Evaluation and Treatment of ADHD

WILLIAM D. SMUCKER, M.D., Summa Health System, Akron Ohio
MARJANEH HEDAYAT, M.D., Internal Medicine Specialists Inc., Fairlawn, Ohio

Symptoms of attention-deficit/hyperactivity disorder (ADHD) are present in as many as 9 percent of school-age children. ADHD-specific questionnaires can help determine whether children meet diagnostic criteria for the disorder. The recommended evaluation also includes documenting the type and severity of ADHD symptoms, verifying the presence of normal vision and hearing, screening for comorbid psychologic conditions, reviewing the child's developmental history and school performance, and applying objective measures of cognitive function. The stimulants methylphenidate and dextroamphetamine remain the pharmacologic agents of first choice for the management of ADHD. These agents are equally effective in improving the core symptoms of the disorder, but individual children may respond better to one stimulant medication than to another. Achievement of maximal benefit may require titration of the initial dosage and dosing before breakfast, before lunch and in the afternoon. The family physician should tailor the treatment plan to meet the unique needs of the child and family. Psychosocial, behavioral and educational strategies that enhance specific behaviors may improve educational and social functioning in the child with ADHD. (Am Fam Physician 2001;64:817-29,831-2.)

O *A patient information handout on ADHD, written by the authors of this article, is provided on page 831.*

Up to 19 percent of school-age children have behavioral problems, with up to one half of them displaying attention or hyperactivity problems.[1] Frequently, family physicians are asked to evaluate and treat a child who does poorly in school, has disruptive relationships with peers or defies parental discipline. Although attention-deficit/hyperactivity disorder (ADHD) could account for such symptoms, physicians should remember that symptoms consistent with ADHD can be due to other disorders *(Table 1)*.[2-10]

This article suggests a systematic approach to implementing key elements of the practice guidelines formulated by the American Academy of Pediatrics (AAP)[11] and the American Academy of Child and Adolescent Psychiatry (AACAP)[2] for the evaluation and treatment of children with presumed ADHD. Both guidelines recommend using ADHD- specific rating scales to obtain parent and teacher ratings of core symptoms, basing the diagnosis on the criteria for ADHD as given in the *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed. (DSM-IV),[12] and screening for comorbid disorders. The AACAP proposes augmenting the standard history and physical examination with a review of the child's developmental and family history, confirmation of normal hearing and vision in the child, and an assessment of family stressors and coping style *(Table 2)*.[2,11]

A detailed evaluation can be a challenge for the family physician who first learns of a child's difficulties during a routine office visit when parents are intent on obtaining stimulant medication for a child who has already been "diagnosed" with ADHD by themselves or teachers. This initial office visit may only allow time to listen to the parents' concerns, explain the need for a thorough evaluation and arrange for further data collection. A systematic approach to diagnosis can help the physician avoid the tempting (and seemingly time-efficient) urge to forego a comprehensive evaluation, write a prescription and "monitor progress" at a subsequent visit.

Parents and teachers should understand that a careful and complete evaluation will span several office visits and may require special testing or consultation. Parents and teachers can better accept the postponement of immediate treatment if the physician communicates an understanding of the behaviors that concern them, indicates a shared commitment to doing what is best for the child and explains the elements of a stepwise, compre-

TABLE 1
Differential Diagnosis of ADHD

General medical conditions	Neurologic conditions	Environmental conditions
Hearing impairment	Learning disability*	Improper learning environment (e.g., unsafe, disruptive)*
Visual impairment	Tic disorder	Mismatch of school curriculum with child's ability (e.g., gifted, learning-disabled)
Medication effects (e.g., antihistamine decongestants, beta agonists, anticonvulsants)	Seizure disorder	Family dysfunction or stressful home environment*
Asthma	Mental retardation (e.g., fetal alcohol syndrome, fragile X syndrome, phenylketonuria)	Poor parenting (e.g., inappropriate, inconsistent, punitive)*
Allergic rhinitis	Developmental delays	Child neglect or abuse*
Eczema	Brain injury	Parental psychopathology*
Enuresis*	Sleep disorders	
Encopresis	**Psychiatric conditions**	
Malnutrition (e.g., vitamin deficiency)	Oppositional defiant disorder*	
Hypothyroidism	Conduct disorder*	
Lead toxicity	Substance abuse	
	Anxiety*	
	Depression*	
	Obsessive-compulsive disorder*	
	Post-traumatic stress disorder	

ADHD = attention-deficit/hyperactivity disorder.

**—Common comorbid and associated conditions.*

Information from references 2 through 10.

hensive approach to the proper diagnosis of the child's problem behaviors.

Confirming the Diagnosis

A number of questions need to answered before the diagnosis of ADHD can be established.

Do the child's symptoms fulfill DSM-IV criteria for the diagnosis of ADHD?

Despite broad endorsement for using ADHD-specific behavior rating scales and DSM-IV criteria to diagnose and monitor ADHD, most primary care physicians use neither.[1] Yet proper diagnosis of ADHD requires a clear understanding of the type and severity of academic difficulties and the core ADHD behaviors that occur at home and in school.[2,3,11]

The DSM-IV criteria for the diagnosis of ADHD are given in *Table 3*.[12] Examples of practical ADHD-specific rating scales that elicit DSM-IV criteria for inattention and hyperactivity are provided in *Figure 1*[13]*;* norms for patient age and gender, and scoring information for physicians are provided in *Figure 2*.[13] Children with scores above the 93rd percentile generally meet the DMS-IV criteria for the diagnosis of ADHD. Administration of the scales should be repeated periodically as part of an overall assessment of the child's response to treatment.

Does the child have normal vision and hearing?

It is important to verify that the child's vision and hearing are normal. Visual and auditory problems can contribute to poor school performance and inattention.

Does the child's history suggest the presence of a comorbid psychiatric disorder?

Some of the behaviors in ADHD can be manifestations of, or coexist with, other psychiatric disorders. As many as one third of children with ADHD also have oppositional defiant disorder, one fourth to one half have conduct disorder, one fifth have depression and one fourth have anxiety.[4,10,14,15] Preschool-age children and adolescents who have not been previously diagnosed with ADHD are more likely to have comorbid psychiatric conditions.[5]

The family physician can screen for comorbid psychiatric disorders using questions such as those given in *Table 4.* Positive responses should prompt more formal evaluation and consideration of the DSM-IV criteria for such disorders.[12]

Does the child have a learning disability?

Although ADHD behaviors alone may result in poor school performance, it is important to remember that 20 to 30 percent of children with ADHD also have learning disabili-

Parents and teachers should understand that a careful and complete evaluation will span several office visits and may require special testing or consultation.

TABLE 2

TABLE 3

DSM-IV Criteria for the Diagnosis of ADHD

A. Either 1 or 2:

1. Six (or more) of the following symptoms of inattention have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

   Inattention

   a. Often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
   b. Often has difficulty sustaining attention in tasks or play activities
   c. Often does not seem to listen when spoken to directly
   d. Often does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
   e. Often has difficulties organizing tasks and activities
   f. Often avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
   g. Often loses things necessary for tasks or activities (e.g., toys, school assignments, pencils, books or tools)
   h. Is often easily distracted by extraneous stimuli
   i. Is often forgetful in daily activities

2. Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level:

   Hyperactivity

   a. Often fidgets with hands or feet, or squirms in seat
   b. Often leaves seat in classroom or in other situations in which remaining seated is expected
   c. Often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
   d. Often has difficulty playing or engaging in leisure activities quietly
   e. Is often "on the go" or acts as if "driven by a motor"
   f. Often talks excessively

   Impulsivity

   g. Often blurts out answers before questions have been completed
   h. Often has difficulty awaiting turn
   i. Often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattention symptoms that caused impairment were present before the age of seven years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic or occupational functioning.

E. The symptoms do not occur exclusively during the course of a pervasive developmental disorder, schizophrenia or other psychiatric disorder and are not better accounted for by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder or a personality disorder).

DSM-IV = Diagnostic and Statistical Manual of Mental Disorders. 4th ed.; ADHD = attention-deficit/hyperactivity disorder.

FIGURE 1.

ADHD Rating Scale-IV: Scoring and Norms

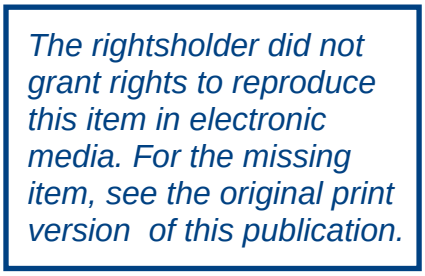

FIGURE 2.

ties.[2,3,6,10,14] Cognitive testing may be beneficial in the child whose reading or language achievement is below grade level. This testing can be used not only to assess learning disabilities but also to identify academic strengths and suggest educational interventions to improve school performance.[16] Some physicians choose to determine the need for formal cognitive testing after observing the impact of stimulant medication on a child's ADHD symptoms and school performance.

Has the child's development proceeded normally?

Although the parents of children with ADHD frequently describe colic, difficult temperament and feeding or sleep problems, developmental milestones are usually normal.[7,8] A history of developmental delay suggests the possibility of an underlying organic condition.

How has the family responded to the child's behavior?

Family dysfunction can cause behaviors consistent with those occurring in ADHD. Similarly, family tensions can exacerbate existing ADHD. Therefore, it is important to inquire about family stressors and coping methods. For instance, the family physician should understand the family's philosophical approach to discipline, as well as their difficulties in disciplining the child with ADHD.

Do the findings of the child's history or physical examination suggest the need for additional diagnostic testing?

ADHD is a clinical diagnosis. Blood tests and imaging studies of the brain are not recommended in the routine evaluation of the child with ADHD symptoms.[2,4,11,17] Diagnostic testing should be guided by the findings of the history and physical examination.

A family history of mental retardation, fragile X syndrome, phenylketonuria or degenerative neurologic disorder suggests the need for further evaluation.[18] Similarly, dysmorphic features and abnormalities of growth, development or neurologic function may reflect a genetic disorder (e.g., fragile X syndrome), a prenatal insult (e.g., alcohol abuse by the mother) or a chronic medical condition.[8]

Children with reading or language achievement below grade level may benefit from formal cognitive testing. This testing can be used not only to assess learning disabilities but also to identify academic strengths and suggest educational interventions to improve school performance.

Creating an Individualized Treatment Plan

A comprehensive treatment plan should address not only the child's symptoms of inattention, hyperactivity and impulsivity, but

TABLE 4

Screening Questions to Detect Comorbid Conditions in the Child with ADHD*

Depression
Does the child worry or cry excessively?
Does the child have recurrent thoughts of death or suicide?
Conduct disorder
Is the child violent or cruel toward people or animals?
Has the child deliberately destroyed others' property?
Does the child steal?
Has the child been involved in delinquent behavior?
Oppositional defiant disorder
Does the child argue with adults and actively defy rules?
Does the child frequently lose his or her temper?
Tourette's syndrome
Does the child show repetitive vocal or motor tics?
Possible sexual abuse
Does the child exhibit inappropriate sexual behavior?

ADHD = attention-deficit/hyperactivity disorder.

**—Positive responses should prompt more formal evaluation and consideration of the diagnostic criteria for such disorders.[12]*

also the child's academic performance, social interactions and family function. The AACAP recommends a multimodal treatment plan.[2] One reason for this recommendation is that even though pharmacotherapy improves attention and decreases excessive physical activity, these symptomatic improvements do not necessarily enhance the child's function in educational or social domains.[3,19,20] Thus, it is reasonable to recommend parental support and education to improve coping abilities, suggest behavioral interventions to improve conduct at home and school, and advocate educational intervention to optimize academic progress.[2,3,21]

The Multimodal Treatment Study of Children with ADHD (MTA) was a well-designed randomized trial comparing four ways to treat ADHD: protocol-based medication management alone, intensive behavioral treatment alone, combined medication and behavioral (multimodal) treatment, or community care.[22] In the community-care group, children with ADHD and their parents received information about their comprehensive assessments and the available mental health resources for ADHD in their community. In this group, the decision to use medications, behavioral interventions, or both, was left to the discretion of community-based physicians and the children's parents. Two thirds of the children in the community-care group received stimulant medications.

The study showed that protocol-based medication management plus intensive behavioral therapy did not improve core ADHD symptoms better than protocol-based medication management alone, but that both strategies were superior to community care. Intensive behavioral treatment alone was nearly equal in effectiveness to community care, confirming the viability of specialized behavioral treatment for parents who prefer nonpharmacologic treatment of ADHD.[23]

Most family physicians cannot access the intensive behavioral treatment used in the MTA study. However, they can create multimodal treatment plans using elements of various psychosocial, behavioral and educational interventions.

PSYCHOSOCIAL INTERVENTIONS

Psychosocial interventions should help the child with ADHD gain social skills and have more satisfying interactions with peers and family members. For instance, encouraging children with ADHD to participate in sports or other recreational activities may promote self-esteem and improve positive relationships with peers and adults.

ADHD advocacy and support groups can help parents adapt to the challenges of living with a child who has ADHD. These groups can also help parents learn useful behavior management and discipline strategies.

Individualized counseling may benefit the child with ADHD who has a comorbid psychologic condition. This form of counseling can also be helpful if the family has been experiencing emotional distress.

BEHAVIORAL INTERVENTIONS

Behavioral interventions use positive rewards to encourage appropriate behaviors and reduce problem behaviors. These interventions begin with a detailed description of specific behaviors and the environmental conditions that elicit and reinforce them. Interventions are most effective when parents and school personnel focus on a limited number of

The Authors

WILLIAM D. SMUCKER, M.D., is associate residency director for Summa Health System, Akron, Ohio, and professor of family medicine at Northeastern Ohio Universities College of Medicine, Rootstown. Dr. Smucker graduated from Case Western Reserve University School of Medicine, Cleveland, and completed a family medicine residency at Summa Health System.

MARJANEH HEDAYAT, M.D., is in private practice at Internal Medicine Specialists Inc., Fairlawn, Ohio. After graduating from Saint Louis University School of Medicine, St. Louis, Dr. Hedayat completed an internal medicine internship at Jewish Hospital, St. Louis, and a family medicine residency at Summa Health System.

Address correspondence to William D. Smucker, M.D., Family Practice Residency Program, Summa Health System, 75 Arch St., Ste. 002, Akron, OH 44304 (e-mail: smuckerw@summa-health.org). Reprints are not available from the authors.

specific behaviors, agree to a system of rewards and consequences, and apply the consequences quickly and consistently in all settings.

EDUCATIONAL INTERVENTIONS

The purpose of educational interventions is to maximize the likelihood of the child's academic success by developing areas of strength, adapting to special needs and remediating knowledge and skill deficits. Schools have a legal responsibility to determine whether a child is eligible for special educational services, such as tutoring or adaptation of educational methods, and to ensure that these services are provided.[7] Teachers may suggest academic skills training to help the child follow directions, use time efficiently, check his or her work, take notes and study effectively.

PHARMACOLOGIC TREATMENT

An evidence-based review by the Agency for Healthcare Research and Quality (formerly the Agency for Health Care Policy and Research) found that most studies of ADHD treatments were limited by one or more design deficiencies in sample size, descriptions of primary outcomes, measurement of compliance or assessment for comorbid disorders.[4] Despite these limitations, the authors of the review concluded that ADHD symptoms tend to improve over time with or without treatment, that stimulant medications and desipramine improve core symptoms more effectively than placebo, and that currently available stimulants have equal efficacy.

Although stimulant medications improve core ADHD symptoms in up to 80 percent of properly diagnosed children, the diagnosis of ADHD cannot be reliably confirmed or excluded based on a positive or negative response to stimulants.[3,19-21,24] Stimulant medications may improve excessive physical activity, inattention, impulsivity and poor self-control, physical and verbal aggression, and low academic productivity. Treatment with these agents may not improve antisocial behavior, reading skills or academic achievement.

Combination (multimodal) treatment did not improve core ADHD symptoms better than protocol-based medication management alone, but both were superior to community care.

Reported adverse effects of stimulant medications include insomnia, decreased appetite, stomach pain, headache, emergence or worsening of tics, decreased growth velocity, tachycardia, blood pressure elevation, rebound or deterioration of ADHD behaviors when medication wears off, emotional lability, irritability, social withdrawal and flattened affect. Because many of these signs and symptoms are reported in children with ADHD who receive a placebo, it is prudent to document the presence or absence of potential adverse effects before a stimulant drug is initiated.

Of the stimulant drugs used to treat ADHD, only pemoline (Cylert) is associated with an increased risk of liver damage and hepatic failure. Accordingly, the package insert warns that pemoline should not be prescribed without first obtaining informed consent using the form supplied by the manufacturer of the drug. The package insert also recommends monitoring serum alanine aminotransferase levels before pemoline therapy is initiated and every two weeks thereafter.

A number of stimulants, some with short- and long-acting formulations, are listed in *Table 5*.[4,9,19-22] The table includes recommendations for initial and maximal dosages, some based on body weight. When reviewing these recommendations, the physician should remember that the response to stimulant medication is not directly related to the dose per kilogram of body weight or to serum drug levels.

Because the MTA medication management strategy produced results that were superior to those for community care, the family physician may wish to emulate this strategy for prescribing stimulants. The MTA protocol first identified the best dose of methylphenidate by measuring the effect of placebo and various

methylphenidate doses on the findings of ADHD rating scales completed by parents and teachers.[22] Methylphenidate doses of 5, 10 and 15 or 20 mg were administered at breakfast and lunch, with one half of the dose (rounded to the nearest 5 mg) given in the afternoon. An inadequate response to methylphenidate was followed first by a trial of dextroamphetamine, then pemoline and then imipramine. Dosages were increased if the rating scales showed an incomplete response or were decreased to alleviate adverse effects.

TABLE 5
Medications Used to Treat ADHD

Medication	*How supplied*	*Usual initial dose*	*Single-dose range*	*Dosage range*	*Dosage schedule*
Methylphenidate, immediate release					
Generic, Ritalin, Methylin	Tablet: 5, 10 and 20 mg	0.3 to 0.6 mg per kg per dose, or 2.5 to 5 mg	0.3 to 0.8 mg per kg	5 to 80 mg per day	Two or three times daily: full dose given 30 minutes before breakfast and lunch; half-dose given at 3:00 to 4:00 p.m.
Methylphenidate, extended release					
Ritalin-SR	Tablet: 20 mg	20 mg	0.6 to 2 mg per kg, or 20 to 40 mg	20 to 80 mg per day	Once or twice daily
Concerta	Tablet: 18 and 36 mg	18 mg	18 mg	18 to 54 mg per day	Once daily
Dextroamphetamine, immediate release					
Generic, Dexedrine	Capsule: 5, 10 and 15 mg	0.15 mg per kg, or 2.5 to 5 mg	0.15 to 0.5 mg per kg	5 to 40 mg	Two or three times daily
DextroStat	Tablet: 5 and 10 mg				
Dextroamphetamine, extended release					
Dexedrine Spansules	Capsule: 5, 10 and 15 mg	5 mg each morning	0.3 to 0.8 mg per kg, or 5 to 20 mg	5 to 40 mg per day	Once or twice daily
Amphetamine-dextroamphetamine (Adderall)	Tablet: 5, 10, 20 and 30 mg	2.5 to 5 mg	0.15 to 0.5 mg	2.5 to 40 mg per day	Once or twice daily
Pemoline (Cylert)	Tablet: 18.75, 37.5 and 75 mg Chewable tablet: 37.5 mg	18.75 mg each morning	0.5 to 2.5 mg per kg	2 mg per kg, or 18.75 to 112.5 mg per day	Once or twice daily

ADHD = attention-deficit/hyperactivity disorder; NA = not available.

Information from references 4, 9, and 19 through 22.

In some children, stimulant medications with longer half-lives may be beneficial if the effects of short-acting preparations are too brief (two and one-half to three hours), if symptoms worsen at the end of the dosing interval or if administering medication at school is problematic. A combination agent containing amphetamine and dextroamphetamine (Adderall) has a rapid onset and longer duration of action than methylphenidate; in appropriate dosages, it may prevent rebound symptoms.[25] However, no study has shown

Peak clinical effect	*Onset of behavioral effect*	*Duration of behavioral effect*	*Contraindications, monitoring, precautions and adverse effects*
Average: 1.9 hours; range: 0.3 to 4 hours	20 to 60 minutes	3 to 6 hours	Contraindications: motor tics, glaucoma, history of seizures, hypertension, pregnancy Recommended monitoring: height, weight, blood pressure, pulse Precautions: avoid decongestants Adverse effects: rebound or deterioration of behavior when medication wears off; emotional lability, irritability, tearfulness, social withdrawal, flattened affect, insomnia, poor appetite, stomach pain, weight loss, reduced growth velocity, headache
Average: 4.7 hours; range: 1.3 to 8.2 hours	60 to 90 minutes	5 to 8 hours	Same as above Tablets should not be cut in half or crushed.
NA	1 to 2 hours	12 hours	Same as above
1 to 2 hours	20 to 60 minutes	4 to 6 hours	Same as methylphenidate *plus* avoid concomitant use with monoamine oxidase inhibitors
NA	60 to 90 minutes	6 to 10 hours	Same as methylphenidate
1 to 2 hours	30 to 60 minutes	4 to 6 hours	Same as methylphenidate
Variable Steady state in 2 to 3 days Titrate dosage every 3 to 4 weeks.	2 hours (variable)	6 to 10 hours	Informed consent must be obtained before this drug is prescribed. Required monitoring: alanine aminotransferase level at baseline and every 2 weeks; inquire about anorexia, malaise, gastrointestinal symptoms, dark urine. Adverse effects: choreoathetoid movements, liver dysfunction, liver failure, *plus* same as methylphenidate

A child may respond poorly to stimulant medication because of an undiagnosed comorbid condition, the emergence of psychosocial stressors or noncompliance.

that this agent is superior to the dextroamphetamine stimulants.

Because of lack of efficacy or the emergence of adverse effects, stimulant therapy is unsuccessful in 25 to 30 percent of children.[21] A child may respond poorly to stimulant medication because of an undiagnosed comorbid condition, the emergence of psychosocial stressors or noncompliance. In the MTA study,[22] children were given bupropion or haloperidol if stimulants proved ineffective. Desipramine and clonidine have also been suggested as alternatives to stimulants in children with ADHD.[24]

ALTERNATIVES TO DRUG THERAPY FOR ADHD

Parents of children with ADHD may inquire about alternatives to drug treatment, including dietary modification, nutritional supplements, homeopathy and vision therapy. The family physician should be familiar with the studies that have evaluated the efficacy of these treatments.[26]

The most widely studied dietary modifications for the treatment of ADHD are the additive-free Kaiser-Permanente diet and the Feingold diet. These diets have been found to produce behavioral or cognitive improvement in approximately 5 percent of hyperactive children. Unfortunately, this response rate is no better than the expected response to placebo.[2,27]

Parents of a child with ADHD who wish to pursue dietary modification should do so in consultation with a physician to monitor progress and in consultation with a dietitian to ensure nutritional adequacy. They should also recognize the potential risk of forgoing pharmacologic treatment, which has many benefits.

Reducing or eliminating sugar to treat ADHD has widespread support among lay persons and in the lay press. However, controlled trials have not shown that the ingestion of sugar has an effect on activity or aggression in normal or hyperactive children.[2,18,27,28]

ADHD symptoms are not improved by supplementing a child's diet with iron, magnesium, pyridoxine or zinc if no nutritional deficiency exists.[26] Similarly, megavitamin therapy does not improve ADHD behaviors and may produce toxic effects.[29] Eye muscle exercises and special eyeglass lenses have not proved beneficial in children with ADHD.[30]

INDICATIONS FOR REFERRAL

Further assessment by a psychiatrist or developmental-behavioral pediatrician may be beneficial for children with ADHD who have comorbid psychiatric conditions, who do not respond to stimulants or who have extremely difficult problems in their relationships with peers, teachers or family. Referral is also indicated for children with developmental abnormalities or mental retardation and severe symptoms of ADHD.[7]

Follow-up Visits

Follow-up visits should occur as often as needed to monitor the effects of a comprehensive treatment plan. The MTA study, which showed that combined medication and behavioral treatment was superior to standard community care, used monthly 30-minute medication management visits to encourage and advise children and parents, review ADHD rating scales and adjust medication dosages.[22]

Because the child with ADHD frequently has low self-esteem and few successes, the family physician should start each visit by having the child and parent report positive experiences with hobbies, athletics, peer activities, family interactions or academic performance. Then the physician should monitor the effects of medications by reviewing ADHD-specific rating scales and inquiring about possible adverse drug effects.

Dr. Smucker's research and scholarly work is supported in part by a grant from the Summa Health System Foundation and Northeastern Ohio Universities College of Medicine, Rootstown, Ohio.

The authors thank Maggie Abernathy for invaluable assistance with the preparation of the manuscript.

The authors indicate that they do not have any conflicts of interest. Sources of funding: none reported.

REFERENCES

1. Wasserman RC, Kelleher KJ, Bocian A, Baker A, Childs GE, Indacochea F, et al. Identification of attentional and hyperactivity problems in primary care: a report from pediatric research in office settings and the ambulatory sentinel practice network. Pediatrics 1999;103:E38.
2. Dulcan M. Practice parameters for the assessment and treatment of children, adolescents, and adults with attention-deficit/hyperactivity disorder. American Academy of Child and Adolescent Psychiatry. AJ Am Acad Child Adolesc Psychiatry 1997;36:85S-121S.
3. Goldman LS, Genel M, Bezman RJ, Slanetz PJ. Diagnosis and treatment of attention-deficit/hyperactivity disorder in children and adolescents. JAMA 1998;279:1100-7.
4. Jadad AR, Boyle M, Cuningham C, et al. Treatment of attention-deficit/hyperactivity disorder. Rockville, Md.: Agency for Healthcare Research and Quality, 1999; evidence report/technology assessment no. 11 (prepared by McMaster University under contract 290-97-0017); AHRQ publication no. 00E005.
5. Hazell P. The overlap of attention deficit hyperactivity disorder with other common mental disorders. J Paediatr Child Health 1997;33:131-7.
6. Fletcher JM, Shaywitz SE, Shaywitz BA. Comorbidity of learning and attention disorders. Separate but equal. Pediatr Clin North Am 1999;46:885-96,vi.
7. Barbaresi WJ. Primary-care approach to the diagnosis and management of attention-deficit hyperactivity disorder. Mayo Clin Proc 1996;71:463-71.
8. Accardo P. A rational approach to the medical assessment of the child with attention-deficit/hyperactivity disorder. Pediatr Clin North Am 1999; 46:845-56,v.
9. Miller KJ, Castellanos FX. Attention deficit/hyperactivity disorders. Pediatr Rev 1998;19:373-84.
10. Biederman J, Newcorn J, Sprich S. Comorbidity of attention deficit hyperactivity disorder with conduct, depressive, anxiety, and other disorders. Am J Psychiatry 1991;148:564-77.
11. Clinical practice guideline: diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. American Academy of Pediatrics. Pediatrics 2000;105:1158-70.
12. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington, D.C.: American Psychiatric Association, 1994.
13. DuPaul GJ, et al. ADHD rating scale-IV: checklists, norms, and clinical interpretation. New York: Guilford, 1998.
14. Pliszka SR. Comorbidity of attention-deficit/hyperactivity disorder with psychiatric disorder: an overview. J Clin Psychiatry 1998;59(suppl 7):50-8.
15. Spencer T, Biederman J, Wilens T. Attention-deficit/hyperactivity disorder and comorbidity. Pediatr Clin North Am 1999;46:915-27,vii.
16. Lafleur LH, Northup J. ADHD: how school psychologists can help [Editorial]. Am Fam Physician 1997;55:773-4.
17. Schneider SC, Tan G. Attention-deficit hyperactivity disorder. In pursuit of diagnostic accuracy. Postgrad Med 1997;101(4):231-2,235-40.
18. Wolraich ML, Lindgren SD, Stumbo PJ, Stegink LD, Appelbaum MI, Kiritsy MC. Effects of diets high in sucrose or aspartame on the behavior and cognitive performance of children. N Engl J Med 1994; 330:301-7.
19. Adesman AR, Morgan AM. Management of stimulant medications in children with attention-deficit/hyperactivity disorder. Pediatr Clin North Am 1999;46:945-63,vii-viii.
20. Bennett FC, Brown RT, Craver J, Anderson D. Stimulant medication for the child with attention-deficit/hyperactivity disorder. Pediatr Clin North Am 1999;46:929-44,vii.
21. Medication for children with attentional disorders. American Academy of Pediatrics Committee on Children with Disabilities and Committee on Drugs. Pediatrics 1996;98:301-4.
22. A 14-month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. The MTA Cooperative Group. Multimodal Treatment Study of Children with ADHD. Arch Gen Psychiatry 1999;56:1073-86.
23. Taylor E. Development of clinical services for attention-deficit/hyperactivity disorder. Arch Gen Psychiatry 1999;56:1097-9.
24. Silver LB. Alternative (nonstimulant) medications in the treatment of attention-deficit/hyperactivity disorder in children. Pediatr Clin North Am 1999;46:965-75.
25. Pelham WE, Aronoff HR, Midlam JK, Shapiro CJ, Gnagy EM, Chronis AM, et al. A comparison of Ritalin and Adderall: efficacy and time-course in children with attention-deficit/hyperactivity disorder. Pediatrics 1999;103:e43.
26. Baumgaertel A. Alternative and controversial treatments for attention-deficit/hyperactivity disorder. Pediatr Clin North Am 1999;46:977-92.
27. Krummel DA, Seligson FH, Guthrie HA. Hyperactivity: is candy causal? Crit Rev Food Sci Nutr 1996;36:31-47.
28. Milich R, Pelham WE. Effects of sugar ingestion on the classroom and playground behavior of attention deficit disordered boys. J Consult Clin Psychol 1986;54:714-8.
29. Haslam RH. Is there a role for megavitamin therapy in the treatment of attention deficit hyperactivity disorder? Adv Neurol 1992;58:303-10.
30. Lennerstrand G, Ygge J. Dyslexia; ophthalmological aspects 1991. Acta Ophthalmol [Copenh] 1992; 70:3-13.