Attention-Deficit/Hyperactivity Disorder: Management

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Attention-deficit/hyperactivity disorder (ADHD) is the most common psychiatric disorder of childhood and often persists into adulthood. ADHD is a neurophysiologic disorder defined in behavioral terms and associated with significant morbidity in the realms of social and academic success, and self-esteem. ADHD is often associated with comorbid psychiatric disorders and learning disabilities, which further impede the successful development of these persons. It is essential that family physicians be knowledgeable about the presentation and diagnosis of ADHD. Stimulant medications continue to be the mainstay of treatment, although many other medications (such as antidepressants and alpha blockers) are helpful adjuvants to therapy. Current recommendations for treatment include an individualized, multimodal approach involving parents, teachers, counselors and the school system. Treatment follow-up includes monitoring response to medications in various settings, as well as side effects. With time and interest, the family physician can develop the skills needed to treat this disorder. (Am Fam Physician 2001;64:1355-62.)

Members of various medical faculties develop articles for "Practical Therapeutics." This article is one in a series coordinated by the Department of Family Medicine at the University of Michigan Medical School, Ann Arbor. Guest editor of the series is Barbara S. Apgar, M.D., M.S., who is also an associate editor of AFP.

Attention-deficit/hyperactivity disorder (ADHD) is the most common psychiatric disorder of childhood, present in approximately 5 percent of the population.[1] This disorder can affect a child's education, development, peer functioning and self-esteem. Treating patients with ADHD can be rewarding, with long-term benefits for the patient, the family and the physician-family relationship. Family physicians should be able to diagnose and treat the majority of patients who present with ADHD.[2]

Competency in the diagnosis and treatment of patients with ADHD requires an understanding of the spectrum of this condition, its comorbidities and various treatment approaches. A key component of treatment requires that the physician be aware of community and national resources for children with ADHD and their parents, including the school system, support groups and referral resources for complicated cases.

Diagnosing ADHD

The *Diagnostic and Statistical Manual of Mental Disorders,* 4th ed. (DSM-IV) criteria[3] serve as a standardized framework for the diagnosis of ADHD and recognize three subtypes of the condition: inattentive, hyperactive and combined.

The American Academy of Pediatrics recently published recommendations for the diagnosis of ADHD in school-age children *(Table 1)*.[4] These recommendations can be modified slightly to diagnose adult patients *(Table 2)*.[4-9] Standardized behavior checklists *(Table 3)*[10] can be useful in gathering information before making the diagnosis and in choosing an appropriate treatment. These scales may be completed by pediatric patients and their parents, teachers and other caregivers or by adult patients and their "significant other," children, close friends and coworkers.

DIFFERENTIAL DIAGNOSIS

Although ADHD can account for hyperactivity or inattentiveness, physicians should remember that these symptoms can also be caused by other disorders. Most of the differential diagnoses are easily missed in the absence of a thorough history and targeted questions, and some are comorbid and associated conditions. Approximately 65 percent of chil-

TABLE 1

Diagnostic Recommendations for School-Aged Children with Possible ADHD

In a child aged 6 to 12 years who presents with inattention, hyperactivity, impulsivity, academic underachievement or behavior problems, primary care physicians should initiate an evaluation for ADHD.
The diagnosis of ADHD requires that a child meet DSM-IV criteria.
The assessment of ADHD requires evidence directly obtained from parents or caregivers regarding the core symptoms of ADHD in various settings, the age of onset, duration of symptoms and degree of functional impairment.
The assessment of ADHD requires evidence directly obtained from the classroom teacher (or other school professional) regarding the core symptoms of ADHD, duration of symptoms, degree of functional impairment and coexisting conditions. A physician should review any reports from a school-based multidisciplinary evaluation where they exist, which will include assessments from the teacher or other school-based professionals.
Evaluation of the child with ADHD should include assessment for coexisting conditions.
Other diagnostic tests not routinely indicated to establish the diagnosis.

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

Information from Clinical practice guideline: diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. American Academy of Pediatrics. Pediatrics 2000;105:1158-70.

TABLE 2

Diagnostic Recommendations for Adults with Possible ADHD

In persons aged 13 years and older, who presents with inattention, hyperactivity, impulsivity, a history of interpersonal failures (multiple divorces, social isolation, no identifiable long-term friendships), deviant social or addictive behaviors (alcohol abuse, drug abuse, repeated failure at smoking cessation, delinquency or criminal behavior), occupational underachievement or frequent job failures, primary care clinicians should initiate an evaluation for ADHD.[5-9]
The diagnosis of ADHD requires that a teenager or adult meet DSM-IV criteria.
The person performing the assessment for ADHD should consider obtaining evidence, with patient consent, directly from employers and co-workers or employees, regarding the core symptoms of ADHD, duration of symptoms, degree of functional impairment and coexisting conditions.
The assessment of ADHD requires evidence directly obtained from the patient, spouse or significant other, parents (if available) and other family or household members regarding core symptoms of ADHD in various settings, age of onset, duration of symptoms and degree of functional impairment.
Evaluation of a teenager or adult with ADHD should include assessment for coexisting conditions.
Other diagnostic tests not routinely indicated to establish the diagnosis.

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

Information from Clinical practice guideline: diagnosis and evaluation of the child with attention-deficit/hyperactivity disorder. American Academy of Pediatrics. Pediatrics 2000;105:1158-70, with additional information from references 5 through 9.

dren with ADHD have one or more comorbid conditions, including major depression, conduct disorder, oppositional defiant disorder, Tourette's syndrome and learning disabilities.[11,12] In adolescence and adulthood, antisocial personality disorder and substance abuse often complicate ADHD.[13]

In complicated cases, it may be helpful to treat the comorbid condition first and see if the hyperactive or inattentive behavior persists. Although no laboratory test or imaging mode is available to detect ADHD, the use of continuous performance testing may help confirm a diagnosis of ADHD. In appropriate patients, the physician should consider testing for anemia, thyroid dysfunction or lead toxicity. ADHD is a learning disability that qualifies patients for accommodations in educational settings and should prompt referral for evaluation, if warranted.

Treatment Strategies

ESTABLISHING A TREATMENT GOAL

Because ADHD is defined and diagnosed in behavioral terms, a set of behavioral objectives should be established. The patient should be involved in the process of establishing therapeutic goals based on the presenting symptoms. The patient's reason for seeking treatment is often the clue to behavioral modifications that can measure the efficacy of treatment *(Table 4)*.

INITIATING STIMULANT TREATMENT

Psychostimulants have emerged as the treatment of choice for ADHD as the result of several randomized, placebo-controlled trials that have established these medications as effective in approximately 70 percent of patients with ADHD.[14-16]

At the initiation of treatment with stimulant medications, physicians can inform patients (or their parents) to watch for side effects and observe their onset and duration to aid in evaluating the efficacy of the medication and dosing schedule. An appropriate dose should have a reasonably consistent onset and duration of

action in an individual patient. When the patient's drug level falls below therapeutic level and continues declining, rebounding can occur, causing an increase in emotional lability and impulsivity, or a worsening of presenting symptoms. The recognition of rebound is paramount in determining whether a patient can be treated with multiple doses of the medication. Failure to recognize rebound can lead to repeated episodes of emotional upheaval, which is a truly disheartening response for patients, parents, teachers and physicians.

A stimulant medication and starting dose should be selected and initially administered only once daily *(Table 5)*. Physicians should emphasize to patients that observing their response to the treatment (i.e., effects, onset, duration) will help in determining the correct dose and dosing interval.[17] If the starting dose is too low, the desired response will not be achieved. If the starting dose is too high or misdiagnosis results in an inappropriately prescribed stimulant, the typical side effects will occur.[18] Reliable patients should be allowed to titrate their dose in predetermined increments up to a predetermined maximum.

Once the most effective dose has been established, the physician can determine the dosing frequency, keeping in mind the reported duration of action. If redosing is necessary, the next dose should be given before the previous dose has lost its efficacy and early enough in the day to avoid sleep problems. Some patients with ADHD sleep better with a stimulant, so a trial of dosing that would intentionally influence sleep might be considered on a Friday night.

TREATMENT OPTIONS

The challenge for physicians is to establish a treatment regimen that has a rapid, predictable onset of action, a duration of action that does not require redosing, no negative side effects (e.g., rebound, mood alteration, anorexia, sleep deprivation) and a beneficial effect on comorbidities. A variety of short- and long-acting stimulants,[19] antidepressants, alpha and beta blockers, mood stabilizers and

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TABLE 3
Standardized Behavior Checklists Used in the Diagnosis of ADHD

Achenbach Behavioral Checklist
1 S. Prospect St.
Burlington, VT 05401-3456
802-656-8313

ADD-II Comprehensive Teacher Rating Scale (ACTeRS)
MetriTech, Inc.
4106 Fieldstone Rd.
Champaign, IL 61821
800-747-4868

Child Behavior Rating Scale
Western Psychological Resources
12031 Wilshire Blvd.
Los Angeles, CA 90025-1251
800-648-8857

Copeland Symptom Checklist for Attention Deficit Disorder
Resurgens Press, Inc.
P.O. Box 12389
Atlanta, GA 30355-2389
404-457-2004

Conners Rating Scales
Multi-Health Systems, Inc.
908 Niagara Falls Blvd.
North Tonawanda, NY 14120-2060
800-456-3003

ADHD = attention-deficit/hyperactivity disorder.

Adapted with permission from Johnson TM. Evaluating the hyperactive child in your office: is it ADHD? Am Fam Physician 1997;56:156.

TABLE 4
Common Treatment Goals of Patients with ADHD

Ability to do the following:
- Remember recently read material
- Get written work done in a reasonable amount of time (i.e., less work brought home to complete)
- Avoid procrastination
- Get organized
- Finish one project before starting another
- Initiate uninteresting but necessary tasks without wasting time

ADHD = attention-deficit/hyperactivity disorder.

TABLE 5
Comparison of Psychostimulants Used in the Treatment of ADHD

Medication	*Available forms*	*Dose (mg)*	*Doses per day*	*Effect duration (hours)*
Rapid onset, short duration				
Methylphenidate (Ritalin)*†	Tablet: 5, 10, 20 mg (10, 20 mg scored)	Initial: 5 Increment: 5 to 10	2 to 6	1 to 4
Dextroamphetamine (Dexedrine)*	Capsule: 5, 10, 15 mg	Initial: 2.5 to 5 Increment: 2.5 to 5	1 to 3	1 to 8
(Dextrostat)*	Tablet: 5 mg (scored)	Same as above	Same as above	Same as above
Slower onset, longer duration				
Methylphenidate (Ritalin-SR)†	Tablet: 20 mg	Initial: 20 Increment: 20	1 to 3	3 to 9
(Metadate-ER)	Tablet: 10, 20 mg	Same as above	Same as above	Same as above
Dextroamphetamine (Dexedrine Spansules)*	Capsule: 5, 10, 15 mg	Initial: 5 Increment: 5	1 to 3	6 to 8
Pemoline (Cylert)	Tablet: 18.75, 37.5 and 75 mg, and 37.5-mg chewable tablet (all scored)	Initial: 37.5 Increment: 18.7	1 to 2	7 to 9
Rapid onset, longer duration				
Amphetamine-dextroamphetamine (Adderall)*	Tablet: 5, 7.5, 10, 12.5, 15, 20, 30 mg (scored for halves and quarters)	Initial: 2.5 to 10 Increment: 2.5 to 5	1 to 3	6 to 8
Methylphenidate (Concerta)	Capsule: 18, 36, 54 mg	Initial†: 18 Increment: 18	1	12

ADHD = attention-deficit/hyperactivity disorder.

**—Age-adjusted starting doses.*

†—*In methylephenidate-naïve patients.*

major tranquilizers are available to help physicians meet this challenge.

Short-Acting Stimulants. Methylphenidate (Ritalin) and dextroamphetamine (Dexedrine) are two commonly used short-acting stimulants. Onset of action is generally rapid, and duration of action is about four hours. Some patients respond better to one stimulant than the other, so it may be useful to administer both separately and compare responses.

Initiating treatment with a short-acting stimulant has some practical advantages. If the medication or dose is inappropriate, side effects will be gone within four hours. Also, a single, effective dose may convince a skeptical teacher or parent of the medication's benefit, because they can observe the patient's behavior with and without the medication during the same day.

The disadvantages of short-acting stimulants include the risk of rebound and the necessity of dosing more than once daily to achieve benefit throughout the day.

Long-Acting Stimulants. Methylphenidate and dextroamphetamine exist in long-acting formulations but, until recently, their efficacy as "once-a-day" medications had been disappointing. These forms have a slower onset of action than the short-acting stimulants. Coadministration of a rapid-onset stimulant can be a useful strategy,[20] because rapid onset of effect is achieved and, if desired, the longer-acting drug can prevent rebound symptoms.

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A patient who has achieved effective results with a cumulative methylphenidate dosage of 15 to 60 mg daily may be a good candidate for a trial of Concerta in an attempt to convert to once-daily dosing.

Two medications provide rapid onset and long duration of action. A combination agent containing amphetamine and dextroamphetamine (Adderall) has a duration of action that increases as the initial dose is increased and is achieved via gradual hepatic metabolism of the inactive salts to active forms. Adderall can adequately treat most patients with ADHD when administered once daily and is available in multiple strengths of scored tablets to allow for flexible dosing.

One form of methylphenidate (Concerta) utilizes a unique delivery system. A layer of fast-acting methylphenidate coats a two-chambered capsule; one chamber contains methylphenidate, and the other chamber contains a slowly expanding substance that pushes out the methylphenidate. Concerta is designed to provide a 12-hour duration of action and may prove to be a reliable once-daily medication. It is available in 18-mg, 36-mg and 54-mg doses, with 54 mg being the recommended maximal daily dose. A patient who has achieved effective results with a cumulative methylphenidate dose of 15 to 60 mg daily may be a good candidate for a trial of Concerta in an attempt to convert to once-daily dosing. Patients with daily doses outside this range may find it difficult to achieve appropriate dosing with Concerta. Adderall and Concerta can be supplemented with a rapid-acting stimulant if, when given alone, the onset of action is too slow.

The concept of a maximal safe dose of any of the stimulants is difficult to apply to an individual patient since effective doses and durations of action vary significantly from patient to patient. A more useful approach is individualizing dosing regimens that are effective and void of side effects.

Antidepressants. Any antidepressant with norepinephrine effects can be used as independent treatment or as an adjunct to stimulant medication. These agents include tricyclic antidepressants,[21] bupropion (Wellbutrin)[22] and venlafaxine (Effexor).[23] The tricyclic antidepressants are common additions to treatment when physicians are trying to improve the patient's sleep and appetite, or treat a comorbidity of enuresis. If depression is a comorbidity, therapy with any antidepressant, including the selective serotonin reuptake inhibitors (SSRIs), should be considered.[24] The SSRIs can also be useful in patients who seem to be hyperfocused on certain activities, such as computer games or "surfing the Web," or who exhibit unproductive behaviors that might be considered a variation of obsessive-compulsive disorder.

Other Adjunctive Medications. The $alpha_2$ blockers clonidine (Catapres)[25] and guanfacine (Tenex)[26] are useful in modulating emotions and behaviors (e.g., motor tics, anger, irritability, anxiety and frustration) that can be initiated or worsened by stimulants. Beta blockers[27] and low doses of certain antiseizure medications, such as carbamazepine (Tegretol) and divalproex (Depakote), can be helpful. When extreme oppositional defiant behavior is a suspected comorbidity or when tics remain problematic, therapy with major tranquilizers like risperidone (Risperdal) could be initiated, and psychiatric consultation should be considered.

Psychosocial Interventions. Most experts and organizational policies promote a multimodal approach to therapy for the child with ADHD. The treatment plan should include behavior modification and educational, psychotherapeutic and school-based approaches. Although this multimodal approach appears to meet the varied needs of patients and families, little scientific evidence supports its efficacy. The multimodal approach is currently being reviewed.[28]

Education. Parents, teachers and children can be educated about ADHD as an initial component of treatment. The physician can reassure the parents that ADHD is a result of nature[29,30] rather than nurture, to help them avoid feelings of guilt over "bad parenting." In addition, it is important for physicians to address parents' fears about using what has been described in the popular press as an "overprescribed drug with abuse potential." A patient education

handout directed toward parents should be available, because parents of children with ADHD often have characteristics of ADHD themselves. The handout should combine succinct written information and graphics. A list of resources for ADHD information should also be made available *(Table 6)*. Parents can be referred to local and national support groups, such as Children and Adults with Attention-Deficit/Hyperactivity Disorder (CHADD; Web address: http://www.chadd.org).

TABLE 6
Books for Children with ADHD and Their Parents

Children

Distant Drums, Different Drummers: A Guide for Young People with ADHD. By Barbara D. Ingersoll. Bethesda, Md.: Cape Publications, 1995.

Eukee the Jumpy Elephant. By Cliff L. Corman and Esther Trevino. Plantation, Fla.: Specialty Press, 1995.

Otto Learns About His Medicine: A Story About Medication for Children with ADHD. By Matthew Galvin. New York: Magination Press, 1996.

Putting on the Brakes: Young People's Guide to Understanding Attention Deficit Hyperactivity Disorder (ADHD). By Patricia O. Quinn and Judith M. Stern. New York: Magination Press, 1991.

Shelley: the Hyperactive Turtle. By Deborah M. Moss. Kensington, Md.: Woodbine House, 1989.

Sometimes I Drive my Mom Crazy, But I Know She's Crazy about Me. By Lawrence E. Shapiro. King of Prussia, Pa.: Center for Applied Psychology, 1993.

Zipper: The Kid with ADHD. By Caroline Janover. Bethesda, Md.: Woodbine House, 1997.

Parents

The Attention Deficit Answer Book: the Best Medications and Parenting Strategies for Your Child. By Alan Wachtel and Michael Boyette. New York: Plume, 1998.

Brainstorms: Understanding and Treating the Emotional Storms of Attention Deficit Hyperactivity Disorders from Childhood through Adulthood. By H. Joseph Horacek. Northvale, N.J.: J. Aronson, 1998.

Daredevils and Daydreamers: New Perspectives on Attention-Deficit/Hyperactivity Disorder. By Barbara D. Ingersoll. New York: Doubleday, 1998.

How to Keep Your Kids from Driving You Crazy: a Proven Program in Improving Your Child's Behavior and Regaining Control of Your Family. By Paula Stone Bender. New York: Wiley, 1997.

Your Defiant Child: 8 Steps to Better Behavior. By Russell A. Barkley and Christine M. Benton. New York: Guilford Press, 1998.

ADHD = attention-deficit/hyperactivity disorder.

Children with ADHD should be encouraged to understand that the medication helps them focus and learn, and that they aren't taking it because they are "bad." Some children benefit from hearing age-appropriate stories about other children with ADHD *(Table 6)*. Local school personnel should understand the cause and treatment of ADHD so they can help students with ADHD succeed in the educational environment.

Special Education. Children with ADHD and a comorbid learning disability may require special education services. The parents and physicians must act as advocates for appropriate testing and services. Children with a significant discrepancy between cognitive ability and academic achievement qualify for special education services under the Individuals with Disabilities Education Act (IDEA).[31] Children who do not qualify for special education services can still benefit from targeted classroom interventions.

Behavior Modification Training. Effective discipline in children with ADHD can be challenging. Effective discipline should target problem behaviors with consistency while minimizing interactions that could damage the child's self-esteem. Physicians can encourage parents to learn behavior modification techniques that emphasize positive reinforcement.

Teachers can be encouraged to learn effective strategies for classroom management of these children, including the use of daily behavior report cards. Simple techniques such as seating arrangements can help children with ADHD. Teachers can be referred to the CHADD educator's manual for guidance.[32] For children who qualify, classroom management plans should be part of their Individual Educational Program (required by the IDEA).[31]

Children with challenging behavior that jeopardizes peer and teacher relationships (or employer relationships in adolescents and adults) may benefit from social-skills training. Individual counseling is not indicated for the primary symptoms of ADHD, but sup-

portive therapy may be helpful for patients who develop low self-esteem as a result of the disorder.

FOLLOW-UP

An assessment of the efficacy of medication, sleep patterns and appetite function should be made at every follow-up visit. When evaluating the effectiveness of the treatment, physicians should review the behavioral objectives that were established at the initiation of treatment and identify any changes that were unexpected and undesirable (such as a loss of creativity or spontaneity, a narrowed emotional response, aggressiveness, depression or paranoia). Tolerance to stimulants does not generally occur in patients with ADHD.

Any treatment regimen that interferes with sleep may not allow adequate time for patients' supply of neurotransmitters to be replenished. Possible interventions include (1) administering the last dose of stimulant earlier in the day, reducing this dose or eliminating it, or (2) adding a tricyclic antidepressant, trazodone (Desyrel), clonidine or guanfacine at bedtime.

Even when the stimulant dose is not excessive and the response is efficacious, patients may experience appetite suppression. Fasting hypoglycemia may occur, and patients may complain that the medication is not working at the end of a school day or workday. Possible interventions to prevent significant appetite suppression include the following: (1) emphasizing the importance of regular eating despite a suppressed appetite; (2) prescribing that stimulants be taken immediately after meals; (3) adding therapy with a tricyclic antidepressant at bedtime and (4) stopping the stimulant.

When $alpha_2$ blockers are used, hypotension may occur. These drugs should be tapered before being stopped.

The use of most stimulant medications does not require laboratory monitoring. The exception is pemoline (Cylert), which requires biweekly liver function testing and informed consent.[33] Blood pressure, heart rate and heart rhythm should be assessed at every visit, along with weight and height in children. A baseline complete blood cell count can be useful, since decreased appetite can lead to iron deficiency anemia. In certain geographic areas, screening for lead toxicity should be considered.

If the treatment regimen is interfering with the patient's sleep, the physician might consider administering the last dose of the medication earlier in the day, reducing this dose or stopping the medication altogether.

ALTERNATIVE APPROACHES

A variety of alternative approaches exist for the treatment of ADHD, but there are few double-blind studies to validate these approaches.[34-36]

BILLING AND CODING

Since more than one half of the time spent during initial and subsequent office visits to diagnose and treat a patient with ADHD involves consultation, the amount of time spent will determine the visit billing code. Unfortunately, many insurers will not reimburse family physicians for evaluation and management codes with a psychiatric diagnosis. One option, once the diagnosis has been established, is to use the Current Procedural Terminology (CPT) code 90862 for medication management of a psychiatric diagnosis.

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