, and ethnicity.[15,17] In practice-based studies, referral rates for failed screenings ranged from 20% to 60%.[5,14]

In 2016, the AAP administered another Periodic Survey to evaluate changes in early childhood developmental screening and referral practices since 2002 and 2009. This survey focused on developmental surveillance and screening practices, referral and management practices, and barriers. This survey also examined autism spectrum disorder (ASD) screening and referral practice, but these results will be shared in a separate article. Given the changing context of the use of standardized developmental screening tools across the 3 surveys, the objective of our analysis is to examine trends in pediatricians' reported screening and referral practices as well as attitudes toward and barriers to these practices.

METHODS

Data

The Periodic Survey collects data from a national, random sample of nonretired AAP members. The 2016 survey explored pediatricians' knowledge, attitudes, and practices regarding screening and managing children for developmental delays or problems. The survey instrument was developed collaboratively by AAP research staff, the AAP's Council on Children With Disabilities and Section on Developmental and Behavioral Pediatrics, and the Autism Intervention Research Network on Physical Health at Massachusetts General Hospital. Many questions were replicated from a 2002 survey, and the use of formal screening tools (ie, standardized and validated measures) was also asked about in 2009. The AAP Institutional Review Board approved all surveys.

In 2016, an 8-page, self-administered questionnaire was sent to a random sample of 1638 active, US-based members of the AAP. It included pediatric residents and excluded those subspecialty subboarded. Survey participants were sent up to 7 paper mailings between November 2015 and March 2016, and electronic surveys were sent to nonrespondents after the second and fourth paper mailings. The response rate in 2016 was 47%. The 2009 survey was sent to 1620 AAP members with a response rate of 57%. The 2002 survey, which was sent to 1617 members, resulted in a response rate of 58%. The analytic sample was restricted to postresidency pediatricians who provided primary care and reported assessing for developmental risk in patients <36 months of age (2016, N = 469; 2009, N = 532; 2002, N = 562).

Dependent Variables

The primary dependent variable (used in logistic regression analysis) was pediatrician use of a standardized general developmental screening tool. Respondents were asked, "How often do you or your staff use the following methods or tools to identify children birth to 35 months of age at risk for A) developmental delay/problems and B) autism?" Respondents were only asked about autism screening in 2016, and thus, the primary focus of our analysis is on developmental screening (for which we have responses across all 3

surveys); we are in the process of preparing an additional article for publication that will provide an in-depth analysis of our results on ASD screening. Additional findings on autism screening will be reported in another article. A list of standardized instruments is provided (Table 1). Responses were dichotomized to indicate those who usually use at least 1 standardized screening tool (always or almost always use a formal screening tool = 1; sometimes, rarely, or never use a formal screening tool = 0) for all 3 surveys.

Other variables of interest (available only in 2002 and 2016) include who in the practice administered screens and reviewed results as well as perceived barriers to screening for developmental delays. We also examined several variables related to referral, including the estimated percentage of the respondents' patients with possible developmental problems who were referred to state EI or specialists, how likely respondents were to refer patients to EI or specialists on the basis of certain conditions, and perceived barriers to EI referral.

Independent Variables

The primary independent variable was survey year. To assess the independent effect of survey year on reporting standardized screening tool use, we also included a set of pediatrician demographics and practice characteristics that were available across the 3 surveys in the multivariable logistic regression model as controls: practice area (suburban, rural, urban and inner city, or urban and not inner city), practice setting (solo or 2-physician practice; group practice or health maintenance organization [HMO]; medical school, hospital, clinic, or other), hours worked per week (continuous), sex (female or male), and age (continuous). Our choice of independent variables to include in the multivariable model, although constrained by the variables that we had available across all 3 surveys, was informed by previous research on this topic using the Periodic Survey.[4] Although the surveys collected information on patient insurance status, the measure suffered from substantial missing data in 2016 and was not significantly associated with our dependent variable in the multivariable model; thus, it was excluded from the analysis.

Nonresponse Bias

We assessed nonresponse bias by comparing the analytic samples to their respective target samples using key demographic variables available in the AAP member database (age, sex, and US geographical region). For each survey year, one-sample proportion tests compared the analytic and target samples on the basis of sex and region, and a *t* test compared the samples on the basis of age.

Data Analysis

χ^2 tests compared rates of developmental screening tool use, administration of developmental screenings, and barriers to screening across survey years. A multivariable logistic regression model examined changes in standardized screening tool use over time while controlling for the other variables listed above. Additionally, χ^2 tests compared rates of referral, developmental conditions leading to referral, and barriers to EI referral across survey years. Data were analyzed by using IBM SPSS Statistics 25 (IBM SPSS Statistics, IBM Corporation). $P \leq .05$ was considered significant.

RESULTS

Nonresponse Analysis

In a nonresponse analysis comparing survey respondents to nonrespondents, there were no differences in sex or region in 2016, but the mean age of respondents was slightly higher than that of nonrespondents, with the respondents' mean age being 47.8 years compared with 44.7 years

TABLE 1 Use of Developmental Screening Tools by Pediatricians: 2002–2016

	2002		2009		2016		*P*
	%	*n*	%	*n*	%	*n*	
Clinical assessment (ie, history and physical examination) without the use of a formal (standardized) screening instrument or checklist[a]	70.9	508	60.1	464	52.4	443	<.001
Clinical assessment guided by a formal (standardized) screening instrument[a]	34.1	501	42.6	462	62.9	450	<.001
Informal milestone checklist filled out by parents[a]	17.6	483	26.8	444	34.3	423	<.001
Informal milestone checklist review by provider or staff[a]	35.4	489	37.6	449	55.3	432	<.001
Formal screening by using a standardized instrument							
ASQ[a]	8.7	446	21.1	384	47.5	427	<.001
Denver II	13.7	481	17.4	380	13.6	354	.24
PEDS[a]	2.9	441	16.1	373	18.1	371	<.001
Other[a]	46.7	45	71.7	113	9.3	204	<.001
Any formal screening tool[a]	20.6	562	42.7	532	62.5	469	<.001

Question wording: "How often do you or your staff use the following methods or tools to identify children birth to 35 mo of age at risk for developmental delay or problems?" Percentage of pediatricians responding always or almost always is reported.

[a] Result from the χ^2 test indicates statistically significant difference in the distribution of the variable across years ($P < .05$).

for nonrespondents ($P < .001$). No differences were seen in 2002, whereas similar differences were seen in age in 2009 and 2016.

Analytic Sample Characteristics

Across survey years (Table 2), the samples became increasingly female (54% in 2002 and 66% in 2016; $P < .001$), and the average age increased to 49 years ($P < .001$). The practice area distribution of pediatricians remained relatively stable over time, but in 2016, pediatricians were more likely to work in group-practice settings relative to previous survey years ($P = .006$).

Screening in Practices

Overall, the reported use of any standardized screening tool among pediatricians has increased from 21% in 2002 to 63% in 2016 (Table 1; $P < .001$). The standardized screening tool with the largest increase in reported use is the ASQ,[9] rising from 9% in 2002 to 48% in 2016 ($P < .001$). In 2016, 14% of pediatricians reported using the Denver II, and 19% report using the PEDS instrument. Use of ASQ and PEDS tools increased in each survey year, whereas reported use of the Denver II remained stable across surveys. In 2016, 72% of pediatricians reported using 1 or more standardized autism-specific screening tools (Modified Checklist for Autism in Toddlers, Pervasive Developmental Disorders Screening Test II, or Screening Tool for Autism in Toddlers and Young Children) to identify patients at risk for ASD.

Survey results indicate that screenings shifted from being administered primarily by the pediatrician (86%) in 2002 to other staff (60%) in 2016 ($P < .001$). However, review and interpretation of the screenings were conducted by 96% of pediatricians in 2016, indicating that even as other practice staff became more involved in the administration of screenings over time, pediatricians remained heavily involved in the review of screening results.

In 2016, the most commonly perceived barrier to screening children for risk of developmental delay or ASD was time limitations, with 57% of pediatricians agreeing or strongly agreeing (Table 3). There was no difference in reporting of time as a barrier between pediatricians who administered the screen and those who did not. Time limitations, inadequate reimbursement for conducting a standardized screening, lack of office staff to perform screenings, belief that screening is not an appropriate role for pediatricians, and lack of confidence in screening ability declined as reported barriers to screening from 2002 to 2016. The only barrier that increased over time was lack of treatment options for positive screen results, which increased from 9% to 21% ($P < .001$).

At a bivariate level, the results in Table 1 indicated a substantial increase in reported standardized screening tool use across surveys. To assess whether this trend of increased standardized tool use remains statistically significant even when taking into account the changing demographics and practice characteristics of pediatricians over time, we employed a multivariable logistic regression model estimating the use of any standardized tool for developmental screening (Table 4). Even after adjusting for other available characteristics, pediatricians in 2016 were much more likely to report using a standardized screening tool relative to pediatricians in 2002 (adjusted odds ratio = 7.3; 95% confidence interval = 5.4–9.9). Among our control variables, pediatricians practicing in urban, inner-city areas and rural areas were more likely than those in suburban areas to report using a standardized screening tool, whereas women (adjusted odds ratio = 1.47; 95% confidence interval = 1.1–1.8) were more likely than men to report standardized tool use.

Referral Practices

On average, pediatricians in 2002 self-reported referring 41% (SD = 40.9; median = 20%) of their patients who were identified as at risk for developmental problems to EI. That number increased to 59%

TABLE 2 Descriptive Overview of the Analytic Sample by Survey Year

	2002	2009	2016	*P*
Female sex, %	54.3	56.0	66.1	<.001[a]
Age, y, mean (SD)	44.1 (9.6)	47.1 (10.1)	49.0 (10.9)	2002 vs 2016: <.001[b]; 2002 vs 2009: <.001[b]
Hours worked per week, mean (SD)	43.9 (13.4)	42.9 (13.4)	41.9 (12.6)	2002 vs 2016: .01[b]; 2002 vs 2009: .22[b]
Practice area, %				.36[a]
Suburban	43.5	43.6	49.3	
Rural	14.0	15.1	13.9	
Urban, inner city	16.7	18.1	13.9	
Urban, not inner city	25.8	23.2	23.0	
Practice setting, %				.006[a]
Solo or 2-physician practice	18.2	20.0	12.4	
Group practice or HMO	57.9	56.5	66.2	
Medical school, hospital, clinic, or other	23.8	23.3	21.3	
Analytic sample size, *n*	562	532	469	

[a] Results from the χ^2 test comparing distributions across survey years.
[b] Results from the 2-tailed *t* test comparing means across survey years.

TABLE 3 Barriers to Screening Children <36 Months Old for Risk of Developmental Delay or ASD: 2002–2016

	2002		2016		*P*
	%	*n*	%	*n*	
Time limitations in current practice[a]	79.5	522	57.2	465	<.001
Inadequate reimbursement for conducting a formal screening[a]	48.6	519	29.1	463	<.001
Lack of medical office staff to perform screening[a]	46.7	514	21.8	463	<.001
Language barriers (ie, physician or staff cannot speak language of family)	18.3	517	21.8	463	.17
Belief that formal screening is not an appropriate role for the pediatrician[a]	9.3	516	2.2	464	<.001
Lack of treatment options for positive screen results[a]	9.1	515	21.4	464	<.001
Lack of confidence in ability to screen[a]	8.9	516	3.7	464	.001
Lack of knowledge regarding referral options for positive screen results	8.1	514	9.7	462	.38
Lack of confidence in the validity of screening instruments	6.8	512	5.0	461	.22

Question wording: "How strongly would you agree or disagree that the following are barriers to your screening children <36 mo old for risk for developmental delay or problem/autism?" Percentage of pediatricians responding strongly agree or agree is reported.

[a] Result from the χ^2 test indicates statistically significant difference in the distribution of the variable across years ($P < .05$).

(SD = 38.2; median = 75%) in 2016 (2-tailed test, $P < .001$; Wilcoxon rank test, $P < .001$), with pediatricians on average referring 22% (SD = 25.8; median = 10%) of patients who were identified with developmental problems to specialists before referring them to EI (given the skew present in these figures, we have provided means, medians, and results for both parametric and nonparametric tests). Although these figures may be subject to recall bias, they provide evidence of increased referral activity among pediatricians. Referral rates did not differ by screening tool used.

Survey results indicate that pediatricians in 2016 considered a wider variety of developmental conditions when making the decision to provide an EI or specialist referral (Table 5). Pediatricians were more likely in 2016 than in 2002 to report being "very likely" to refer a patient to either EI or a specialist for the following developmental conditions: global developmental delays, loss of developmental milestones, delayed speech, sensory impairment, abnormal muscle tone and/or motor delay, family concern, newborn failing a hearing screen, and risk of neglect or abuse.

In 2016, the most commonly perceived barrier to EI referral was lack of feedback from the EI program about the child's progress and outcomes, which was reported by 38% of respondents (Table 6). From 2002 to 2016, lack of understanding of the EI program's processes (46% to 30%) and lack of information about EI and its services (42% to 29%) declined as reported barriers ($P < .001$). Inconsistent quality of services increased as a perceived barrier from 2002 to 2016 (24% to 30%; $P = .02$).

TABLE 4 Logistic Regression Model: Characteristics Associated With Using Any Formal Tool for Developmental Screening

	Adjusted Odds Ratio	95% Confidence Interval	*P*
Survey year (reference = 2002)			
2009	2.90*	2.19–3.87	<.001
2016	7.26*	5.37–9.91	<.001
Female sex (reference = male)	1.47*	1.15–1.88	.002
Age, y	1.01	0.99–1.02	.15
Hours worked per week	0.99	0.98–1.01	.16
Practice area (reference = suburban)			
Rural	1.51*	1.07–2.13	.02
Urban, inner city	1.47*	1.04–2.08	.03
Urban, not inner city	1.05	0.79–1.40	.72
Practice setting (reference = solo or 2-physician practice)			
Group practice or HMO	1.05	0.77–1.44	.73
Medical school, hospital, clinic, or other	1.28	0.92–1.79	.14

* $P < .05$ ($N = 1475$).

DISCUSSION

In 2006, in part as a response to the 2002 Periodic Survey showing low rates of standardized developmental screening, the AAP convened an expert panel of affiliated professionals to develop new guidelines for pediatricians to improve the early identification of children with developmental disorders through surveillance and screening.[6] The result was a new policy statement and clinical algorithm for developmental surveillance and screening, implementation guidance for the primary care clinician, and substantial AAP educational efforts to promote screening. In a follow-up survey, reported screening rates increased from 21% in 2002 to 48% in 2009.[4] In 2016, 63% of pediatricians reported use of standardized developmental screening tools. This represents a tripling in screening over 15 years and a doubling since the 2006 guidelines.

TABLE 5 Developmental Conditions Leading to Referral: 2002–2016

	EI Referral					Specialist Referral				
	2002		2016		*P*	2002		2016		*P*
	Very Likely To Refer, %	*n*	Very Likely To Refer, %	*n*		Very Likely To Refer, %	*n*	Very Likely To Refer, %	*n*	
Global developmental delays	85.0	534	94.6[a]	465	<.001	80.5	514	88.5[a]	463	<.001
Loss of developmental milestones	74.1	514	89.6[a]	462	<.001	85.5	523	92.1[a]	467	.001
Delayed speech or language	74.0	535	83.9[a]	465	<.001	48.7	493	46.4	446	.49
Sensory impairment	72.5	524	83.8[a]	462	<.001	78.3	516	84.0[a]	463	.02
Abnormal muscle tone or motor delay	70.7	523	81.9[a]	458	<.001	76.1	514	77.5	463	.59
Family concern	45.3	516	60.7[a]	468	<.001	32.6	485	26.9	446	.06
Newborn failing a hearing screen	45.1	517	51.3	452	.05	64.2	508	70.5[a]	448	.04
Significant disruptive behavioral problem	42.8	523	37.6	447	.10	61.6	513	62.2	463	.85
Risk of neglect or abuse	42.4	533	50.4[a]	446	.01	28.1	487	40.8[a]	439	<.001

Question wording: "How likely or unlikely would you be to refer children <36 mo old with each of the following conditions to (1) your state's Early Intervention program or (2) to a developmental or medical specialist?" Percentage responding very likely is reported.

[a] Result from the χ^2 test indicates statistically significant difference in the distribution of the variable across years ($P < .05$).

Similar improvements in screening were found by using parent self-report data,[13] in which a much lower screening rate of 30% was reported, but some states' rates approximated those in this pediatrician-report. Medical record–based investigations in large clinical programs reported that >80% of children were screened.[14,16] Although these studies reflect rates at individual health centers, they also provide a more accurate accounting of screening rooted in visit documentation. Although gaps remain, a consistent increase in screening has occurred since the 2006 AAP guidelines trending toward universal screening of children for developmental problems.

The current survey suggests that several factors contribute to increased developmental screening. One is a shift toward tool administration by other office staff (60%), which may reflect a response to the earlier concerns about time constraints.[5,6] Although administration seems to have changed hands, nearly all pediatricians (96%) report maintaining responsibility for result interpretation. With the rise of electronic medical record systems, additional changes in screening administration may be occurring that are not reflected in our findings, such as using other staff or automation or the use of nonstandardized milestone lists for screening. Future surveys will benefit from exploring the contributions and limitations of these new modalities.

Improvements may also be attributable to a perceived decline in barriers. Our findings indicate that pediatricians are now less likely to report barriers to screening. Other research shows a similar decrease in barriers when quality-improvement processes were put in place to expand the practice.[14,16,18–20] Despite the significant decrease from 80% in 2002, 57% of the pediatricians in 2016 indicated that time was a barrier, calling for continued attention to this issue. Additionally, 21% of pediatricians in 2016 indicated lack of treatment options for positive screen results as a barrier, increasing from 9% since 2002. Improved access to evaluation and treatment options for children with concerning screen results is needed. Although this study did not investigate specific successful screening practices, others have reported benefits from use of a computerized decision aid, office- or home-based online screening, and practice education.[18–21]

Screening children for developmental delays is the first step in a process of

TABLE 6 Barriers to EI Referral: 2002–2016

	2002		2016		*P*
	Strongly Agree or Agree, %	*n*	Strongly Agree or Agree, %	*n*	
Lack of understanding of the EI program's processes or procedures[a]	45.9	523	29.6	467	<.001
Lack of information about the EI program and its services[a]	42.3	523	28.9	467	<.001
Lack of feedback from the EI program about the child's progress or outcomes	33.7	519	37.7	464	.19
Uncertainty about EI eligibility criteria	28.8	518	29.1	467	.90
Inconsistent quality of EI services[a]	23.9	519	30.3	465	.02

Question wording: "How strongly would you agree or disagree that the following are barriers to your referring children <36 mo old to your state's Early Intervention (EI) program or other developmental treatment services in your community?" Percentage of pediatricians responding strongly agree or agree is reported.

[a] Result from the χ^2 test indicates statistically significant difference in the distribution of the variable across years ($P < .05$).

early identification and treatment of developmental disorders. As we move toward universal developmental screening, attention must be directed to the subsequent recommended steps of referral, evaluation, and initiation of treatment. Pediatricians now report higher rates of referral to EI for children who are identified as at risk for a developmental problem, with referral being more likely across a wide set of developmental issues. The referral increases may be due to better understanding of EI and a decrease in perceived barriers. Improvements in EI referral were also reported in practice-improvement projects using centralized electronic referral systems, patient navigators, tracking systems, and EI partnerships.[13,19] However, inconsistent quality of EI programs is more commonly reported in this survey as a barrier to referral (24% in 2002 and 30% in 2016). Additionally, the highest-reported barrier to referral in 2016 was the lack of feedback from programs (38%), suggesting a need for improved communication between pediatricians and local EI professionals, as has been implemented in another project.[22]

Referrals to specialists can be used to evaluate for etiology and co-occurring conditions that may impact treatment and family understanding. Rates of such referrals are high and have also increased for children who are at risk for developmental delay, with significantly increased referrals to both EI and specialists for global delays, milestone loss, and sensory impairment being observed. Despite these improvements, only 46% of providers reported referring for delays in speech and language (although these delays are common in children with ASD), hearing loss, and neurogenetic conditions. Referral rates to specialists remain low for abuse and neglect or family concerns, but these are generally beyond the scope of these tools. Although rates of referral for specialty evaluation are high, only 21% of providers are referring for concerns before referral for EI, which is in line with common reports from pediatricians about the difficulties in children's access to specialty services.[23,24]

There are some limitations to this study. Because this survey is based on respondent self-report, there is potential for inaccurate estimations of screening or referrals rates. Additionally, social desirability bias may have caused some pediatricians to overestimate their rates of certain developmental practices. However, the previous surveys had the same methodology, suggesting that these figures represent true change. Furthermore, the sample was drawn from the AAP member database and may not be representative of all pediatricians and other child medical professionals. Response rates for the Periodic Survey declined across survey years, as they have for surveys more broadly.[25] However, response rates for the Periodic Survey compare favorably with other health care provider surveys, and previous research indicates that there is no conclusive link between a survey's response rate and response bias.[26–28] Although it is possible that there are unmeasured attributes (eg, interest in developmental screening) that are influencing survey response, our nonresponse bias analysis finds that there are no substantial differences in age, sex, or regional characteristics between respondents and nonrespondents, and sex and age were included as controls in the multivariable logistic regression model. Lastly, these data measured responses to questions about developmental screening but not ASD screening. Given the overlap between ASD and other developmental disorders, respondents may have included their ASD screening practices in the reporting on general developmental screening, causing overreporting or underreporting of developmental screening.

CONCLUSIONS

The encouraging results of this study show increased use of standardized developmental screening tools since 2002, with nearly two-thirds of pediatricians now performing standardized screening of children for developmental problems. This improvement has occurred with declines in perceived barriers to screening, although time limitations remain a strong concern and with staffing shifts in standardized screening administration in pediatric practices. However, one-third of pediatricians are not completing standardized screening, with barriers remaining, leaving many children unscreened for developmental disorders and potentially resulting in delayed identification and treatment of problems that may affect children and families for a lifetime. With more screening, pediatricians are now also referring a higher percentage of patients with concerns identified by developmental screening to both EI and to developmental and medical specialists, with referral occurring for a wider set of conditions. To further increase the rates of both developmental screening and referral of patients with concerns for treatment, increased attention should be focused on improving screening and referral systems. This may include the incorporation of screening tests and referral and tracking systems into electronic medical record systems, allowing for better tracking of child outcomes and feedback to the medical home. Improved communication systems between practices and community intervention, therapy, and education programs will similarly aid in tracking. Pediatricians must also continue advocating for effective and evidence-based interventions across EI and treatment programs to ensure

that each child will reach his or her potential. A revision of the 2006 guidelines on developmental surveillance and screening[7] will soon be published, incorporating many of the findings and conclusions from this survey.

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ABBREVIATIONS

AAP: American Academy of Pediatrics
ASD: autism spectrum disorder
ASQ: Ages and Stages Questionnaire
EI: early intervention
HMO: health maintenance organization
PEDS: Parents' Evaluation of Developmental Status

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