AMERICAN ACADEMY OF PEDIATRICS

Committee on Children With Disabilities

Developmental Surveillance and Screening of Infants and Young Children

ABSTRACT. Early identification of children with developmental delays is important in the primary care setting. The pediatrician is the best-informed professional with whom many families have contact during the first 5 years of a child's life. Parents look to the pediatrician to be the expert not only on childhood illnesses but also on development. Early intervention services for children from birth to 3 years of age and early childhood education services for children 3 to 5 years of age are widely available for children with developmental delays or disabilities in the United States. Developmental screening instruments have improved over the years, and instruments that are accurate and easy to use in an office setting are now available to the pediatrician. This statement provides recommendations for screening infants and young children and intervening with families to identify developmental delays and disabilities.

ABBREVIATIONS. IDEA, Individuals With Disabilities Education Act; CHAT, Checklist for Autism in Toddlers.

BACKGROUND

Developmental and behavioral problems are commonly seen by pediatricians and other primary care practitioners. According to a recent estimate, 12% to 16% of American children have developmental or behavioral disorders.[1] Identifying and addressing these concerns is of great importance so that appropriate intervention can be instituted. The primary care practitioner's office is the only place where most children younger than 5 years are seen and is ideal for developmental and behavioral screening.

Developmental surveillance is an important technique used by pediatricians. Dworkin defined developmental surveillance as "a flexible, continuous process whereby knowledgeable professionals perform skilled observations of children during the provision of health care. The components of developmental surveillance include eliciting and attending to parental concerns, obtaining a relevant developmental history, making accurate and informative observations of children, and sharing opinions and concerns with other relevant professionals."[2] Pediatricians often use age-appropriate developmental checklists to record milestones during preventive care visits as part of developmental surveillance.

Screening is a "brief assessment procedure designed to identify children who should receive more intensive diagnosis or assessment."[3] Developmental screening is aimed at identifying children who may need more comprehensive evaluation. It communicates the pediatrician's interest in the child's development, not just his or her physical health.[4] Developmental evaluation may lead to a definitive diagnosis, development of an interdisciplinary comprehensive plan of remediation, realization that there is no significant problem, or a decision that additional observation is warranted.

The Individuals With Disabilities Education Act (IDEA) Amendments of 1997[5] mandate early identification of, and intervention for, developmental disabilities through the development of community-based systems. Because the passage of IDEA, the emphasis of screening has shifted to identifying disabilities at a younger age, with the current focus being on infants and children from birth through 2 years of age. At this age, the pediatrician is involved very closely with children and families and is in a position to have significant impact on their functioning. The IDEA requires physicians to refer children with suspected developmental delays in a timely manner to the appropriate early intervention system.

The pediatrician has specific roles within the system that are described in a recent policy statement by the Committee on Children With Disabilities.[6] Children and families are best served when pediatricians' screening efforts are coordinated with tracking and intervention services available in the community. Developmental surveillance and screening during preventive health care visits also provide the ideal opportunity for the pediatrician to offer anticipatory guidance to the family about supporting their child's development.

STATEMENT OF THE PROBLEM

The emphasis on earlier identification creates the opportunity to provide the benefits of early intervention but also poses greater challenges in screening. Parents expect their pediatricians to give them guidance on developmental issues but will turn to other community systems if the pediatrician does not fill this role. Lack of appropriate physician guidance may result in delays in diagnosis and appropriate intervention. Detecting developmental delays early is challenging. Delays or deviations in development may come to the attention of professionals and parents because a child is known to have risk factors by history, has physical findings or medical conditions

The recommendations in this statement do not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

PEDIATRICS (ISSN 0031 4005).

likely to be associated with delays, or manifests delays at the time of observation. A delay in a skill becomes evident only at the age when a specific developmental milestone is expected. Early recognition of delays requires in-depth knowledge of the precursors to the skill as well as clinical judgment. Waiting until a young child misses a major milestone, such as walking or talking, may result in late rather than early recognition. It is especially important to recognize delays in language skills early, because early intervention may improve the outcome of children with hearing loss and may enable earlier diagnosis of children with mental retardation and pervasive developmental disorders.[7,8] Universal hearing screening is especially important in the improving language skill outcome and is recommended by the American Academy of Pediatrics.[9]

Mild delays and deviations are often hard to detect, because children develop in spurts and, at times, discontinuously. Developmental disabilities also encompass a spectrum of problems of varying kinds and severity. Although there is broad agreement as to what constitutes clear-cut delay or deviation, there is not complete consensus among professionals or between parents and physicians as to the severity at which evaluation and intervention become appropriate. The central dilemma for the pediatrician who screens patients is that identification must precede the provision of services, and the act of identifying a child as one who needs a thorough evaluation for developmental disabilities provokes anxiety in parents. This concern may create a tendency to identify only markedly delayed children, denying other children potential access to needed care.

Child development is a dynamic process and is often hard to measure by its very nature. The various streams of development, including gross motor, fine motor, language, cognitive, and adaptive behavior, are interrelated and complex within themselves. Children develop skills variably and show a new skill inconsistently when first mastering it. A single test at one point in time only gives a snapshot of the dynamic process, making periodic screening necessary to detect emerging disabilities as a child grows.

Developmental screening tests have inherent limitations that have led to controversy regarding their use. Developmental testing of young children, whether for screening or evaluation, has limited ability to predict future functioning but is a valid and reliable way to assess skills in a variety of domains. Developmental screening tools undergo extensive testing for validity, reliability, and accuracy and are standardized using children and families who represent the cultural, linguistic, and economic diversity of the intended population to be as accurate as possible.

Sensitivity and specificity of developmental screening tools are measured by comparing the test results to that of gold-standard developmental evaluation tools. Good developmental screening tests have sensitivities and specificities of 70% to 80% largely because of the nature and complexity of measuring the continuous process of child development.[10] This leads to overdetection and underdetection. Because screening needs to be periodic, a child not detected by a single screening will be detected by a subsequent screening. Children who have been overreferred may benefit from other community programs as well as a close watch on their development. However, when pediatricians use only clinical impressions rather than formal screening, estimates of children's developmental status are much less accurate.[11,12]

The advantages of developmental screening instruments are that they state their norms explicitly, serve as a reminder to the pediatrician to observe development, are an efficient way to record the observations, and help the pediatrician identify more children with delays. The major disadvantage to the pediatrician is that they take time and effort to administer and interpret, which are largely not reimbursed. Therefore, developmental screening instruments are not widely used in pediatric practice.[13–15]

NEW DEVELOPMENTS

The science of developmental testing has improved in the last 10 years, making it easier for the pediatrician to accurately and efficiently screen development. Parental report of skills and concern had been considered too inaccurate to be used as a screening tool alone. However, several studies have shown that parental report of current skills is predictive of developmental delay.[16–18] This has led to the development of parental report instruments that have been well tested in economically and culturally diverse populations and provide accurate information about development. Barriers to the use of parent report instruments are the inability to read or understand the language. Both of these can be easily overcome through oral administration or translation. The explicit use of parental reports has the added advantage of parents being active participants in the evaluation of their children and shows respect for their expertise.

Systematically eliciting parental concern about development is an important new method of identifying infants and young children with developmental problems. Parental concerns about language, fine-motor, cognitive, and emotional-behavioral development are highly predictive of true problems.[19–22] Recently, Glascoe[19] has shown that by asking about developmental concerns systematically, the pediatrician can screen for developmental delays as effectively as by using formal developmental screening tools that require developmental examination of the child.

Pediatricians now have many developmental screening tools from which to choose. The best instruments have good psychometric properties, including adequate sensitivity, specificity, validity, and reliability, and have been standardized on diverse populations. Parent report instruments, such as the Parents' Evaluation of Developmental Status,[23] Ages and Stages Questionnaires,[24] and Child Development Inventories,[25] have excellent psychometric properties and the advantage of requiring much less time from the pediatrician than instruments that require direct examination. Instruments such as the

Denver-II screening test,[26] Bayley Infant Neurodevelopmental Screener,[27] Battelle Developmental Inventory,[28] Early Language Milestone Scale,[29] and Brigance Screens[30–32] involve direct examination of the child's skills. The CAT-CLAMS is a promising test designed specifically for pediatricians to use in the office that assesses the child's cognitive and language skills independently and uses parental report and direct testing of the child's skills.[33] These instruments are listed as examples and should not be considered specific endorsements.

Each screening instrument has strengths and weaknesses. For example, the Denver-II screening test is used widely but has modest sensitivity and specificity depending on the interpretation of questionable results.[34] Each test also needs to be administered with adherence to specific instructions; otherwise, results are not valid. The choice of testing method may depend on risk factors in the population, time allotted for the procedure, availability of other sources of developmental screening in the community, and personal preference of the pediatrician. Recent reviews of commonly used screening instruments[35–37] can help guide the pediatrician's choice of screening instruments.

Screening for behavioral and psychosocial problems in young children poses particular challenges. Children with developmental delays are at higher risk for behavioral problems. Many developmental screening instruments for young children do not address these areas adequately. Asking specific questions is most important. Tools such as the Temperament and Atypical Behavior Scale,[38] Child Behavioral Checklist,[37] The Carey Temperament Scales,[40] Eyberg Child Behavior Inventory,[41] Pediatric Symptom Checklist,[42] and Family Psychosocial Screening,[43] among others, are helpful in detecting behavioral concerns.

Lately, there has been increased interest in screening toddlers for autistic spectrum disorders because of a perceived rise in prevalence and availability of early diagnosis and intervention. The American Academy of Neurology and the Child Neurology Society recently published a practice parameter that recommends use of developmental screening tools with good sensitivity and specificity at every preventive care visit, use of specific probe questions for early signs of autism, and use of specific autism screening tools when concerns arise.[44] Specific autism screening tools, such as the Checklist for Autism in Toddlers (CHAT),[45] may help guide the pediatrician in additional diagnostic referral but may provide false reassurance because of poor sensitivity and excellent specificity.[46] Additional information on screening young children for autism is contained in the American Academy of Pediatrics policy statement and technical report "The Pediatrician's Role in the Diagnosis and Management of Autistic Spectrum Disorder in Children."[47,48] Developmental screening programs will take time and effort to administer in the pediatric office setting. A recent cost-benefit analysis of developmental screening approaches, including costs of administration, interpreting results, diagnostic testing, and treatment, showed that the use of parental reports was by far the least costly to the pediatrician in the short term.[49] However, reimbursement for developmental screening services is often inadequate, especially when it is considered part of the preventive care visit rather than a separate service. A separate *Current Procedural Terminology* code exists for developmental screening (96110); however, reimbursement is inconsistent.[50]

RECOMMENDATIONS

All infants and young children should be screened for developmental delays. Screening procedures should be incorporated into the ongoing health care of the child as part of the provision of a medical home, as defined by the Academy.[51] To screen for developmental delays or disabilities and intervene with the identified children and their families, the primary pediatrician providing the medical home should:

1. Maintain and update her or his knowledge about developmental issues, risk factors, screening techniques, and community resources, such as early intervention, school, Title V, and other community-based programs, for consultation, referral, and intervention.
2. Acquire skills in the administration and interpretation of reliable and valid developmental screening techniques appropriate for the population.
3. Develop a strategy to provide periodic screening in the context of office-based primary care, including the following:
   - Recognizing abnormal appearance and function during health care maintenance examinations;
   - Recognizing medical, genetic, and environmental risk factors while taking routine medical, family, and social histories;
   - Listening carefully to parental concerns and observations about the child's development during all encounters;
   - Recognizing troubled parent-child interaction by reviewing history or by observation;
   - Performing periodic screenings of all infants and young children during preventive care visits; and
   - Recognizing the importance that test procedures and processes be culturally sensitive and appropriate to the population.
4. Present the results of the screening to the family using a culturally sensitive, family-centered approach.
5. With parental agreement, refer children with developmental delays in a timely fashion to the appropriate early intervention and early childhood education programs and other community-based programs serving infants and young children.
6. Determine the cause of delays or refer to appropriate consultant for determination. Screen hearing and vision to rule out sensory impairments.
7. Maintain links with community-based resources, such as early intervention, school, and other community-based programs, and coordinate care with them.

8. Increase parents' awareness of developmental disabilities and resources for intervention by such methods as display and distribution of educational materials in the office.
9. Be available to families to interpret consultants' findings.

Ongoing involvement with the family permits the pediatrician to respond to parental concerns about the child's development when such concerns exist. When parents are not aware that a delay exists, the pediatrician can guide them toward closer observation of the child and, thus, enable them to recognize the delay. Referral for evaluation and services can take place only after the pediatrician has succeeded in this challenging task. At that point, the pediatrician's role shifts to one of involvement in the evaluation as appropriate, referral to available community resources for intervention and family support, assistance in understanding the evaluation results, assessment and coordination of services, and monitoring the child's developmental progress as part of the provision of a medical home.

CONCLUSION

Early identification of children with developmental delays or disabilities can lead to treatment of, or intervention for, a disability and lessen its impact on the functioning of the child and family. Because developmental screening is a process that selects children who will receive more intensive evaluation or treatment, all infants and children should be screened for developmental delays. Developmental surveillance is an important method of detecting delays. Moreover, the use of standardized developmental screening tools at periodic intervals will increase accuracy. Pediatricians should consider using standardized developmental screening tools that are practical and easy to use in the office setting. Successful early identification of developmental disabilities requires the pediatrician to be skilled in the use of screening techniques, actively seek parental concerns about development, and create links with available resources in the community.

REFERENCES

1. Boyle CA, Decoufle P, Yeargin-Allsoop MY. Prevalence and health impact of developmental disabilities. *Pediatrics*. 1994;93:863–865
2. Dworkin PH. Detection of behavioral, developmental, and psychosocial problems in pediatric primary care practice. *Curr Opin Pediatr*. 1993;5:531–536
3. Meisels SJ, Provence S. *Screening and Assessment. Guidelines for Identifying Young Disabled and Developmentally Vulnerable Children and Their Families*. Washington, DC: National Center for Clinical Infant Programs; 1989
4. Kaminer R, Jedrysek E. Early identification of developmental disabilities. *Pediatr Ann*. 1982;11:427–437
5. Individuals With Disabilities Education Act Amendments of 1997 (Pub L No. 105-17)
6. American Academy of Pediatrics, Committee on Children With Disabilities. The pediatrician's role in the development and implementation of an Individual Education Plan (IEP) and/or an Individual Family Service Plan (IFSP). *Pediatrics*. 1999;104:124–127
7. Guralnick MJ. *The Effectiveness of Early Intervention*. Baltimore, MD: Paul H. Brookes Publishing Co; 1997
8. Yoshinaga-Itano C, Sedey AL, Coulter DK, Mehl AL. Language of early- and later-identified children with hearing loss. *Pediatrics*. 1998;102:1161–1171
9. American Academy of Pediatrics, Task Force on Newborn and Infant Hearing. Newborn and infant hearing loss: detection and intervention. *Pediatrics*. 1999;103:527–530
10. Glascoe FP. Developmental screening. In: Wolraich M, ed. *Disorders of Development and Learning: A Practical Guide to 20*. 2nd ed. St Louis, MO: Mosby; 1996:89–128
11. Dworkin PH. Developmental screening: still expecting the impossible? *Pediatrics*. 1992;89:1253–1255
12. Werner EE, Honzik MP, Smith RS. Prediction of intelligence and achievement at ten years from twenty months pediatric and psychologic examinations. *Child Dev*. 1968;39:1063–1075
13. Dobos AE, Dworkin PH, Bernstein B. Pediatricians' approaches to developmental problems: 15 years later [abstract]. *Am J Dis Child*. 1992;146:484
14. Smith RD. The use of developmental screening tests by primary care pediatricians. *J Pediatr*. 1978;93:524–527
15. Scott FG, Lingaraju S, Kilgo J, Kregel J, Lazzari A. A survey of pediatricians on early identification and early intervention services. *J Early Intervent*. 1993;17:129–138
16. Diamond KE. The role of parents' observations and concerns in screening for developmental delays in young children. *Topics in Early Childhood Special Education*. 1993;13:68–81
17. Bricker D, Squires J. The effectiveness of parental screening of at risk infants: the infant monitoring questionnaires. *Topics in Early Childhood Special Education*. 1989;9:67–85
18. Doig KB, Macias MM, Saylor CF, Craver JR, Ingram PE. The child development inventory: a developmental outcome measure for follow-up of the high-risk infant. *J Pediatr*. 1999;135:358–362
19. Glascoe FP, Dworkin PH. The role of parents in the detection of developmental and behavioral problems. *Pediatrics*. 1995;95:829–836
20. Glascoe FP. Parents' concerns about children's development: prescreening technique or screening test? *Pediatrics*. 1997;99:522–528
21. Dulcan MK, Costello EJ, Costello AJ, Edelbrock C, Brent D, Janiszewski S. The pediatrician as gatekeeper to mental health care for children: do

parents' concerns open the gate? *J Am Acad Child Adolesc Psychiatry*. 1990;29:453–458
22. Glascoe FP, Altemeier WA, MacLean WE. The importance of parent's concerns about their child's development. *Am J Dis Child*. 1989;143: 955–958
23. Glascoe FP. *Collaborating with Parents: Using Parents' Evaluation of Developmental Status to Detect and Address Developmental and Behavioral Problems*. Nashville, TN: Ellsworth & Vandermeer Press; 1998
24. Bricker D, Squires J. *Ages and Stages Questionnaires: A Parent-Completed, Child-Monitoring System*. Baltimore, MD: Paul H. Brookes Publishing Co; 1999
25. Ireton H. *Child Development Inventory*. Minneapolis, MN: Behavior Science Systems; 1992
26. Frankenburg WK, Dodds J, Archer P, Shapiro H, Bresnick B. *Denver-II Screening Manual*. Denver, CO: Denver Developmental Materials Inc; 1990
27. Aylward GP. *Bayley Infant Neurodevelopmental Screener*. New York, NY: Psychological Corporation; 1995
28. Newborg J, Stock JR, Wnek L, Guidubaldi J, Svinicki J. *Battelle Developmental Inventory*. Itasca, IL: Riverside Publishing; 1994
29. Coplan J. *ELM Scale: The Early Language Milestone Scale*. Austin, TX: PRO-ED; 1987
30. Brigance AH. *Early Preschool Screen*. Billerica, MA: Curriculum Associates Inc; 1990
31. Brigance AH. *K 41 Screen*. Billerica, MA: Curriculum Associates Inc; 1997
32. Brigance AH. *Preschool Screen*. Billerica, MA: Curriculum Associates Inc; 1998
33. Capute AJ, Accardo PJ. The infant neurodevelopmental assessment: a clinical interpretative manual for CAT-CLAMS. *Curr Probl Pediatr*. 1996; 26:238–257
34. Glascoe FP, Byrne KE, Chang B, Strickland B, Ashford LG, Johnson KL. Accuracy of the Denver-II in developmental screening. *Pediatrics*. 1992; 89:1221–1225
35. Blackman JA. Developmental screening: infants, toddlers and preschoolers. In: Levine MD, Carey WB, Crocker AC, eds. *Developmental-Behavioral Pediatrics*. 3rd ed. Philadelphia, PA: WB Saunders; 1999: 689–695
36. Belcher HM. Developmental screening. In: Capute AJ, Accardo PJ, eds. *Developmental Disabilities in Infancy and Childhood. Volume I*. 2nd ed. Baltimore, MD: Paul H. Brookes Publishing Co; 1996:323–340
37. Squires J, Nickels RE, Eisert D. Early detection of developmental problems: strategies for monitoring young children in the practice setting. *J Dev Behav Pediatr*. 1996;17:420–427
38. Bagnato SJ, Neisworth JT, Salvia JJ, Hunt FM. *Temperament and Atypical Behavior Scale (TABS). Early Childhood Indicators of Developmental Dysfunction*. Baltimore, MD: Paul H. Brookes Publishing Co; 1999
39. Achenbach T. *Child Behavior Checklist*. Burlington, VT: Department of Psychiatry, University of Vermont; 1991
40. Carey W. *The Carey Temperament Scales*. Scottsdale, AZ: Behavioral/ Developmental Initiatives; 1997
41. Eyberg S. *Eyberg Child Behavior Inventory & Sutter-Eyberg Student Behavior Inventory-Revised (ECBI/SESBI-R)*. Lutz, FL: Psychological Assessment Resources; 1999
42. Jellinek MS, Murphy JM, Robinson J, Feins A, Lamb S, Fenton T. Pediatric Symptom Checklist: screening school-age children for psychosocial dysfunction. *J Pediatr*. 1988;112:201–209
43. Kemper KJ, Kellener KJ. Family psychosocial screening: instruments and techniques. *Ambul Child Health*. 1996;4:325–339
44. Filipek P, Accardo P, Ashwal S, et al. Practice parameter: screening and diagnosis of autism: a report of the quality standards subcommittee of the American Academy of Neurology and the Child Neurology Society. *Neurology*. 2000;55:468–479
45. Baron-Cohen S, Allen J, Gillberg C. Can autism be detected at 18 months? The needle, the haystack and the CHAT. *Br J Psychiatry*. 1992;161:839–843
46. Baird G, Charman T, Baron-Cohen S, et al. A screening instrument for autism at 18 months of age: a 6-year follow-up study. *J Am Acad Child Adolesc Psychiatry*. 2000;39:694–702
47. American Academy of Pediatrics, Committee on Children With Disabilities. The pediatrician's role in the diagnosis and management of autistic spectrum disorder in children. *Pediatrics*. 2001;107:1221–1226
48. American Academy of Pediatrics. Technical report: the pediatrician's role in the diagnosis and management of autistic spectrum disorder in children. *Pediatrics*. 2001;107(5). URL: http://www.pediatrics.org/cgi/content/full/107/5/e85
49. Glascoe FP, Foster EM, Wolraich ML. An economic analysis of developmental detection methods. *Pediatrics*. 1997;99:830–837
50. American Medical Association. *CPT 2000: Current Procedural Terminology*. 4th ed. Chicago, IL: American Medical Association; 1999
51. American Academy of Pediatrics, Ad Hoc Task Force on Definition of the Medical Home. The medical home. *Pediatrics*. 1992;90:774

Developmental Surveillance and Screening of Infants and Young Children

Committee on Children With Disabilities

Pediatrics 2001;108;192
DOI: 10.1542/peds.108.1.192

PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Developmental Surveillance and Screening of Infants and Young Children

Committee on Children With Disabilities

Pediatrics 2001;108;192
DOI: 10.1542/peds.108.1.192