

AMERICAN ACADEMY OF PEDIATRICS

Committee on Children With Disabilities

Technical Report: The Pediatrician's Role in the Diagnosis and Management of Autistic Spectrum Disorder in Children

ABSTRACT. Autism and its milder variants are not rare. Most pediatricians will have the opportunity to provide a medical home for a child with autism. This technical report serves to complement and expand on the information in the accompanying policy statement to increase the pediatrician's fund of knowledge and comfort level in caring for children with autism. In so doing, it is anticipated that earlier diagnosis and referral for appropriate intervention will be possible and that this will, in turn, have a positive effect on long-term outcomes for children with autism and their families. *Pediatrics* 2001;107(5). URL: <http://www.pediatrics.org/cgi/content/full/107/5/e85>; autism, autistic spectrum disorder, pervasive developmental disorder.

ABBREVIATIONS. *DSM*, *Diagnostic and Statistical Manual of Mental Disorders*; AD, autistic disorder; PDD, pervasive development disorder; PDD-NOS, pervasive development disorder-not otherwise specified; ASD, autistic spectrum disorder; CHAT, Checklist for Autism in Toddlers; ADI-R, Autism Diagnostic Interview-Revised; ADOS, Autism Diagnostic Observation Schedule; TEACCH, Treatment and Education of Autistic and Communication Handicapped Children.

In 1943, Dr Leo Kanner first described autism in a small group of children who demonstrated extreme aloofness and total indifference to other people.¹ Additionally, the children made little eye contact and had severe language deficits associated with the apparent lack of desire to communicate. They reacted to the environment in very unusual ways and demonstrated no pretend or imaginative play. The term "infantile autism" first appeared as a diagnostic label in the *Diagnostic and Statistical Manual of Mental Disorders (DSM), Third Edition*.² Throughout the years, the definition and criteria for diagnosis have been revised and broadened to include milder and more common forms of the disorder.

The newest criteria are published in the *DSM, Fourth Edition*³ and the *DSM for Primary Care, Child and Adolescent Version*.⁴ These criteria differ from previous *DSM* versions in that the term "qualitative" has been added to reflect the recent view that a range of qualitative abnormalities exists. Autistic disorder (AD) is currently listed as 1 of 5 pervasive developmental disorders (PDDs). The remaining 4 PDDs are pervasive developmental disorder-not otherwise

specified (PDD-NOS), Asperger syndrome, Rett syndrome, and childhood disintegrative disorder.

Although clinical patterns vary depending on severity, all children with autism demonstrate some degree of qualitative impairment in reciprocal social interaction, qualitative impairment of communication, and restricted, repetitive, and stereotypic patterns of behaviors, interests, and activities. Table 1 lists the 12 *DSM* criteria that currently characterize AD. Diagnosis is dependent on the presence of at least 6 criteria, with at least 2 relating to disorders of social development and 1 each relating to disorders of communication and stereotypic behavior patterns. Delays or deviances in at least 1 of these areas must have an onset before 3 years of age. Although onset of symptoms for most children with autism occurs during late infancy, it is well recognized that some children demonstrate regression in speech and social skills, withdraw, and become indifferent to their surroundings during the second year of life after a period of relatively typical development.^{5,6}

A diagnosis of PDD-NOS is made when a child meets some but not all criteria for AD. The *DSM* criteria were developed for children 3 years and older; a very young child may not demonstrate all of the criteria. In such cases, a diagnosis of PDD-NOS is given, which may later be revised to AD if additional symptoms appear later and the child meets full criteria.

Asperger syndrome is characterized by poor peer relationships, lack of empathy, and a tendency to overfocus on certain topics. In contrast to AD, Asperger syndrome is associated with a typical IQ and relatively typical language skills. Controversy exists as to whether Asperger syndrome represents a high-functioning form of autism or a separate entity. Nevertheless, Asperger syndrome, AD, and PDD-NOS are generally included under the umbrella of autistic spectrum disorder (ASD), a term that is also used at times to refer to all of the PDDs discussed here.⁷⁻⁹ The mildest forms of ASD may overlap with other language, behavior, and learning disorders, such as semantic-pragmatic language disorder, obsessive-compulsive disorder, or right hemisphere learning disorder.

Rett syndrome is a neurodegenerative disorder that has recently been associated with a defined etiology (mutation in the gene *MECP2*).¹⁰ The condition occurs almost exclusively in girls with onset during the first or second year of life after a period of typical development. It is characterized by loss of purposeful hand skills accompanied by stereotypic hand

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.

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TABLE 1. Diagnostic Criteria for 299.00 Autistic Disorder

- A. A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):
- (1) qualitative impairment in social interaction, as manifested by at least two of the following:
 - (a) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
 - (b) failure to develop peer relationships appropriate to developmental level
 - (c) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (eg, by a lack of showing, bringing, or pointing out objects of interest)
 - (d) lack of social or emotional reciprocity
 - (2) qualitative impairments in communication as manifested by at least one of the following:
 - (a) delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
 - (b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
 - (c) stereotyped and repetitive use of language or idiosyncratic language
 - (d) lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level
 - (3) restricted repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:
 - (a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus
 - (b) apparently inflexible adherence to specific, nonfunctional routines or rituals
 - (c) stereotyped and repetitive motor mannerisms (eg, hand or finger flapping or twisting, or complex whole-body movements)
 - (d) persistent preoccupation with parts of objects
- B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.
- C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder

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movements, particularly hand wringing; gross motor and coordination skills associated with ataxia and tremor; language and cognitive skills; and social interaction skills. Abnormalities are detected on electroencephalograms for almost all children with Rett syndrome.

The fifth PDD is childhood disintegrative disorder. This is extremely rare and is characterized by later onset (older than 24 months) and more profound losses in language, social, play, and motor skills than those seen in AD or PDD-NOS.

There is no single pathognomonic developmental deficit or behavior that is characteristic of all children with autism; however, most children have some degree of impairment in joint attention and pretend play.¹¹ Joint attention is the ability to use eye contact and pointing for the social purpose of sharing experiences with others. Several steps occur before it is fully developed at approximately 18 months old. At

approximately 9 months of age, most typically developing children will follow a point when the caregiver points and exclaims, "Oh, look at the (familiar object)!" At approximately 1 year of age, a typically developing child will attempt to obtain an object out of reach by getting the caregiver's attention through pointing, verbalizing, and making eye contact. This is often labeled "protoimperative pointing." The child will look alternatively at the object and the caregiver in an effort to communicate his or her desire. The object is the goal; the caregiver is the means to the goal. The goal and means to the goal are reversed when a few months later, the typically developing child demonstrates "protodeclarative pointing." The child will point to an interesting object, verbalize, and look alternatively between the object and the caregiver not to obtain the object but simply to direct the adult's attention to the object or event of interest. At about the same time, typically developing children also begin bringing objects to adults just to show them. Children with ASD demonstrate impairments in some or all of these joint attention activities.

As noted above, ASD represents a heterogeneous neurogenetic disorder, with milder forms being more common than classic AD. Several excellent subject reviews and practice parameters describe the heterogeneous array of symptoms characteristic of ASD.^{8,9,12-20} Briefly, children with ASD may indeed make no eye contact and seem totally aloof. Others may demonstrate intermittent awareness of their environment, make some eye contact, smile, and hug. However, these seemingly affectionate gestures usually occur on the child's own terms and may be difficult to elicit by another person. Children with ASD may be nonverbal or they may demonstrate seemingly advanced speech, which includes imitation of songs, rhymes, or television advertisement jingles. However, these utterances rarely have communicative intent. Intellectual functioning ranges from severe mental retardation to superior intellectual functioning, with performance skills often more advanced than verbal ones. However, formal intelligence testing can be challenging, and test results are not always reliable. Some children with autism demonstrate islands of developmentally typical abilities in certain areas of functioning. A few children may be particularly talented in specific areas, such as puzzles, art, music, reading, computer skills, or mathematical calculations. Many demonstrate highly visible stereotypic behaviors, such as hand flapping, finger flicking, or compulsive sniffing; others blend into group settings without any outward signs of underlying abnormalities in thought processes.

Older studies estimated the prevalence of autism to be 4 to 5 in 10 000 children.²¹ The majority of studies conducted through 1998 showed the prevalence to be 1 in 1000 children and the prevalence of the broader ASD to be more than 1 in 500 children.^{22,23} There have been a few recent studies that have shown higher rates.²⁴⁻²⁸ These studies with higher rates have been in communities where intense case finding was used to try to identify every possibly affected child in the area. Population-based US

prevalence data are not yet available; however, even if the conservative rates apply, pediatricians should expect to care for at least 1 child with ASD. ASD, especially isolated ASD, is more common in boys than in girls, with a relative boy-to-girl ratio of approximately 4:1.^{14,21,29} Depending on the study and criteria used for diagnosis, recurrence rates for isolated ASD in subsequent offspring range from 3% to 7%, representing a recurrence risk approximately 50 times the general population.^{14,30,31} Whether ASD associated with a known etiology incurs an increase in recurrence risk for siblings (independent of the syndrome risk) is undetermined.

STATEMENT OF THE PROBLEM

Given the apparent increase in prevalence, the primary care physician is now more likely to encounter a child with ASD. Diagnosis and management of ASD presents the pediatrician with a challenging task. Currently, there is no laboratory test specific for ASD. ASD is a neurobehavioral phenotype that is now believed to have diverse etiologies and is defined by the presence or absence of a constellation of symptoms. Judgment regarding the presence or absence of these behaviors is subjective and depends on the physician's understanding of and experience with ASD.

Because the recurrence rate is significant, early diagnosis is critical to provide timely and accurate genetic counseling specific to the best estimate of etiology before the conception of a subsequent sibling. The importance of early diagnosis is also highlighted by recent evidence that early and intensive behavioral and educational intervention can make a significant positive impact on long-term outcomes.³²⁻⁴¹ Pediatric management of ASD in children is also problematic in that there is no medical cure and no consensus regarding the best intervention strategy.

NEW INFORMATION

Substantial progress has been made during the past 2 decades regarding the neurogenetic aspects of ASD, recognition of early signs, and development of new screening and evaluation tools. Developmental, behavioral, and educational intervention strategies are now more widespread and available to families. Additionally, there is a plethora of recently described nontraditional therapies about which the pediatrician is expected to advise parents, including therapies that have received excessive attention in the media as "miracle cures."

Neurogenetic Correlates of ASD

Although ASD is generally believed to be a biologically based neurodevelopmental disability with a strong genetic basis, the exact cause is still unknown for most affected children. Before the 1970s, it was incorrectly believed that autism resulted from a cold, unloving parenting style (the "refrigerator mother theory").^{14,42} Later, evidence for a genetic basis in isolated ASD was provided by twin studies that revealed a monozygotic concordance rate of 60% for AD and 92% for the broader spectrum of social and

communication deficits with stereotypies. Dizygotic twin rates for AD and for the broader spectrum were 0% and 10% to 30%, respectively.^{14,43} Using these twin concordance rates and the sibling recurrence rate of 3% to 7%, Bailey et al⁴³ calculated the heritability of autism to be approximately 90%. These data support a polygenic model of inheritance with at least 3 (perhaps as many as 20) gene loci contributing to the wide spectrum of symptoms.⁴⁴ Gene markers have recently been identified on chromosomes 1p, 7q, 16p, and 17p in preliminary linkage studies.^{44,45} In fact, autism has thus far been associated with an abnormality of every chromosome except 14 and 20.⁴⁶

Although autism seems to be mainly genetic in origin, a number of environmental effects may play a role in modulating the autism phenotype, indicating a multifactorial mode of inheritance in some cases. A relationship between congenital rubella and autism was noted in the 1970s,^{47,48} and more recently, one has been shown between ASD and early first trimester thalidomide exposure.⁴⁹ Although a group of investigators in the United Kingdom has hypothesized that administration of the measles-mumps-rubella (MMR) vaccine was associated with an increased risk of ASD,⁵⁰ this hypothesis has not been substantiated by more in-depth research.^{46,51-55}

ASD and autistic behaviors are seen at an increased rate in persons with a number of genetic, chromosomal, and metabolic disorders, such as tuberous sclerosis, fragile X syndrome, duplication of 15q 11-13,⁵⁶ methylmalonicaciduria, and untreated phenylketonuria.

Additionally, the common association of ASD with seizures and mental retardation suggests a neurologic basis.⁵⁷⁻⁶⁰ During the past 2 decades, neuroimaging and autopsy studies have revealed a variety of developmental brain abnormalities, all implicating that the etiologic insult likely occurs early during prenatal development.^{61,62} The most common findings include cerebellar hypoplasia associated with a reduction in size and number of Purkinje cells^{63,64}; reduced neuronal cell size, stunted dendritic arbors, and increased cell-packing density in limbic structures⁶⁵; and shortening of the brainstem associated with anatomic deficits in the region of the facial and superior olivary nuclei.⁶⁶ None of these abnormalities seem to be consistent or specific for autism, making it difficult to correlate neuropathologic findings with clinical features of autism.⁶² In addition to anatomic abnormalities, quantitative abnormalities have also been found in serotonin, dopamine, opioid, and most recently, γ -aminobutyric acid neurotransmitter transport systems.⁶⁷⁻⁷⁰

Slow progress in determining the neuropathologic correlates of ASD is attributed to the lack of tissue available for research (fewer than 40 brains available for research on autism vs more than 3500 brains for Alzheimer disease research).¹⁶ Recently, increased federal funding supporting research endeavors, centralized brain banking, and professional and parent campaigns promoting tissue donations have offered new hope. In summary, there are probably multiple causes (genetic, neuropathologic, and environmen-

tal) responsible for the broad spectrum of clinical phenotypes.

Screening and Surveillance

Recent research has revealed that parents are usually correct in their concerns about their child's development, although careful interpretation of the concerns is needed.⁷¹⁻⁷⁴ Early diagnosis of ASD is dependent on listening to the parents' concerns about their child's development. Two studies from the United Kingdom have demonstrated that most parents of children later diagnosed with ASD first became concerned about their child's development around 18 months old.^{75,76} However, the mean interval between the onset of concerns and seeking of professional help was approximately 6 months. On presentation of these concerns to a physician, almost 50% of parents were reassured and told not to worry. The usual interval between the parents' first awareness of a concern and a definitive diagnosis of autism was almost 4 years. The authors of these studies concluded that early parental concerns should be taken more seriously. Indeed, any concern should be valued and should lead to additional investigation.

In contrast, lack of parental concern about development does not imply typical development. For this reason, all children should be formally monitored for developmental progress.^{8,9} Developmental surveillance is an important function of the pediatrician in the context of the medical home^{77,78} and should include social-emotional milestones in addition to the more traditional motor, cognitive, and language skills.⁷⁹ Efficient screening might include standardized parent questionnaires that can be completed in the waiting room and later reviewed by the pediatrician during the appointment. Additionally, standardized tools that involve direct solicitation of skills based on published milestones may be used. Regardless of the method, developmental surveillance should be done at every well-infant appointment. Positive test results should be considered in the context of the child's history and physical examination. For a discussion of screening techniques, the pediatrician is referred to the American Academy of Pediatrics policy statement on developmental surveillance and screening⁸⁰ and the American Academy of Neurology and Child Neurology Society practice parameter on screening and diagnosis of ASD.^{8,9}

Aberrant social skill development is a hallmark for ASD. In general, parents infrequently raise concerns about social skill deficits; therefore, when they do, the concerns are serious red flags, and ASD should be considered. Early social skill deficits may include abnormal eye contact, aloofness, failure to orient to name, failure to use gestures to point or show, lack of interactive play, and lack of interest in peers, among others. Combined language and social delays or regression in language or social milestones are also extremely important red flags for ASD and should immediately prompt additional evaluation. More commonly, parents of children later diagnosed with ASD express concerns about behavior or delayed speech between 18 months and 4 years of age.^{75,81} However, retrospective analyses of home videos

have revealed that significant deviations in development (eg, decreased eye contact, orienting to name, pointing, and showing) can be detected by 1 year of age.⁸²⁻⁸⁴ Speech delay is a common symptom for a variety of disorders and generally is the most common developmental concern voiced by parents of children during the toddler and preschool years.^{85,86} The first step in evaluating a concern about a child's speech is to determine if the delay in expressive language (speech) is also accompanied by a delay in receptive language. Combined expressive and receptive language delays are also hallmarks of mental retardation and hearing loss and must always be distinguished from ASD.

Several screening tools have been developed to aid the physician in detecting ASD. These relatively new instruments, although promising, need additional validation to assess their sensitivity and specificity across populations. The Checklist for Autism in Toddlers (CHAT), a screening tool designed for use with 18-month-old children in primary care settings, is illustrated in Fig 1.^{87,88} The CHAT was developed in England and has been used to screen more than 16 000 toddlers. Of the 14 items measuring various aspects of imitation, pretend play, and joint attention, 9 are derived from parental history and 5 are from observation. The 5 items in boldface are considered critical items. In 1 study, all children failing these 5 critical items twice, 1 month apart, were later diagnosed with AD between 20 and 42 months old.⁸⁹ Children with global delays are likely to also fail the CHAT and need additional investigation to rule out mental retardation. Finally, the CHAT has been demonstrated to have relatively poor sensitivity. A modified version is being tested to address this issue. The Pervasive Developmental Disorder Screening Test (PDDST) is a parent-completed survey that targets children from birth to 3 years of age. It incorporates a 3-tiered approach—1 for the primary care clinic, 1 for the developmental clinic, and 1 for the multidisciplinary autism clinic.⁹⁰ All 3 tiers contain items that measure various aspects of language, social skills, joint attention, pretend play, attachment, sensory responses, and motor stereotypies. Additional screening tools are currently being developed. Primary care physicians are encouraged to become familiar with at least 1 autism screening tool and perform it on all children. If this is not possible, then prompt referral to a specialist or a team of specialists is indicated whenever there is a parent or professional concern.

When autism-specific standardized screening tools are not available, the pediatrician should systematically inquire about aspects of language and social-emotional development, joint attention skills, and pretend play. Some important questions to ask include^{8,9}: "Does your child. . .

- not speak as well as his or her peers?"
- have poor eye contact?"
- not respond selectively to his or her name?"
- act as if he or she is in his or her own world?"
- seem to 'tune others out'?"
- not have a social smile that can be elicited reciprocally?"

- seem unable to tell you what he or she wants, thus preferring to lead you by the hand or get desired objects on his or her own, even at risk of danger?"
- have difficulty following simple commands?"
- not bring things to you to simply 'show' you?"
- not point to interesting objects to direct your attention to objects or events of interest?"
- have unusually long and severe temper tantrums?"
- have repetitive, odd, or stereotypic behaviors?"
- show an unusual attachment to inanimate objects, especially hard ones (eg, a flashlight or a chain vs a teddy bear or a blanket)?"
- prefer to play alone?"
- demonstrate an inability to play with toys in the typical way?"
- not engage in pretend play (if older than 2 years)?"

If the answer to any such questions is "yes" or if abnormalities are found on general developmental or autism-specific screening tests and the physician is not comfortable conducting a comprehensive evaluation to make the diagnosis of ASD, the child should promptly be referred to a specialist or, preferably, a multidisciplinary team of specialists with ASD expertise.

Comprehensive Assessment

There are 2 major diagnostic challenges in the comprehensive assessment of a child with suspected ASD. The first is making the definitive diagnosis based on *DSM-IV* criteria and standardized ASD-specific evaluation tools, and the second is searching for etiologic disorders associated with ASD. Although primary care physicians will likely feel comfortable conducting the etiologic search, they will usually seek the help of ASD specialists in making the definitive diagnosis of ASD.

Specialists with training and skill in evaluating children with ASD will first assess the child's overall developmental status.^{8,9} This is necessary to determine if there is coexisting mental retardation⁹¹ and if the child's social skills are significantly below his or her global level of functioning. Significantly delayed social skills relative to overall developmental functioning is one of the most important *DSM-IV* criteria necessary for the diagnosis of ASD. To demonstrate this discrepancy, some clinicians administer the Vineland Adaptive Behavior Scales and use the socialization scale as a measure of the child's social-emotional development.^{92,93} This scale is then compared with the child's overall developmental status or IQ.

Additionally, ASD specialists usually use 1 or more of the following comprehensive standardized assessment tools that are specific for ASD and usually require special training:

- The Childhood Autism Rating Scale (CARS) is a widely used tool that was developed before the *DSM-IV* was published. It consists of a 15-item structured interview, each item scored according to 7 levels of severity. An overall severity score makes it possible to distinguish between mild,

mild-to-moderate, or severe autism. The scale was designed for use with children 2 years and older, requires training, and takes about 20 to 30 minutes to complete.^{94,95}

- The Autism Behavior Checklist (ABC), also developed before publication of the *DSM-IV*, is a behavior checklist containing 57 items divided into 5 categories: sensory, body and object use, language, social, and self-help. It has been shown to have a low sensitivity, making it less useful as a diagnostic tool. However, it had been helpful in research endeavors in the measurement of intervention effect.⁹⁶
- The Gilliam Autism Rating Scale consists of a checklist for parents based on *DSM-IV* criteria; thus, items are grouped into categories addressing social development, communication, and stereotypic behaviors. It was designed for use in children older than 3 years.⁹⁷
- The Autism Diagnostic Interview-Revised (ADI-R)⁹⁸ and the Autism Diagnostic Observation Schedule (ADOS)⁹⁹ are complementary diagnostic instruments originally created for research but now adapted for clinical purposes. They are intended to be used by experienced clinicians; training in their use is highly recommended. For these reasons and because of their length, they are most appropriate as part of a comprehensive evaluation within specialty clinics. A strength of both instruments is that they operationalize current *DSM-IV* and *International Classification of Diseases, 10th Revision* criteria. The clinical version of the ADI-R takes about 90 minutes to complete and yields scores based on history. The ADOS is a standardized observation of social behavior in natural communicative contexts, with different modules and tasks for children of different ages and language levels. It takes about 30 to 45 minutes to complete. The Pre-Linguistic ADOS is a modified version designed for young children who are not yet speaking.¹⁰⁰ Most recently, the ADOS and the Pre-Linguistic ADOS have been combined into a single tool that provides the same information for a broader range of ages and developmental levels.¹⁰¹

For an evidenced-based analysis and ordering information for these and additional instruments, the pediatrician is referred to the American Academy of Neurology and Child Neurology Society multidisciplinary panel review⁸ and practice parameter⁹ and clinical practice guidelines from the New York State Department of Health Early Intervention Program.¹⁹

A comprehensive evaluation always includes a detailed physical examination. Approximately one fourth of children with isolated ASD have an occipitofrontal circumference greater than the 97th percentile.^{102,103} Macrocephaly is generally not present at birth and, in fact, may not become apparent until 3 or 4 years of age. Accelerated rates of head growth have been documented between 2 and 12 years of age. In the absence of dysmorphic features or focal neurologic signs, additional investigation of macrocephaly by computed tomography or magnetic res-

Checklist for Autism in Toddlers (CHAT)*
For children 18 months & older

Section A: History: Ask parent...

- | | | |
|--|-----|----|
| 1. Does your child enjoy being swung, bounced on your knee, etc? | Yes | No |
| 2. Does your child take an interest in other children? | Yes | No |
| 3. Does your child like climbing on things, such as up stairs? | Yes | No |
| 4. Does your child enjoy playing peek-a-boo/hide-and-seek? | Yes | No |
| 5. Does your child ever PRETEND, for example, to make a cup of tea using a toy cup and teapot/pitcher or pretend other things? | Yes | No |
| 6. Does your child ever use his/her index finger to point, to ASK for something? | Yes | No |
| 7. Does your child ever use his/her index finger to point to indicate interest, that is to get you to look at it? | Yes | No |
| 8. Can your child play properly with small toys (eg, cars or bricks)? | Yes | No |
| 9. Does your child ever bring objects over to you (parent) to SHOW you something? | Yes | No |

Section B: Observation:

- | | | |
|---|-----|----|
| 1. During the appointment, has the child made eye contact with you? | Yes | No |
| 2. Get child's attention, then point across the room at an interesting object and say: "Oh look!" There's a (name of toy)!" Watch child's face. Does the child look across to see what you are pointing at? To record YES, ensure the child did not simply look at your hand, but actually looked at the object to which you pointed. | Yes | No |
| 3. Get the child's attention, then give child a miniature toy cup and teapot/pitcher and say "Can you make a cup of tea?" Does the child PRETEND to pour tea, drink it, etc. If you can elicit an example of pretending in some other game, (birthday party, farm), score a YES on this item. | Yes | No |
| 4. Say to the child "Where's the light?", or "Show me the light." Does the child POINT with his/her index finger at the light? Repeat with, "Where's the...(other unreachable object)?" if child does not understand "light." To record YES, the child must also look at your face around the time of pointing. | Yes | No |
| 5. Can the child build a tower of bricks? (If so, how many? ____) | Yes | No |

TOTAL NO'S _____

- Scoring:**
- Severe Risk for Autism: Fails A5, A7, B2, B3, and B4
 - Mild Risk for Autism: Fails only A7 (protodeclarative pointing), B4 (producing a point)
 - Risk for Different Developmental Disorder: >3 failures on any item
 - Within Normal Limits: <3 failures on any item

*Adapted with permission from Baron-Cohen S.
Numbers in bold are considered critical items.

Fig 1. CHAT.

onance imaging is usually not necessary.^{8,9,104,105} Another dysmorphic feature that recently has been linked to isolated ASD is posteriorly rotated ears. This finding has been reported in approximately 30% of children in some studies.⁶⁶ Otherwise, most chil-

dren with idiopathic ASD have a typical physical appearance.

The physical examination may be more helpful in the search for known etiologic or associated conditions. Pediatricians, geneticists, and ASD specialists

often work together as a team to search for an etiologic or comorbid disorder. Although some children have minor physical anomalies, a recognizable disorder is found in less than 25% of cases.¹⁰⁶ Examination of the skin with a Wood's light should be performed on all children suspected to have ASD, especially when there are seizures, to detect early hypopigmented lesions consistent with ash leaf macules seen in those with tuberous sclerosis. Later, facial angiofibromas become evident. Dysmorphic characteristics associated with 2 additional common etiologic conditions include the long face, large ears, and large testes (postpubertally) associated with fragile X syndrome and the ataxic gait and broad mouth with persistent smile associated with Angelman syndrome. The history and physical examination should assist the physician in assessing which diagnostic tests are needed to determine whether or not a recognizable disorder is present. A "shotgun" approach is not recommended.

An audiologic evaluation and a comprehensive speech and language evaluation should always be performed in any child who has language delays, whether or not autistic features are present. A lead study should be performed if the child demonstrates pica or lives in a high-risk environment. Quantitative plasma amino acid assays should be considered even in the face of negative results of a neonatal screen for phenylketonuria. DNA analysis to detect fragile X syndrome should be performed, especially if there is a positive family history or mental retardation of undetermined etiology. Chromosome analysis should be performed if the child has dysmorphic features or mental retardation of undetermined etiology. Seizures are present in approximately 20% to 35% of children with autism and have 2 peaks of onset: 1 during early childhood and 1 during adolescence.^{57,60,67} Some concern exists as to whether seizures might contribute to the regression seen in some children with autism.⁶⁰ Landau-Kleffner syndrome (acquired epileptic aphasia) is characterized by language regression and may be confused with regressive autism. Thus, an electroencephalogram throughout all 4 stages of sleep is indicated in children with ASD who have symptoms of developmental regression or clinical seizures or in whom there is a high suspicion of subclinical seizures.^{5,8,9} Magnetic resonance imaging may be helpful in the child with ASD and accompanying dysmorphic features or localizing neurologic signs but likely not helpful in the child with isolated macrocephaly.^{8,9,104,105} The need for diagnostic studies must be evaluated on the basis of specific signs in the individual child and the possible contribution the results will make to genetic counseling and management.

In summary, the first step in making the diagnosis is listening to the parents. If parents have concerns about their child's social or language skills, the pediatrician should acknowledge the concerns and act on them immediately. If parents do not have concerns, developmental and behavioral surveillance in the context of the medical home is even more essential. Furthermore, surveillance should be conducted with a higher index of suspicion in siblings of chil-

dren with isolated ASD because of the high recurrence rate. Early diagnosis is not only necessary for timely genetic counseling but also for early referral to an appropriate intervention program and optimal management of medical issues. If a primary care physician is not familiar with comprehensive evaluation techniques or is uncomfortable with making the definitive diagnosis of ASD, the child should be promptly referred to a specialist or, preferably, a team of specialists with ASD expertise.

Management

Equally as challenging as the diagnosis of ASD is its management. There is no proven cure. It is, however, generally believed that an improved prognosis depends on the early implementation of appropriate intervention strategies tailored to the individual developmental needs of the child and his or her family. The approach to the management of the child with autism has changed dramatically since autism was first defined in 1943.

Initially, management focused on psychotherapy with the parents and, at times, separating the child from the parent.⁴² In the 1970s, this approach was abandoned when it became generally accepted that ASD was a neurobehavioral disorder of organic origin.⁶⁰ Various developmental, behavioral, and educational strategies have been developed during the last 2 decades. Certain strategies have been adopted by various local advocacy groups, but there is no global consensus regarding which strategy is most effective. Although a practice parameter addressing management of ASD was published in the child psychiatry literature in 1999,²⁰ to date, there have been no consensus guidelines published in the pediatric literature. Universally accepted broad management goals are to improve the overall functional status of the child by promoting the development of communication, social, adaptive, behavioral, and academic skills; lessening maladaptive and repetitive behaviors; and helping the family manage the stress associated with raising a child with autism. How to reach these broad-based goals is a matter of much debate.

A very important aspect in the management of a child with ASD is parental support. This begins with breaking the news to parents when the diagnosis for their child is a chronic disabling condition such as ASD. Families will always remember the manner in which they were informed of their child's diagnosis. It is important for the pediatrician to allocate ample time for the counseling session and that the information is presented in a sensitive, uninterrupted, and nonrushed manner. Part of breaking the news is educating parents about ASD. Parents need to understand that children with ASD vary widely in clinical presentation, severity of abnormal and disrupting behaviors, intelligence, and prognosis. Providing them with the opportunity to meet other parents of children with ASD is also important. This can be done informally by putting them in touch with another patient and his or her family or through a more formal parent-to-parent network or ASD support group. It is important to provide up-to-date literature to the parents so that their search for informa-

tion does not lead them to outdated information (eg, the “refrigerator mother theory” of causation) or to unproven “quick cures,” which can be found throughout the Internet.

Genetic counseling before the conception of a subsequent sibling is extremely important for parents of a child with isolated ASD and ASD associated with a defined etiology. The recurrence rate for isolated ASD ranges from 3% to 7%.^{30,31} The prevalence of abnormality in siblings is even higher when related disorders, such as isolated language delays, obsessive-compulsive disorder, and social deficits, are considered. Siblings with milder symptoms may go unnoticed by parents who are overwhelmed by the intense caregiving responsibilities associated with raising a child with severe ASD. On the other hand, because of their heightened awareness of ASD, other parents might overreact to typical variations in behavior and speech development in subsequent children. Thus, a higher level of developmental and behavioral surveillance in subsequent siblings, including administration of an ASD-specific screening tool, is an important aspect in the management of ASD in children.

The next step is to provide families with information regarding interventions that are available in their communities. The pediatrician can assist the family by becoming informed about available local programs and helping parents assess the effectiveness of each. Once a program is selected, the pediatrician should advocate for services and assist parents in gaining access to them. Early referral and expedient enrollment and implementation are extremely important. In children younger than 3 years, referral should be made to the state’s early intervention system. If the child is older than 3 years, it is appropriate to refer to the local school district. This should be done promptly, even before a definitive diagnosis is made, so that there is no delay in implementation. It is important that the pediatrician act in partnership with personnel from the developmental and, later, educational systems to facilitate coordinated service delivery. Characteristics of these 2 systems are described in the next section, followed by a discussion of specific strategies that are often used by developmental, educational, and health care professionals.

Early Developmental Intervention for Young Children

Although private organizations provided developmental therapies in the 1970s and 1980s, the Individuals with Disabilities Education Act¹⁰⁷ of 1990 mandated early intervention for any child younger than 3 years with a known developmental disability or who demonstrates a developmental delay. Part C of the 1997 revision of this act¹⁰⁸ requires that such children receive appropriate developmental, therapeutic, and family support services. When a child turns 3 years old, services shift to the local school district. Programs have been developed for children with ASD and exist throughout the country. These programs seem to be most effective when they are started early and are used consistently. Elements that are felt to be

common to model programs for young children include³²:

- A curriculum that stresses the ability to pay attention to other people, imitate others, use preverbal and verbal communication, play, and socially interact.
- A teaching environment that is highly supportive of the child’s learning needs and involves systematic teaching of skills in a 1-to-1 setting with trained personnel.
- A program that is predictable and routine.
- A functional approach to problem behaviors.
- A thoughtful strategy for transition from the specialized preschool classroom to the kindergarten class.
- Family involvement.

Additional components include speech therapy, augmentative communication methods, occupational therapy, extensive parent training, and development of positive social relationships, including the use of typically developing peers as role models and playmates. A recent review of programs serving young children with ASD demonstrated that the best programs are those that initiate intervention as early as possible, individualize services for children and families, use systematic and structured teaching, have a specialized curriculum, are intensive, and involve families.³³ Not all programs have a structured environment or intervene in natural environments; however, most are intensive and use a behavioral or developmental instructional framework. Some preschool programs emphasize the use of play in learning and may use typically developing peers to model social interactions during play. Additionally, behavioral skills training for family members is an important component of many programs.^{34,109,110}

There is a growing body of evidence that intensive early intervention services for children in whom autism is diagnosed before 5 years of age may lead to better overall outcomes.^{32–41} The only controlled study of early intensive interventions with young children was done by Ivar Lovaas of UCLA.³⁶ It has received much attention for its remarkable results. Lovaas reported outcomes of treating young children with ASD (average age at initiation of treatment, 2.8 years) with 40 hours per week of 1-to-1 behavioral training (also called applied behavioral analysis or discrete trial learning) for 2 years. The training method focused on the acquisition of compliance behavior, imitation activities, language acquisition, and integration with peers using repeated discrete behavioral trials to accomplish the goals. After 2 years of therapy, almost 50% of the children in the treatment arm of the study were functioning typically in intellectual and academic areas. At 5-year follow-up, most had maintained their gains.³⁸ The major criticisms of the study are nonuniform participant selection, lack of clear standard diagnostic criteria at entry, the required intensity of the intervention for such young children, choice of outcome measures, and randomization issues. A recently published retrospective study of the Lovaas method⁴⁰

and preschoolers with autism and severe mental retardation showed that children receiving intensive early behavioral intervention obtained significantly higher IQ scores and better expressive speech in a small group of children. Two other studies found similar results.^{111,112} Intensive behavioral treatment is becoming increasingly popular and being implemented in some early intervention programs and school districts. Several model programs based on the applied behavioral analysis approach have been developed.^{113–115} In a recently published clinical practice guideline, the New York State Department of Health Early Intervention Program endorsed this method as its sole strategy for toddlers with ASD in a recently published clinical practice guideline.¹⁹ However, more replicative studies with improved methodology are needed before it can be unequivocally recommended for all young children.

Greenspan and Weiden offer a developmental, relationship-based approach to very early intervention with young children.^{39,116} They theorize that the child's symptoms stem from underlying problems in sensory modulation and processing, motor planning, and affective integration and that the child's interactions with the family are most important in promoting the child's growth and development. They advocate an intensive approach that includes speech and language therapists, occupational therapists, educators, and parents acting as therapists using the "developmental individual difference relationship model." Therapists and parents are taught to open and close circles of communication with the child and follow the child's lead in extensive play during "floor time." Preliminary data are promising in terms of showing overall improvement. However, additional studies that include the use of control groups are needed to better assess this intervention model.

Unfortunately, there is a large gap between what is done in model programs across the country and what is generally available for most young children. Local programs are often limited by funding constraints and lack of trained personnel. Even when programs are locally available, the pediatrician may be unaware of them. Overall, it seems that early intensive intervention may be of help in improving outcomes for some young children with ASD. It is not yet known which children are most helped by these therapies, but it is suspected that it may be children at the milder end of the autism spectrum.

Regardless of the type of program available in a patient's community, the pediatrician should not delay referral to an early intervention program while waiting for a definitive diagnosis.¹¹⁷ Prompt enrollment will facilitate the initiation of intervention strategies and provide parents with an opportunity to meet and network with other parents. A treatment protocol can be revised as more information about the child's condition becomes available. It is very important to keep the lines of communication open between health care and early intervention providers. All participants should work cooperatively as a team to promote the best possible outcome for the child and his or her family.

The public education system is usually the primary source of help for the child with ASD between 3 and 21 years of age. However, in some districts, there have been barriers to access for some children with a diagnosis of PDD-NOS or Asperger syndrome. They are sometimes misclassified as having learning disabilities or are not classified at all by school personnel. Thus, such children may not receive appropriate services unless the family or health care provider specifically advocates for them. Additionally, school districts in the United States vary greatly in the curricula and services offered to children with ASD. Some school districts use curricula designed specifically for ASD¹¹⁸; others use more ecologic curricula based on the individual assessment of the child. Unfortunately, little research has been done on the effectiveness of various curricula and programs for children with ASD.

Educational interventions thought to help children with ASD are those that provide structure, direction, and organization for the child. Educational interventions need to be individualized to the child and take into account his or her overall developmental status and specific strengths and deficits. Methods that improve the child's functional communication in all environments are important and will usually include speech therapy with an emphasis on the use of visual cues.^{119–121} Various augmentative and alternative communication strategies may be helpful in the non-verbal or minimally speaking child. One example, the Picture Exchange Communication System (PECS), teaches the child to exchange a picture of a desired item with the teacher who immediately honors the request.^{120,122} If one can identify a powerful reinforcement for which the child will ask, then communication in this way is meaningful and highly motivating. Later, prompting, shaping, and fading techniques promote generalization, greater spontaneity, and a wider variation in communication encounters.

Teaching social skills is very important for the successful transition to inclusive classrooms with typically developing peers.¹²³ Strategies should also be used in the classroom to decrease maladaptive behaviors and promote compliance. Teaching new skills through positive reinforcement, rather than using aversion, has become the preferred approach to decrease behavioral problems. Parental involvement in intervention is felt to be critical; thus, parent training should be provided as well.^{124,125}

Several comprehensive educational curricula have been developed specifically for children with ASD, including Treatment and Education of Autistic and Communication Handicapped Children (TEACCH), Daily Life Therapy (the Higashi School), and Bright Start, among others.¹²⁶ The most well known is TEACCH, which was originally developed by Schopler in North Carolina in the 1970s¹¹⁸ for the diagnosis, treatment, training, and education of children with ASD and their families. The TEACCH program is based on a strong belief in parent-professional collaboration and is theoretically based on the knowl-

edge that ASD is not caused by parental psychopathology but by a neurologically based abnormality. More recently, the TEACCH philosophy has been very influential in structuring school programs for children throughout the nation. The basic elements of the philosophy include the following¹¹⁸:

- Characteristics of autism must be understood from observations of the child rather than from theories.
- Parent and professional collaboration is of utmost importance.
- The child's adaptation should be improved through teaching new skills and environmental accommodations.
- The child's treatment should be individualized on the basis of comprehensive assessments.
- Teaching should be structured.
- Cognitive and behavior theory should be a priority.
- Skill enhancement and acceptance of deficits should be emphasized.
- Treatment should be holistic in orientation.
- Services should be lifelong and community based.

TEACCH services include diagnostic clinics, parent training, classroom programs, residential programs, respite care, and various vocational placement options. The program begins with assessment and emphasizes teaching according to the child's strengths. The TEACCH program has been evaluated by empirical studies of program components and parent evaluations and has been found to be successful in its goal. However, these studies have not included control groups.¹²⁷ TEACCH has been influential in promoting the use of structured learning situations and the importance of visual strategies and supports for learning in children with autism.¹²⁸

The Higashi School originated in Japan and has been replicated in Massachusetts to a great extent.¹²⁹ This school is based on the philosophy of emphasizing academic, fine art, and physical education skills while using certain behavioral strategies, including prompting. A decrease in behavioral problems is reportedly accomplished by ignoring problematic ones and teaching alternatives, but controlled outcome studies are nonexistent. It also emphasizes group participation rather than an individualized curriculum. The development of language skills and other functional skills is not emphasized.

The Bright Start curriculum focuses on strategies that improve cognitive skills, such as flexible thinking. The curriculum addresses deficits in attention, social interaction, communication, and motivation. However, there are no published outcome studies.¹³⁰

Ecologic approaches are commonly used for children with ASD but do not address specific disabilities commonly present in these children. These approaches emphasize teaching a child functional skills in natural environments.¹³¹ The effectiveness of ecologic approaches in teaching children with ASD has not been well studied.

Eclectic approaches use selected components of all curricula and attempt to integrate the various philos-

ophies. Dyer and Peck¹³² recommended an integrated curriculum for language and social skills and an emphasis on functions of behavior. For instance, a child may ask for a desired object by gesturing, physical manipulation, talking, or writing. This has been especially helpful in teaching language and social skills, but data regarding its effectiveness are not available.

One of the areas of debate in the educational arena is inclusion or "mainstreaming" of the child with ASD into the regular classroom. Children with ASD seem to benefit from having typically developing peers model appropriate behavior.^{133,134} The Individuals With Disabilities Education Act^{107,108} requires that the child's education take place in the least restrictive environment that will also meet his or her specific needs. Although it is generally agreed that children with ASD require unique educational interventions, it is not always clear whether a particular child will be best served in a special education classroom that facilitates meeting these unique needs or in a regular classroom that promotes socialization. Children with adequate social and language skills may benefit most from inclusion. Classroom placement must be individualized on the basis of developmental and behavioral assessment of the child, the child's educational best interest, needs of the family, and resources available to the school.

The pediatrician can play a key role in advocating for the child within the school system by educating parents about their child's needs and rights within the school system, explaining the diagnosis to the family and school personnel, participating in and reviewing the Individual Educational Plan,¹³⁵ and making appropriate referrals for additional services when necessary.

Specific Strategies

Strategies that are often used by developmental, educational, and health care providers include but are not limited to behavior management, parent training, habilitative therapies (speech, occupational, and physical therapy), medical management, community support, and alternative therapies, which parents themselves often pursue. Often, several strategies are used simultaneously in the same child.

Behavioral Management. One of the mainstays of the management of ASD in children at any age is the implementation of behavioral training and management protocols at home and at school. Behavioral management must go hand-in-hand with structured teaching of skills to prevent undesirable behavior from developing. Behavioral training, including teaching appropriate communication behaviors, has been shown to be effective in decreasing behavior problems and improving adaptation.^{136,137} Inclusion of children with autism in child care centers and regular classrooms with typically developing children as role models can also be effective in decreasing the frequency of undesirable behaviors. The overall goal of the approach is to reinforce desirable behaviors and decrease undesirable behaviors using behavioral psychological theory.

Behavioral management programs should be initiated after a complete individualized functional assessment of the child's behavioral characteristics and the overall environment. The treatment plan may include behavioral modification and applied behavioral analysis. Overall, it is generally agreed that positive reinforcement should be primarily used and that methods such as extinction and punishment to decrease behaviors should be limited to very specific situations.¹³⁶ Behavioral therapies are most effective when started early and used consistently. Parents, child care providers, and teachers should undergo training so that behavioral strategies will be consistently implemented in all environments, thus enhancing effectiveness. Social skills training to promote social competence is an important component of the habilitation plan for children with ASD. This type of training often uses a behavioral or developmental approach that emphasizes generalization of skills to all settings.¹³⁸

Parent Training. Support and training of parents and other family members are important components of any treatment program for children with ASD. Parent education empowers families to advocate for their child, allows them to continue to teach their child, improves the child's compliance, and decreases stress within the family. A recent study evaluated the effectiveness of a TEACCH-based, parent-implemented home program on educational achievement.^{124,139} Children whose families received parent training had significantly greater achievement during the study period. Additionally, the applied behavioral analysis and developmental individual difference approaches use family training as an important part of the overall intervention plan.

Habilitative Therapies (Speech, Occupational, and Physical Therapy). Speech therapy has an important role in the management of ASD in children. Because a deficit in functional communication skills is one of the core problems in ASD, techniques to improve language skills are valuable.^{119,121} Language assessment needs to include all areas of communication, including semantics and pragmatics, and should lead directly into intervention. Behavioral techniques can be helpful in teaching language to children with ASD as well.^{36,140} One study specifically evaluated language therapy and found that children retained their gains for at least 3 months after the intervention.¹⁴¹ Occupational therapy using sensory integration techniques to address sensory processing problems is commonly used in children with ASD. Although many believe occupational therapy is subjectively effective in educational and clinical settings, research data to support its effectiveness is scant. Occupational and physical therapy may be helpful in addressing coordination and motor planning deficits occurring in some children with ASD. All 3 types of therapy should be interwoven throughout all aspects of a child's program, not just as a "pullout" technique.

Medical Management. Children with ASD have the same health care needs as children without disabilities and benefit from the same health promotion and

disease prevention activities. These activities are best provided within the context of a medical home.^{77,78} In addition, children with ASD may have unique health care needs that relate to etiologic conditions (eg, Angelman syndrome, fragile X syndrome, tuberous sclerosis) or other conditions (eg, epilepsy) associated with ASD. Management of these etiologic or comorbid conditions might include referral and consultation with appropriate specialists.

There is no pharmacologic cure for ASD. However, medications can be helpful in the overall management when used in conjunction with developmental, educational, behavioral, and habilitative therapies. The goals of medication treatment are to minimize core symptoms, prevent harmful behaviors (eg, aggression and self-injurious behaviors), facilitate access to intervention programs, maximize beneficial effects of nonmedical interventions, and improve the quality of life for the child and his or her family.¹⁴² There is not 1 medication that consistently benefits all children with ASD. However, some physicians empirically consider neuroleptics and selective serotonin reuptake inhibitors as possible first line drugs.¹⁴³ Older neuroleptics, such as haloperidol and thioridazine, have been used with varying success in decreasing maladaptive behaviors typical of ASD. Their usefulness is limited by sedation, irritability, and extrapyramidal dyskinesias. One of the most promising newer drugs is risperidone, a neuroleptic that has been found to improve social relatedness, a core symptom of ASD, and significantly improve hostility, aggression, irritability, agitation, and hyperactivity. It has fewer extrapyramidal adverse effects than do haloperidol and thioridazine; however, most children experience a fairly significant weight gain within the first few months of treatment.^{144,145} Selective serotonin reuptake inhibitors are becoming more and more popular because of their high rates of effectiveness and because they have fewer adverse effects than do neuroleptics.^{20,68,143,146,147} They are helpful in treating depression, anxiety, and obsessive and ritualistic behaviors that may be associated with ASD, and some studies have demonstrated more global effects on behavior, language, cognition, and social relatedness. A positive response is often correlated with a family history of an affective disorder.¹⁴⁷ Adverse effects are uncommon but include restlessness, hyperactivity, agitation, and insomnia.

Children with ASD are at greater risk of psychopathologic problems than are children without disabilities.¹⁴⁸ Common psychiatric disorders associated with ASD include mood disorder, anxiety disorders, attention-deficit/hyperactivity disorder, and obsessive-compulsive disorder. Whenever possible, a psychiatric diagnosis should be made to guide treatment.^{13,15,20,142,143,149} Sometimes, challenging symptoms such as overactivity, sleep disorders, aggression, stereotypies, or self-injury become the focus of medical treatment. When considering medical intervention, it is usually recommended that the family target 1 or sometimes 2 behaviors that are the most troublesome. These target behaviors may change as the child grows older or progresses devel-

opmentally. Treatment is aimed at decreasing these targeted behaviors to facilitate communication, learning, socialization, and integration into community settings.

Although stimulants have been widely prescribed in young children with ASD, their effectiveness in decreasing excess motor activity and increasing attention is variable. In fact, stimulant therapy may actually increase aggressiveness and stereotypical behavior.¹⁶ More recently, clonidine hydrochloride and guanfacine hydrochloride have been shown to be somewhat helpful in treating overactivity in this population.^{143,150} Lithium and anticonvulsants (carbamazepine, valproic acid), sometimes used as mood stabilizers, may be helpful in children with cyclic behavioral patterns or aggression outbursts; however, blood monitoring is necessary.^{15,151} Although popular in the past, fenfluramine hydrochloride has recently been shown to have little positive effect on core symptoms. In fact, a negative impact on learning has been demonstrated, and thus, it is no longer recommended for children with ASD.^{20,143} Treatment with naltrexone hydrochloride has been successful in some children with self-injurious behaviors, but its overall usefulness has been disappointing.^{15,152,153} Melatonin and clonidine have been shown to be helpful by inducing and maintaining sleep in some children with ASD and insomnia.^{154,155} Periodically, it may be wise to temporarily withdraw a medication to better evaluate its continuing positive effects and to make sure that these outweigh any possible adverse effects.

For a more in-depth discussion of medications used in the management of ASD, the pediatrician is referred to the psychiatry practice parameter published in 1999²⁰ and to reviews written by Rapin¹⁵ and McDougle.¹⁴³ Although pediatricians may not feel comfortable initiating drug interventions in children with ASD, they can still play an integral role in ongoing medical management once the drug dose is titrated and stabilized. Drug initiation and stabilization may be best accomplished by referral to a developmental pediatrician, child neurologist, or child psychiatrist.

Community Support. The degree to which the family needs community support depends on its structural (eg, single parent, dual parent), functional (eg, parental coping styles, sibling issues), and external (eg, poverty, work schedules) characteristics.^{156,157} Resources available to families consist of 3 levels of support: natural (ie, extended family, neighbors, friends, and church), informal (ie, community organizations), and formal (ie, public agencies). When natural resources are available to assist parents, the family may not need extensive community and public programs. Other families may have no natural resources and will rely heavily on social service agencies and government-subsidized support. Respite (scheduled periods of rests from child rearing responsibilities provided by trained personnel) has been identified as one of the most needed services of families without natural supports. These breaks can serve to recharge parents, rekindle spousal relation-

ships, enable outings with nondisabled children, and ultimately, empower parents to continue to care for their child at home rather than resort to institutionalization. Government-subsidized waiver programs provide funds to parents to purchase respite. Waiver programs can be accessed through state Medicaid and disability agencies; however, long waiting lists exist in most states. As the child enters adolescence, families may seek information about transition, group homes, supportive employment, guardianship, and "special needs wills."¹⁵⁶ To assist families in the context of the medical home, it is imperative that the pediatrician be aware of available community services and public programs and also know how to access and coordinate them.

Literature about ASD and information about local and national resources can be obtained from national ASD agencies (<http://www.autism-society.org>). Although information on the Internet is readily accessible, parents should be aware of problems and risks involved with seeking guidance from information that is not reviewed by experts. Nevertheless, ASD Web sites and chat rooms can provide a peer support system for families across the nation. Other families may benefit more from face-to-face parent contact through local ASD support group meetings or regional and national ASD conferences.

Alternative Therapies. Treatments or interventions that are not routinely taught in US medical schools or are unavailable at US hospitals are considered non-traditional, unconventional, or controversial and usually do not conform to standards of the medical community.¹⁵⁸ As many as 1 in 3 adults from all sociodemographic groups may use unconventional therapies, with a significant proportion of them withholding this information from their physicians.^{158,159} A Canadian study reported that at least 11% of children received alternative medical care, and its authors speculated that number to be an underestimate.¹⁶⁰

A standard or traditional therapy for children with developmental disabilities is one that should have a sound scientific basis supported by research. However, because some traditional therapies for children with developmental disabilities have not undergone rigorous scientific review, it is difficult to use the absence of scientific validation as the defining feature that distinguishes a therapy as nontraditional.¹⁶¹ The following characteristics of therapies constitute an operational definition of a controversial treatment for children with developmental disabilities¹⁶¹:

- Treatments based on overly simplified scientific theories (eg, the importance of crawling as a stage of motor development)
- Therapies claimed to be effective for more than 1 condition (eg, megavitamins used for attention-deficit/hyperactivity disorder, learning disabilities, ASD, and developmental delay)
- Claims that children will respond dramatically and some will be cured, particularly if treated early

- Use of case reports or anecdotal data rather than carefully designed studies to support claims for treatment
- Failure to identify specific treatment objectives or target behaviors
- Treatments are stated to have unremarkable or no adverse effects; thus, proponents deny the need to conduct controlled studies¹⁶²

Because ASD is a chronic condition for which presently there is no cure, it has become the focus of several unconventional treatments. There may be many reasons for a family's pursuit of controversial therapies for their child, including: the basic and understandable parental desire to pursue anything that might possibly help their child, a simplification of behaviorally or educationally based therapies that might otherwise be very time consuming, claims of improvements made by other families, and rising skepticism people may have about scientifically based treatments. In anticipating the possibility that families of children with ASD will pursue controversial therapies, the pediatrician should be familiar with them. What follows is a brief summary of some therapies that are currently popular and receiving attention.

- *Nutritional supplements.* Multiple anecdotal and case reports have generated interest in the use of a variety of nutritional supplements to treat children with ASD. Studies documenting nutritional supplementation with high-dose pyridoxine and magnesium have claimed beneficial effects on the symptoms of ASD but have been criticized for their methodologic shortcomings and failure to address the issue of safety of use.¹⁶³ Although the only blinded and controlled study showed no adverse effects of high-dose pyridoxine and magnesium, it also demonstrated no differences in behaviors of controls or patients who received placebo versus high-dose pyridoxine and magnesium for a 10-week period.¹⁶³ One small double-blind, crossover study reported decreased stereotypic behaviors in children who received ascorbic acid.¹⁶⁴ Although there have been anecdotal reports from Russia that dimethylglycine improved behavior and speech in 15 children, a recent double-blind, placebo-controlled investigation using a low dose of this supplement demonstrated no statistically significant effect on autistic behaviors.¹⁶⁵
- *Elimination diets.* The presence of allergies or food intolerance in children often stimulates families to explore unconventional diets. Investigators have proposed that impaired bowel permeability causes selective absorption of ingested peptides and potentiates symptoms of ASD,¹⁶⁶⁻¹⁶⁸ leading to the conclusion that gluten and milk elimination diets improved behavioral symptoms.^{166,169} Another recent investigation failed to document a higher prevalence of hypersensitivity to common food allergens in children with ASD, compared with controls.¹⁷⁰ In still another report,¹⁷¹ only a small number of patients was studied prospectively, and in that and another study,¹⁶⁹ control for

pharmacologic or educational interventions was not provided.

- *Immune globulin therapy.* Throughout the past 20 years, investigators have presented evidence for immunologic abnormalities in small groups of children with ASD, including abnormalities of T cells, B cells, natural killer cells, and the complement system.¹⁷² One author reported significant improvement in 1 child, leading to the suggestion that there may be a small subset of children with ASD in whom an autoimmune process plays a pathogenic role.¹⁷² In the later study of 20 children with ASD, 10 who received intravenous immune globulin for a 6-month period reportedly demonstrated improvements in social behavior, eye contact, echolalia, and speech articulation.¹⁷² However, the investigators did not use standard outcome measures and did not state whether participants received other concurrent treatments during the course of the study. Two recent reports failed to demonstrate significant changes in behaviors associated with ASD in 17 children who received regular infusions of immune globulin for a 6-month period.^{173,174} Larger controlled investigations would be needed to assess this kind of treatment, but there is no scientific evidence to justify the use of infusions of immune globulin to treat children with ASD.
- *Secretin.* An anecdotal report of 3 children whose behaviors were ameliorated by intravenous infusion of secretin generated much publicity and interest in its treatment potential.¹⁷⁵ A double-blind, placebo-controlled trial of a single intravenous dose of secretin, however, failed to demonstrate significant improvement in ASD behaviors measured by 3 standardized instruments.¹⁷⁶ This and other more recent studies have failed to demonstrate any scientific evidence to justify the use of secretin infusion to treat children with ASD.^{177,178}
- *Chelation therapy.* Most recently, some concerns have been raised that ASD might be caused by early childhood exposure to environmental toxicants, particularly metals and minerals. Among the incriminated metals, mercury has been most consistently believed to be associated with the development of ASD. Developmentally delayed children, including those with ASD, may have pica or unusual diets that increase their risk of exposure to environmental neurotoxicants.¹⁷⁹ Additionally, recent media coverage regarding mercury exposure from dietary sources (eg, methylmercury in some fish) and from thimerosal (ethylmercury) in vaccines has heightened parental concerns regarding the possible link between ASD and mercury exposure. Thus, parents may seek clinical assessment of the child's mercury burden usually by hair analysis or by a provocative chelation test in which a dose of chelator is given followed by measurement of the amount of mercury appearing in urine.

To date, there are no published studies linking mercury exposure to the development of ASD or demonstrating that children with ASD have had greater exposure to mercury than have unaffected

children. Preliminary data from the Centers for Disease Control does not suggest a relationship between thimerosal-containing vaccines and ASD.¹⁸⁰ Hair analysis is not recommended for bio-monitoring, because false elevations may occur if the specimen is not carefully collected. Provocative chelation tests for mercury have not been scientifically validated and are also not recommended. Several chelating agents, including succimer, dimercaprol, *d*-penicillamine, and N-acetylcysteine, have been shown to accelerate mercury elimination from the body.¹⁸¹ However, there is no evidence that chelation therapy will improve developmental function when given to treat mercury toxicosis. Moreover, chelating agents can have significant toxicity (eg, hepatotoxicity) and precipitate allergic reaction.¹⁸² Chelation therapy is therefore not recommended for the purpose of improving neurodevelopmental function in children with ASD.

- *Auditory integration training (AIT)*. Originally developed by the French physician Guy Berard in the 1960s, AIT is based on the yet unproven theory that symptoms in ASD are caused by auditory perception defects resulting in distortions of sound or auditory hypersensitivity (hyperacusis).^{13,162,183–185} Treatment consists of initial identification of peaks of sound distortion or hypersensitivity followed by twice daily sessions for 2 weeks in which specially selected music determined to be optimum for the patient is played through a device called the Audiokintron. A single pilot study of 17 patients supported the hypothesis that AIT improved some autistic behaviors but did little to decrease hyperacusis.¹⁶² The Audiokintron may potentially be unsafe, delivering levels of sound to the eardrum that may be harmful to hearing.¹⁸⁶ In another study, all 80 children randomized into 2 groups, 1 receiving AIT and the other receiving unmodified music, showed improvements in behavior and performance IQ.¹⁸⁷ This suggested that some aspect of listening to music might have some effect on features of ASD. Finally, a more recent study incorporated a blinded crossover experimental design using the following measures: parent and teacher behavioral questionnaires, direct observation recordings, IQ, language, and social and adaptive testing. No differences were noted, with the exception of poorer scores on social and adaptive and expressive language scores after AIT.¹⁸⁸ On the basis of the lack of clearly demonstrated efficacy, the Academy has recommended against the use of AIT.¹⁸⁹
- *Facilitated communication (FC)*. FC is a technique whereby a trained facilitator provides physical support to a nonverbal person's arm and hand while that person uses a typewriter, computer keyboard, or communication device. Claims have been made that FC improves expressive language abilities in individuals with severe intellectual disabilities or ASD. Its proponents emphasize that success depends on the trained facilitator's belief in both the child's potential for competent com-

munication and in the process of FC itself. Despite its widespread use, multiple scientific studies have failed to demonstrate the effectiveness of FC as a treatment.^{190–195} Even if the treatment does work in some children, it does little to ameliorate behavioral features of ASD. In addition, concerns have been raised about false allegations of sexual abuse by caretakers from children with ASD through their use of FC. Many allegations have resulted in legal proceedings and pose ethical challenges to the pediatrician.^{196–198} Until it can be determined if there are children with ASD who may benefit from FC, it should be considered experimental.¹⁸⁹

Controversial, nontraditional therapies will continue to gain local and national attention, and questions about their efficacy and use will be brought to the physician's attention. Because parents of children with ASD look to their pediatrician for advice about their children's health, behaviors, education, and treatment, pediatricians should approach alternative therapies openly and compassionately.^{161,199,200} They can greatly assist families by:

- Ensuring they have access to standard services and are actively involved in all treatment decisions.
- Discussing controversial therapies initially and whenever asked.
- Becoming knowledgeable about traditional and controversial treatments or referring families for appropriate consultation.
- Allowing adequate time for discussion and ensuring that comments are not unintentionally viewed as an endorsement of a treatment.
- Discussing the placebo effect and the importance of controlled research studies.²⁰¹
- Being willing to support a trial of therapy in select situations, and in such situations, requiring clear treatment objectives and pretesting and posttesting.
- Remaining actively involved, even if in disagreement with the family's decision.

CONCLUSIONS

Our understanding of the spectrum, etiology, diagnosis, and management of ASD in children has changed dramatically throughout the past 2 decades. Recently developed screening and diagnostic tools have made earlier identification and referral to developmental and educational programs possible. Thus, there is a growing body of evidence that early and appropriate intervention may indeed have a positive impact on overall outcome. Additionally, interest in and funding opportunities for research continue to increase dramatically, yet even more funding is needed. In general, there is a new climate of optimism for better outcomes. In the context of the medical home, the pediatrician can play a significant role by acting immediately on parental concerns, monitoring behavior and development, referring promptly for a comprehensive evaluation, searching for etiologic and comorbid conditions, expediting enrollment and implementation of appropriate inter-

vention strategies, managing medical issues, and coordinating care among various service delivery systems. In so doing, it is anticipated that the disabling aspects of ASD can be minimized to such a degree that, although not cured, more children with autism will indeed be able to live independently as adults.

RESOURCE FOR FAMILIES

Autism Society of America
7910 Woodmont Avenue, Suite 300
Bethesda, MD 20814
Phone: 1-800-328-8476
Fax: 1-301-657-0869
Web site: <http://www.autism-society.org>

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