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Sandra H. Jee, Moira Szilagyi, Claire Ovenshire, Amy Norton, Anne-Marie Conn,
Aaron Blumkin and Peter G. Szilagyi

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Improved Detection of Developmental Delays Among Young Children in Foster Care



WHAT'S KNOWN ON THIS SUBJECT: Children in foster care are at risk for having developmental delays. The AAP recommends developmental surveillance and screening in pediatric practice. Clinicians have the opportunity to identify potential developmental delay and to advocate receipt of services.



WHAT THIS STUDY ADDS: Even in a pediatric medical home that provides specific attention to developmental problems, systematic use of a validated screening instrument doubled the detection rate for developmental problems.

abstract

OBJECTIVE: Our goal was to determine if systematic use of a validated developmental screening instrument is feasible and improves the detection of developmental delay (DD) in a pediatric medical home for children in foster care.

DESIGN AND METHODS: This study had a pre-post study design, following a practice intervention to screen all children in foster care for DD by using the Ages and Stages Questionnaire (ASQ). The baseline detection rate was determined by medical chart review for all children aged 4 to 61 months who were new to foster care (NFC) during a 2-year period. After implementation of systematic screening, caregivers of young children who were NFC or already in foster care (IFC) completed the ASQ at preventive health care visits. We assessed the feasibility of systematic screening (the percentage of ASQs completed among the NFC and IFC groups). We compared the detection of DD among the baseline NFC group and the screening-NFC group by using bivariate and multivariable logistic regression.

RESULTS: Of 261 visits that occurred after initiation of screening, 251 (96%) visits had a completed ASQ form in the medical chart, demonstrating high feasibility. Among children who were NFC, the detection of DD was higher in the screening than baseline period for the entire population (58% vs 29%; $P < .001$), for each age group (infants: 37% vs 14%; toddlers: 89% vs 42%; preschool: 82% vs 44%; all $P \leq .01$), and for all developmental domains. On adjusted analyses, the detection of potential DD in toddler and preschool children was higher among the NFC screening group than the NFC baseline group.

CONCLUSION: Systematic screening for DD using the ASQ was feasible and seemed to double the detection of DDs. *Pediatrics* 2010;125:282–289

AUTHORS: Sandra H. Jee, MD, MPH,^{a,b} Moira Szilagyi, MD, PhD,^{a,b} Claire Ovenshire, RN,^b Amy Norton, MA,^a Anne-Marie Conn, MA,^a Aaron Blumkin, MS,^a and Peter G. Szilagyi, MD, MPH^a

^aDivision of General Pediatrics, Department of Pediatrics, and Strong Children's Research Center, University of Rochester Medical Center, Rochester, New York; and ^bStarlight Pediatrics, Rochester, New York

KEY WORDS

developmental delays, children, foster care

ABBREVIATIONS

AAP—American Academy of Pediatrics
DD—developmental delay
NFC—new to foster care
IFC—already in foster care
ASQ—Ages and Stages Questionnaire
WCC—well-child check

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Address correspondence to Sandra H. Jee, MD, MPH, 601 Elmwood Ave, Box 777, Rochester, NY 14642. E-mail: sandra_je@urmc.rochester.edu

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Although routine developmental surveillance and periodic developmental screening of all young children is recommended by the American Academy of Pediatrics (AAP),^{1,2} most providers are not yet screening children systematically³⁻⁵ and it is unclear how to efficiently implement this recommendation in a busy pediatric practice.⁶⁻⁸ In addition, evidence is lacking about whether standardized screening improves detection of developmental delay (DD), especially in subpopulations of at-risk children⁹⁻¹³ such as children in foster care, which is a population with many risk factors and documented poor outcomes.^{14,15}

Reports of the prevalence of DD among children in foster care vary widely from <5% to >80%, depending on the sample studied and screening or diagnostic methods used.¹⁶⁻²² Traumatic experiences before foster care, including child abuse and neglect, exposure to domestic violence, and impaired parenting, place children in foster care at high risk for developmental problems. Despite the reported high prevalence of DD, few children in foster care are screened and many children with delays remain undetected.²³ Reasons for this low rate of detection include the following: changes in caregivers; lack of developmental histories; and the difficulty of distinguishing immediate emotional trauma from persistent delay.

The AAP promotes the pediatric medical home as a model for the comprehensive care of children with special health care needs, including children in foster care.²⁴⁻²⁸ In Rochester, NY, children in family based foster care receive their primary care at such a medical home, Starlight Pediatrics, which afforded the opportunity to assess the 3 study objectives: (1) evaluate the feasibility of using an age-specific, parent-completed screening instrument to systematically assess the developmen-

tal health of young children at routine well-child visits; (2) study the impact of systematic developmental screening on the detection of DD among children in foster care; and (3) compare the prevalence of DD among children who were new to foster care (NFC) with children who were already in the foster care (IFC) system.

METHODS

Setting

Starlight Pediatrics is a general pediatric practice located in the county health department, which for 20 years has served all children in family based foster care in Monroe County, NY (700 children, 3400 visits per year). The staff includes health providers: 3 part-time pediatricians and 4 pediatric nurse practitioners (total of 2.3 full-time equivalents); 4 full-time pediatric nurses; and a part-time social worker. In this article, "providers" refers to pediatricians and pediatric nurse practitioners in our office.

Developmental Screening Instrument

The Ages and Stages Questionnaires (ASQ), Second Edition, are a set of 19 validated developmental questionnaires designed for completion by caregivers of children aged 4 months to 5 years of age.²⁹ The ASQ is a brief, nondiagnostic screening tool that has been validated in other settings.³⁰⁻³² Each age-specific questionnaire contains 30 questions covering 5 domains: communication; gross motor; fine motor; problem-solving; and personal-social. We selected the ASQ over 2 other brief screening instruments that were shorter,^{33,34} because of the high sensitivity of ASQ and its focus on task-oriented behaviors.

Standardized Screening

In January 2007, Starlight Pediatrics changed its standard of care so that

foster parents were asked to complete an ASQ before each well-child visit for children aged 4 months to 5 years. ASQ forms were mailed the week before the child's appointment, and caregivers were reminded to bring in the form when our office secretary called the day before the scheduled appointment to confirm their appointment. Forms that were not brought into the appointment were offered at the visit, or were requested to be returned by mail if there was limited time. Questionnaires were available in English and Spanish, with the majority of caregivers completing the English version. Age adjustments were made for prematurity per ASQ protocol. We documented the relationship to the child of the person filling out the questionnaire and reasons for incomplete ASQs. Providers scored and reviewed ASQ results during visits. Previously, there were no standardized forms completed at routine visits and providers would note any concerns regarding development on the well-child form. To prepare for implementation of standardized screening, all providers were given verbal instructions, a demonstration about using and scoring the ASQ, and guidelines for referral. To facilitate this standard of care, we had monthly clinical meetings for the first 6 months of implementation to obtain feedback regarding use of the ASQ.

Study Design and Study Population

The study design for objective 1 (feasibility of standardized screening) involved measurement of percent of ASQs completed. The study design for objective 2 (impact of standardized screening) involved a pre-post design, evaluating 2 cohorts of children, both NFC: children aged 4 months to 5 years who entered foster care between January 1, 2005, and December 31, 2006, and were seen in the practice during the 2-year period before standardized screening (baseline co-

hort) versus age-matched children who were NFC seen between January 1, 2007, and August 30, 2008, after implementation of screening (screening cohort). The study design for objective 3 (prevalence of DD among children who were NFC versus children who were IFC) involved a cross-sectional comparison of the 2 groups during the screening period.

In our study population, children were considered NFC if they were in care for <3 months before the health care visit. Children were considered IFC if they had been in foster care for at least 3 months; the exception was for newborn infants who entered foster care but were too young to complete the ASQ until 4 months of age. We decided a priori to make this distinction on the basis of AAP foster care guidelines³⁵ and clinical experience; we follow AAP foster care guidelines on performing a comprehensive physical examination, which is done at least within 3 months of entry into foster care. For this study, all children needed to have at least 1 well-child care visit during the appropriate study period to be included. Children were excluded from the study only if they had a major handicapping condition. Identification of DD was determined on the basis of the first well-child check (WCC) the child had on entry into care, so that the baseline group and NFC screening groups were both assessed at the same point in time on entry into care.

Measurements

During the baseline and screening periods, the practice used age-specific and foster care-specific standard forms for well-child visits scheduled at AAP recommended intervals, with additional visits at 21, 42, and 54 months, per national foster care guidelines.³⁵ Developmental concerns were routinely recorded on WCC forms at the time of the visit.

We conducted a medical chart review and collected demographic and devel-

opmental data retrospectively from the standard WCC forms for both cohorts and from ASQ forms for the screening cohort. The primary outcome variable was the detection of potential DD as documented in the medical chart. For the baseline cohort, this measure was defined as any written documentation of DD on the well-child form, problem list, or developmental section of the medical chart. For the screening cohort, a potential DD was defined as having an ASQ score below the cutoff on domain-specific norms in 1 of the 5 developmental domains³⁶ and/or clinician assessment of delay as documented in the medical chart. Because we were using a screening rather than a diagnostic process, confirmed DD was not an outcome. For this article, we refer to detection of a potential DD as simply DD.

Independent variables included demographic information such as race/ethnicity, gender, age (infant = 4–12 months of age, toddler = 13–36 months of age, and preschooler = 37–61 months of age), and previous referrals for DD. On the basis of the AAP recommendations for developmental screening at the 9-month, 18-month, and 30-month visit, we stratified the sample to correspond roughly to 3 clinically meaningful age groups.²

Reliability

Two coders were selected and trained to conduct the chart reviews. Data were limited to information documented in the medical chart and ASQ. Research personnel familiar with the medical chart extracted the data. To evaluate interrater reliability, 10% of the charts were coded by both coders. All measures reported in this article had a minimum percentage agreement of 80%. All data were independently double-entered and verified for consistency.

Data Analysis

To assess objective 1 (feasibility), we measured frequency of completion of ASQs among the NFC and IFC screening cohort. To assess objective 2 (impact of standardized screening), we compared the detection of children with DD in the baseline NFC versus the screening NFC cohort. We used multivariable logistic regression to examine associations between children who did and did not have a DD, adjusting for age, race/ethnicity, and gender differences between baseline and screening cohorts. We conducted Pearson's χ^2 and Fisher's exact tests for comparing detection and referrals. To assess objective 3 (prevalence of DD in NFC versus IFC groups), we used Fisher's exact tests and the Cochran-Armitage Trend Test³⁷ to test data suggestive of a difference in the detection of DD between IFC and NFC groups. We performed subanalyses by age group and developmental domain. Analyses were performed by using Stata 10.1 software (Stata Corp, College Station, TX). A 2-sided $\alpha < .05$ was considered significant. The University of Rochester Research Subjects Review Board approved the study.

RESULTS

For objective 2 (impact of standardized screening) the sample included 184 children who were NFC in the baseline cohort and 128 children who were NFC in the screening cohort. For objective 3 (prevalence of DD), the sample comprised 128 children who were NFC and 128 children who were IFC in the screening cohorts. Four children were found to be ineligible: 3 in the baseline cohort had a major handicapping condition; and 1 in the NFC screening group left foster care during the course of the study.

Only 1 eligible child in the screening cohort did not have an ASQ administered and 3 children had incomplete

TABLE 1 Demographic Characteristics of Baseline and Screening Groups for Children Who Were NFC and Those Who Were IFC

Characteristics	NFC in Baseline Cohort (N = 181),	NFC in Screening Cohort (N = 125),	IFC in Screening Cohort (N = 126),
	n (%)	n (%)	n (%)
Child group, mean age (SD), mo	92 (50) ^a	73 (58)	12 (10) ^b
Infant, 5.9 (2.5)	48 (27) ^a	35 (28)	57 (45) ^b
Toddler, 24.5 (7.2)	41 (23) ^a	17 (14)	57 (45) ^b
Preschool, 48.9 (8.3)			
Median (range)	12 (4–61) ^a	7 (4–61)	36 (3–61) ^b
Gender, n (%)			
Boys	93 (51) ^a	67 (54)	61 (48) ^c
Race/ethnicity, n (%)			
White, non-Hispanic	29 (16) ^a	33 (27)	20 (16) ^d
Black, non-Hispanic	94 (52) ^a	50 (40)	73 (58) ^d
Hispanic	17 (9) ^a	17 (13)	10 (8) ^d
Biracial	17 (9) ^a	8 (6)	16 (13) ^d
Other/unknown	23 (14) ^a	17 (14)	7 (5) ^d

Objective 2 (impact of standardized screening) compared NFC (baseline) versus NFC (screening). Objective 3 (prevalence of DD) compared NFC (screening) versus IFC (screening). All tests were χ^2 tests, except when age was treated as continuous variable; this was a Wilcoxon rank-sum test.

^a All comparisons between baseline and the NFC group were not significant.

^b $P < .001$, comparing the NFC and IFC groups.

^c Not significant, comparing the NFC and IFC groups.

^d $P = .003$, comparing the NFC and IFC groups.

forms (2 NFC; 1 IFC) and were excluded from analysis. Eligible subjects included in our analysis were 181 children who were NFC in the baseline group, 125 in the NFC screening group and 126 in the IFC screening group.

Foster parents completed 90% of the ASQ questionnaires, biological parents completed 4%, and other/unknown sources completed 6%. Table 1 shows sociodemographic characteristics of the subjects. There were no statistically significant differences between the NFC screening cohort and the NFC baseline cohort. The IFC screening cohort was older than the NFC screening cohort; multivariable analyses adjusted for age.

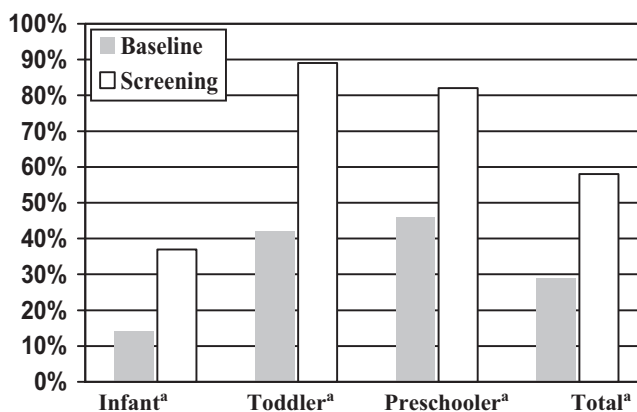
Objective 1: Feasibility of Developmental Screening

Data from the screening cohort were used to examine the feasibility of standardized developmental screening. Of 261 visits that occurred, 251 (96%) had a completed ASQ form in the chart, including 125 (96%) children in the NFC group and 126 (96%) children in the IFC group.

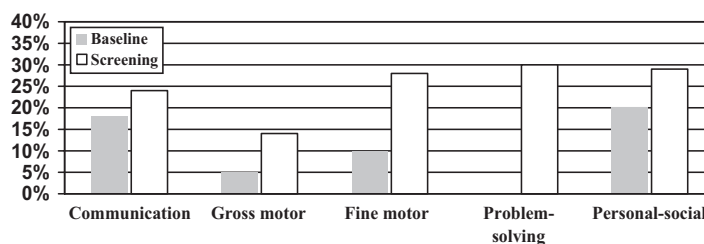
Providers scored the ASQ forms and reviewed results during the routine health visit, which took <5 minutes for most children. For caregivers who had incomplete items on the ASQ because they were unsure of their child's ability, providers offered a toy box to families so that a hands-on demonstration could be used during the visit.

Objective 2: Impact of Developmental Screening

Among the children who were NFC, the rate of detection of DD was significantly higher in the screening than the baseline cohort overall (58% vs 29%; $P < .001$), for each of the 3 age groups (Fig 1), and for both boys (64% vs 35%; $P < .001$) and girls (50% vs 22%; $P < .001$). Increased detection of DD was noted in all 5 domains measured by the ASQ (Fig 2), but was most dramatic in

**FIGURE 1**

Percentage of children who were NFC and identified with possible DDs compared by clinical assessment in the baseline period versus the ASQ in the screening period. ^a $P \leq .001$ for all comparisons of baseline to screening cohorts according to age groups (χ^2 test).

**FIGURE 2**

Percentage of children who were NFC with detected DD according to domain, compared by clinical assessment in the baseline phase versus the ASQ in the screening phase. ^a $P < .01$ for all comparisons of baseline to screening cohorts according to domain (χ^2 test).

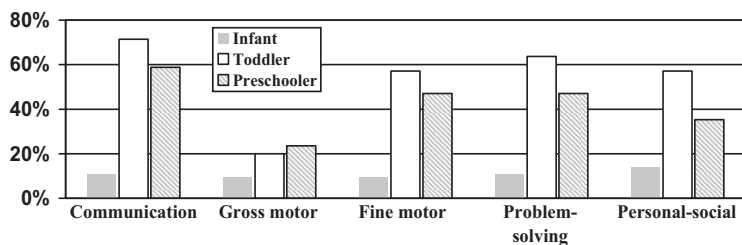


FIGURE 3

Percentage of children who were NFC with detected DD according to domain and age group. ^a $P < .01$ for all comparisons of age groups according to domain except for the gross motor skill domain (χ^2 test).

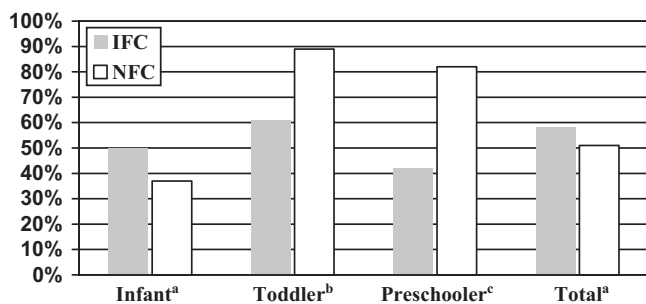


FIGURE 4

Percentage of children with detected DD, grouped according to age, comparing the IFC group versus the NFC group. ^a $P =$ not significant; ^b $P = .004$; ^c $P = .005$. P values are for comparison of children who were IFC with those who were NFC according to age group (Fisher's exact test).

the fine motor and problem-solving domains, which we stratified by age group (Fig 3).

Objective 3: Prevalence of Potential DD Among Children Who Were NFC Compared With Children Who Were IFC

We also compared children in the NFC screening with those in the IFC screening cohort (Fig 4). There was no significant overall difference in detection of DD overall. However, when stratified by age, DD was substantially higher in the

NFC group than the IFC group in toddlers and preschoolers.

Among children identified with a DD, 82% had a delay in at least 1 domain. Children with a DD in either the problem-solving or personal-social domain had delays in at least 1 other domain 86% and 78% of the time, respectively.

We ran separate multivariable logistic regression analyses to assess independent associations of child demographics and cohort status (baseline versus NFC screening). DD

was more likely to be identified among those children in the NFC screening cohort versus baseline screening cohort, and those who were older, and who were boys (Tables 2 and 3).

Finally, we tested independent associations of child demographics and length of time in care by using multivariable logistic regression analyses. We found that children who were NFC in the screening cohort were more likely to be identified with being at risk for a DD than children who were IFC (Table 4). Again, this model showed that children were significantly more likely to be identified with a DD if they were older or boys.

DISCUSSION

We demonstrated the feasibility of using a standardized instrument to screen for DD in a real-world, somewhat specialized, clinical setting: a medical home for children in foster care. The very high (96%) completion rate for ASQs was probably attributable to (1) mailing ASQs before the health appointments and reminding

TABLE 3 Multivariable Logistic Regression Analysis of Characteristics Associated With Predicting Potential DD for Children in the NFC Baseline and Screening Cohorts

Variables	aOR (95% CI)
Cohort	
Baseline	1.00 (reference)
Screening	5.07 (2.82–9.11) ^a
Child age, mo	
4–12	1.00 (reference)
13–36	7.04 (3.65–13.58) ^a
37–66	7.09 (3.41–4.71) ^a
Gender	
Girls	1.00 (reference)
Boys	2.10 (1.22–3.62) ^b
Race	
White	1.00 (reference)
Black	0.66 (0.32–1.36)
Hispanic	0.95 (0.36–2.51)
Biracial	0.47 (0.15–1.46)
Other/unknown	0.55 (0.21–1.46)

aOR indicates adjusted odds ratio; CI, confidence interval.

^a $P < .001$.

^b $P = .01$.

TABLE 2 Number of Developmental Domains Affected in NFC and IFC Children Whose ASQ Score Was Below the Cutoff

No. of Domains Affected	Screening Cohort, NFC (N = 72), %	Screening Cohort, IFC (N = 64), %	P^a
5	17	3	.004
4	17	6	
3	13	14	
2	13	13	
1	21	48	
0	19	16	

^a From the Cochran-Armitage Trend Test.

TABLE 4 Multivariable Logistic Regression Analysis of Characteristics Associated With Predicting Potential DD for Children in the IFC and NFC Screening Cohorts

Variables	aOR (95% CI)
Cohort	
IFC	1.00 (reference)
NFC	3.48 (1.66–7.31) ^a
Child age, mo	
4–12	1.00 (reference)
13–36	8.38 (3.67–19.10) ^b
37–66	5.02 (2.10–12.00) ^b
Gender	
Girls	1.00 (reference)
Boys	2.78 (1.58–4.91) ^b
Race	
White	1.00 (reference)
Black	1.71 (0.80–3.67)
Hispanic	0.77 (0.28–2.20)
Biracial	0.79 (0.28–2.27)
Other/unknown	1.88 (0.59–6.04)

aOR indicates adjusted odds ratio; CI, confidence interval.

^a $P = .01$.

^b $P < .001$.

foster parents to complete them, (2) giving immediate feedback to foster parents by reviewing ASQ forms during the well-child visit, and (3) monthly clinical meetings with clinical staff to obtain feedback regarding use of the ASQ.

The most dramatic finding in our study was the near doubling of the detection rate of DD (from 29% to 58%) with the use of a validated developmental screening instrument. This occurred despite the relatively high baseline detection rate of DD. Our second major finding was the dramatic increase in the detection of delays in the problem-solving, personal-social, and fine motor domains, where detection had previously been poor. Use of the ASQ facilitated detection of delays in all domains, but especially in these domains that are less amenable to routine clinical assessment.

The use of the ASQ allowed us to estimate the overall prevalence of DD in our population. More than a decade ago, the authors of studies noted the high prevalence of developmental problems in the foster care popula-

tion.^{16,21,38} Our findings highlight the high prevalence of DD among the current foster care population. Our prevalence rates were 10-fold higher than that of Steele and Buchi²⁰ who reported prevalence on the basis of a statewide database rather than standardized screening.

The finding that 48% of children with a DD had delays in more than 1 domain, adds to our understanding of the complex needs of children in foster care. The authors of other studies have documented the burden of physical, mental health, and developmental problems among children in foster care^{22,39–43}; ours is the first study, to our knowledge, that examines the prevalence of problems in specific developmental domains and according to age. This topic merits additional study because a clearer understanding of the developmental profiles of children in foster care may help to optimize their treatment.

We considered 3 possible explanations for the interesting finding that toddlers and preschoolers had higher rates of DD in the NFC than IFC groups. First, foster parents may overreport developmental concerns regarding a child new to their home, because they have not witnessed all the skills of which the child is capable. Second, removal from family and placement in a foster home is emotionally traumatizing for almost all children and they may “regress” as they adjust to their new circumstances. Third, it is very likely that children enter foster care with delays related to previous trauma and psychosocial deprivation; placement in a more enriched environment, such as a stable and nurturing foster home may promote the child’s development. This would lead to a lowering of DD as children move from being NFC to IFC. Previous work has suggested that stable foster home placement can lead to gains in physical growth and

developmental skills,⁴⁴ and it is likely that analogous gains in cognitive and psychosocial development also occur. Additional research is needed to determine which of these possible explanations are correct.

Strengths and Limitations

Two strengths of this study are that developmental screening was applied to a county-wide population of children in foster care and completion rates of the ASQ were very high. To our knowledge, this is the first direct test of the impact of a standardized developmental screening on detection of DD for children in foster care.

There are several potential limitations to this study. First, the study was done in a specialized medical home serving children in foster care, which may limit generalizability. However, pediatricians are being encouraged to do universal developmental surveillance for all children, and targeted developmental screening for those at greatest risk. Our findings strongly support the AAP’s recommendation that the special needs population of children in foster care should have a formal developmental screen in their pediatrician’s office, or be referred for such screening.

Our completion rate of ASQs may have been higher than that of other practices. On the other hand, the already high baseline detection rates of DD posed a conservative bias, making it more difficult to detect changes because of systematic screening. Thus, implementation of the ASQ in other practice settings may yield even greater improvements in the detection of DD.

A third limitation of this study is that medical chart review was used to obtain data about developmental surveillance. Data were limited to what was documented in the charts, which may have underestimated the detection of

DDs in the baseline cohort. However, chart review avoided introducing a study effect on our measures of clinical care before and after the screening intervention, and was appropriate to study the feasibility of a practice intervention.

Implications for Practice

This study supports the AAP's recommended use of systematic developmental screening for the foster care population. Developmental screening dramatically increased the detection

rate of DD when compared with baseline developmental surveillance. Because of the high prevalence of developmental health problems and the transience of this population in the health care system, children in foster care are likely to benefit from a more proactive approach to developmental screening than that used in other clinical settings. Future work should investigate whether timely identification of these problems improves service receipt and long-term outcomes for this vulnerable group.

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Needle-Free Vaccines Make Some Good Points: The Wall Street Journal (Whalen J, December 12, 2009) recently reported on the development of needle-free vaccines administered through a patch placed on the skin. Current work involves vaccines to treat traveler's diarrhea (E coli) and influenza. Their benefit includes the fact that no refrigeration is needed, which might make getting vaccination in third world countries (where electricity is not readily accessible to allow refrigeration) much easier, not to mention it can be self-administered in areas where doctors and nurses are not readily available. In developed countries, it may enable those who are needle-phobic to still get their vaccinations. The technology remains experimental with formal testing yet to be done.

Noted by JFL, MD

Improved Detection of Developmental Delays Among Young Children in Foster Care

Sandra H. Jee, Moira Szilagyi, Claire Ovenshire, Amy Norton, Anne-Marie Conn, Aaron Blumkin and Peter G. Szilagyi

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