



Developmental assessment in children

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Approximately 16% of children in the United States have developmental delay, many of whom are not diagnosed until school age. Surveillance of pediatric developmental milestones alone is insufficient for identification of developmental disorders. Based on current evidence, recommendations vary regarding formal screening for developmental delay in children. Physicians who care for children must often overcome obstacles to routinely implement screening for developmental disorders using validated tools. Despite evidence that early intervention for developmental delay improves outcomes, referral patterns for these services remain inconsistent. Family physicians should be familiar with available screening instruments for developmental delay that may be applicable to their practice, as well as local resources for additional evaluation and referral for early intervention.

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Introduction

Approximately 1 in 6 children in the United States (US) has a reported developmental disability.^{1,2} Boys appear to have a higher prevalence overall compared with girls.¹ African American and non-Hispanic white children have a higher prevalence for disabilities compared with Hispanic children.¹ Children insured by public health programs have a nearly 2-fold higher prevalence of any developmental disability compared with those children insured by private payers.^{1,2} Additional risk factors associated with developmental delay include prematurity, low or very low birth weight, neonatal intensive care unit stay longer than 48 hours, lower maternal educational level, and single parent family.³⁻⁶

Preschool-aged children with speech and language delay may be at increased risk for learning disabilities, have difficulty reading in grade school, exhibit poor reading skills at age 7 or 8 years, and have difficulty with written language.⁷ As adults, children with phonological difficulties

may hold lower-skilled jobs than their non-language impaired siblings. Language-delayed children also show more behavior problems and impaired psychosocial adjustment.⁷ Prompt identification of developmental delay with early intervention appears to improve outcomes in affected children.⁸⁻¹¹

Recommendations for screening vs surveillance

The American Academy of Pediatrics (AAP) recommends surveillance of development at all well-child visits, with formal developmental screening using a standardized test at 9, 18, and 30 (or 24) months of age and at any visit where there is concern for development.⁸ The Centers for Disease Control (CDC) recommendations for identification of developmental disorders are based on the AAP guidelines.¹² Additionally, the AAP, CDC, and American Academy of Neurology recommend specifically screening for autism spectrum disorders at 18 and 24 months of age.¹³

Despite these recommendations, up to half of children in the United States with developmental delay remain unidentified until school age.^{9,11,12} The use of informal pediatric milestone checklists alone detects less than one-third of the children with developmental delays.¹⁴ Up to

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67% of children who fail one or more domains on the developmental screening tool, Ages and Stages Questionnaire (ASQ), may not be identified by surveillance alone.¹⁵ In one study, only 9% of children between 9 and 24 months of age were referred for further diagnostic testing based on developmental surveillance alone.¹⁵ However, 16% of the same cohort failed at least one domain on ASQ at the same visit and should have been referred for further testing. Another 30% of the same cohort scored at-risk and should have been given learning suggestions and scheduled for earlier follow-up or both.

Screening tools

Multiple validated screening tools exist, varying with regard to administrator (physician, nonphysician staff, or caregiver), age of child, time needed to complete, cost, and specificity or sensitivity. Primary care providers should select which developmental screening tool they implement based on their patient population, familiarity with the tool, and practice setting.^{9,18-21} Most screening instruments are available in English and Spanish, with additional translations available other languages.^{23,24} Table 1 outlines characteristics of commonly used developmental screening tools.

In one study, pediatric resident physicians preferred the ease of ASQ, which is caregiver-based, over 2 alternate screening tools, one of which also being caregiver based and the other directly administered by the physician.¹⁶ ASQ, however, may be applied only to children younger than 66 months. A provider concerned about developmental delay in an older child may choose to use the caregiver-based Parents Evaluation of Development Status (PEDS) or directly administered Denver Developmental Screening Tool-II.

The 2010 revised American Academy of Neurology and Child Neurology Society guidelines for diagnosis and evaluation of autism spectrum disorders recommend the use of ASQ, PEDS, BRIGANCE screens, and Child Developmental Inventories as developmental screening tools and the use of Modified Checklist for Autism in Toddlers or the Autism Screening Questionnaire as autism screening tools.²⁵

These guidelines do not recommend Denver Developmental Screening Tool-II or revised Denver Pre-Screening Development Questionnaire in the primary care setting owing to their lack of sensitivity and specificity.

Special consideration should be given to premature infants as, even at corrected age, standard screening instruments may not adequately identify development delays in these children.^{4,5}

Implementation

Despite AAP and CDC recommendations, many studies show inconsistent implementation of routine, standardized developmental screening by primary care providers. As a result, only 30% of children eligible for services are

identified by school age.¹¹ The AAP Periodic Survey of Fellows found that, although use of standardized screening tools did increase significantly from 2002-2009, less than half of respondents reported consistent use of a screening tool.²² Similarly, the 2000 National Survey of Early Childhood Health found 57% of parents of children aged 10-35 months recalled their child ever having a development assessment, and the 2007 National Survey of Children reported that only 28% of parents of children aged 10 months to 4 years remembered receiving a developmental questionnaire in the past 12 months.^{18,19}

Eighty-two percent of primary care providers cite time constraints as the most prominent barrier to screening implementation. Additional obstacles include competing clinical demands, cost burden, staffing requirements, lack of consensus on a single developmental assessment tool, and lack of clinical confidence owing to insufficient training.^{9,18}

The North Carolina Assuring Better Child Health and Development Project, a state-wide quality-improvement initiative, improved efficiency of developmental screening by replacing pre-existing processes with the PEDS tool or ASQ.¹¹ Rates of screening in North Carolina improved from 34% in 2000 to 66% in 2002-2003 at the 6-, 12-, 18- or 24-, 36-, 48-, and 60-month visits.¹¹

Further investigation of screening opportunities outside the primary care office may also increase screening rates. One European study found 79% of families returned both surveys when mailed ASQ for their child at age 12 and again at 36 months.⁶ Another study examining Internet-based screening found that some families accepted online revisit assessment.²⁴ Implementation of ASQ in a convenience sample presenting to an urban pediatric emergency room found that 27% of children between 6 and 36 months of age without a prior diagnosis of developmental delay failed at least one domain.²⁶ Neither lack of regular primary care nor parental concerns were associated with a positive screen in this study.

Parental concerns regarding development and behavior have been associated with a higher likelihood of children scoring at-risk on ASQ.^{20,28} Including caregivers in the developmental assessment may lead to more efficient screening, and providing them with additional education regarding normal development is important. One review analyzing the accuracy and readability of English language online resources rated the AAP, Babycenter, CDC, Dr. Spock, How kids develop, Kidshealth, and Parents sites as the most suitable for parents.²⁷

Results

The results of the developmental screening tool, even when normal, provide the family physician an opportunity to emphasize promotion of age-specific developmental goals.⁸

If screening results are normal but administered because of parental concerns about development, the family physician should repeat developmental screening or surveillance at an early return visit.⁸

Table 1 Comparison of some common developmental screening tools^{8,9,15,18,19,21,25,28-30}

	Description	Age range	Number of items	Administration time (min)	Languages available	Accuracy	Cost per administration (\$)
Ages & Stages Questionnaires (ASQ) www.agesandstages.com	Parent-completed questionnaire, screening motor, problem-solving, and adaptive skills	1-66 mo	30	10-15	English, Spanish, French, and Korean	Sensitivity 85% Specificity 86%	13-17
Bayley Infant Neurodevelopment Screen (BINS)* www.pearsonassessment.com	Directly administered by staff, screening receptive, and expressive cognitive functions	3-24 mo	66-78	10-20	English, and Spanish	Sensitivity and specificity 75%-86%	23-27
Denver Developmental Screening Test II† www.denverii.com	Directly administered by staff, designed to screen language, motor, and social skills	0-6 y	125	10-20	English, and Spanish	Sensitivity 56%-83% Specificity 43%-80%	56-60
Parents' Evaluation of Developmental Status (PEDS) www.pedstest.com	Parent-interview form designed to screen for developmental and behavioral problems needing further evaluation	0-8 y	10	2-5	English, Spanish, French, Arabic, Chinese, and more	Sensitivity 74%-80% Specificity 70%-80%	12-16
Infant Development Inventory†		0-18 mo	60	5-10	English and Spanish	Sensitivity 75%-85% Specificity 70%-77%	12-17
Child Development Inventory‡ (Minnesota Child Development Inventory)		15 mo-6 y	300	30-50	English and Spanish	Sensitivity 80%-100% Specificity 70%	Not reported in the literature

*Diagnostic developmental evaluations, including BINS, should be administered by an early childhood professional.^{8,25}

†Neither the Denver Developmental Screening Test II nor the Infant Development Inventory are validated tools.^{25,29,30}

‡Child Development Inventory may be too lengthy for practical administration by a primary care provider.²⁹

Table 2 CDCs autism A.L.A.R.M. recommendations^{13,25,31}

Autism is prevalent	One in 6 children is identified with developmental disorders, often with subtle signs that may be easily missed, whereas 1 in 88 children is diagnosed with an autism spectrum disorder
Listen to parents	Early signs of autism are often present before 18 mo Not only do parents usually have concerns that something is wrong but they generally give accurate information regarding these concerns
Act early	Use validated screening tools to identify problems early Learn to recognize red flags and know the differences between typical and atypical development
Refer	Refer to Early Intervention or a local school program, without waiting for a diagnosis, as well as to an autism specialist, or team of specialists, for a definitive diagnosis
Monitor	Schedule a follow-up appointment to discuss concerns thoroughly, educate parents, and advocate for families Look for conditions known to be associated with autism Continue surveillance and screening within a patient-centered medical home

If screening results are abnormal, the family physician should arrange for developmental and medical evaluation, often in a different setting by other professionals. Developmental evaluation is aimed at identifying the specific disorder. Neurodevelopmental pediatricians, child neurologists, or psychiatrists in conjunction with early childhood professionals such as child psychologists, speech-language pathologists, audiologists, and physical and occupational therapists can provide developmental diagnostic evaluation, ideally as an interdisciplinary team.⁸

Initial medical investigation for any child with developmental delay includes hearing assessment and lead testing, easily accomplished by the primary care provider.²⁵ Further evaluation includes vision screening, review of growth charts and neonatal metabolic screening, and updated medical, family, social, and environmental histories as well as comprehensive physical examination. Additional medical testing, including chromosomal analysis or selective metabolic testing, may be indicated based on history and physical.^{12,13,25} An underlying etiology is identified in approximately 25% of cases of delayed development.⁸

Intervention

The United States Preventive Task Force finds evidence to suggest that interventions can improve the results of short-term assessments of speech and language skills.¹⁷ There is also evidence that early intervention improves motor and

language development in toddlers and preschoolers.⁹⁻¹¹ The Individuals with Disabilities in Education Act mandates immediate referral to state early intervention services from birth to 35 months of age and to appropriate public education after the age of 36 months for eligible children with disabilities.²⁵

Despite this, referrals for early intervention remain inconsistent.^{9,11} The CDCs A.L.A.R.M. guidelines (Table 2) offer a simple mnemonic to remind providers to arrange for early intervention and follow-up for children with developmental disorders.³¹

Early intervention programs include developmental therapies, early childhood education, family training, counseling, home visits, and social services.⁸ Table 3 gives examples of some recommended interventions. A specific developmental disorder diagnosis is not required for early intervention services, thus referral should be made promptly, even while diagnostic evaluation is ongoing.

Delayed referrals may result, in part, from continued reliance on surveillance instead of screening. In the North Carolina Assuring Better Child Health and Development, the referral rate for the cohort who completed PEDS or ASQ screening was higher at 12% than the general population at 6%-8%.¹¹ Of those referred, 53% were children 12 months or younger. Providers reported they were more likely to refer if multiple domains had at-risk scores or if gross-motor skills tests had at-risk scores. Providers also seemed more certain of referral for an older child than for an infant or if parents expressed concern regarding development. Real or perceived lack of availability of early intervention services also decreased the likelihood of referral,¹¹ so family physicians should familiarize themselves with local resources.

If a specific developmental disorder is identified, the child should be designated as having special needs. The family physician should delineate long-term management in

Table 3 Examples of some recommended interventions for developmental delay^{8,13,25}

<i>Speech, language, and communication</i>
Hearing screening
Intervention such as talking or games to stimulate language development
Articulation therapy such as blowing bubbles or practicing sounds in mirrors to model correct motor skills
Oral-motor therapy to strengthen the muscles of the mouth
<i>Cognitive and adaptive</i>
Behavioral therapy
Academic tutoring or accommodation
Music therapy
Play therapy for socialization, such as taking turns in a game
<i>Sensorimotor and occupational therapy</i>
Handwriting practice
Self-help skills with dressing or hygiene
Sensory integration with swings, therapy balls, or obstacle courses

consultation with the child's family, therapists, subspecialists, and educators. Families often benefit from referral to community-based support services such as respite care, parent-to-parent programs, and advocacy organizations.⁸

Coding and billing for developmental screening

Developmental screening can be billed as an additional service to a well-child or other office visit charge using Current Procedural Terminology 2013 code 96110, *Developmental screening, with interpretation and report, per standardized instrument form*.³² The screening may be administered by a physician or nonphysician to a child's parent or caregiver. Current Procedural Terminology code 96610 reflects the physician time reviewing the scores and interpreting the findings with the child's family or caregiver. Addition of this screening code to an Evaluation and Management visit requires adding the modifier “–25” to the Evaluation and Management code.

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