AMERICAN ACADEMY OF PEDIATRICS

Subcommittee on Attention-Deficit/Hyperactivity Disorder

Committee on Quality Improvement

Clinical Practice Guideline: Treatment of the School-Aged Child With Attention-Deficit/Hyperactivity Disorder

ABSTRACT. This clinical practice guideline provides evidence-based recommendations for the treatment of children diagnosed with attention-deficit/hyperactivity disorder (ADHD). This guideline, the second in a set of policies on this condition, is intended for use by clinicians working in primary care settings. The initiation of treatment requires the accurate establishment of a diagnosis of ADHD; the American Academy of Pediatrics (AAP) clinical practice guideline on diagnosis of children with ADHD[1] provides direction in appropriately diagnosing this disorder.

The AAP Committee on Quality Improvement selected a subcommittee composed of primary care and developmental-behavioral pediatricians and other experts in the fields of neurology, psychology, child psychiatry, education, family practice, and epidemiology. The subcommittee partnered with the Agency for Healthcare Research and Quality and the Evidence-based Practice Center at McMaster University, Ontario, Canada, to develop the evidence base of literature on this topic.[2] The resulting systematic review, along with other major studies in this area, was used to formulate recommendations for treatment of children with ADHD. The subcommittee also reviewed the multimodal treatment study of children with ADHD[3] and the Canadian Coordinating Office for Health Technology Assessment report (CCOHTA).[4] Subcommittee decisions were made by consensus where definitive evidence was not available. The subcommittee report underwent extensive review by sections and committees of the AAP as well as by numerous external organizations before approval from the AAP Board of Directors.

The guideline contains the following recommendations for the treatment of a child diagnosed with ADHD:

- **Primary care clinicians should establish a treatment program that recognizes ADHD as a chronic condition.**
- **The treating clinician, parents, and child, in collaboration with school personnel, should specify appropriate target outcomes to guide management.**
- **The clinician should recommend stimulant medication and/or behavior therapy as appropriate to improve target outcomes in children with ADHD.**
- **When the selected management for a child with ADHD has not met target outcomes, clinicians should evaluate the original diagnosis, use of all appropriate treatments, adherence to the treatment plan, and presence of coexisting conditions.**
- **The clinician should periodically provide a systematic follow-up for the child with ADHD. Monitoring should be directed to target outcomes and adverse effects, with information gathered from parents, teachers, and the child.**

This guideline is intended for use by primary care clinicians for the management of children between 6 and 12 years of age with ADHD. In light of the high prevalence of ADHD in pediatric practice, the guideline should assist primary care clinicians in treatment. Although many of the recommendations here also may apply to children with coexisting conditions, this guideline primarily addresses children with ADHD but without major coexisting conditions. The guideline is not intended for use in the treatment of children with mental retardation, pervasive developmental disorder, moderate to severe sensory deficits such as visual and hearing impairment, chronic disorders associated with medications that may affect behavior, and those who have experienced child abuse and sexual abuse. This guideline is not intended as a sole source of guidance for the treatment of children with ADHD. Rather, it is designed to assist the primary care clinician by providing a framework for decision-making. It is not intended to replace clinical judgment or to establish a protocol for all children with this condition, and may not provide the only appropriate approach to this problem.

ABBREVIATIONS. AAP, American Academy of Pediatrics; ADHD, attention-deficit/hyperactivity disorder; *DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*; MTA, multimodal treatment study of children with ADHD; CCOHTA, Canadian Coordinating Office for Health Technology Assessment.

The American Academy of Pediatrics (AAP) recognizes the importance of accurate diagnosis and management of children with attention-deficit/hyperactivity disorder (ADHD). The AAP developed a practice guideline for the diagnosis of ADHD among children from 6 to 12 years of age who are evaluated by primary care clinicians.[1] The significant components of the diagnostic guideline include 1) the use of explicit criteria for the diagnosis using the *Diagnostic and Statistical Manual of Mental Health Disorders, Fourth Edition (DSM-IV)* criteria[5]; 2) the importance of obtaining information about the child's symptoms in more than 1 setting (especially from schools); and 3) the search for coexisting conditions that may make the diagnosis more difficult or complicate treatment planning.

This guideline is based on an extensive review of the medical, psychological, and educational literature. The objectives of the literature review were to determine the long- and short-term effectiveness and

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.

safety of pharmacological and nonpharmacological interventions for ADHD in children from 6 to 12 years of age, and to compare single treatment methods (eg, medications alone) with combined management strategies. Two systematic, evidence-based reviews were used extensively in the development of this guideline.[2,4] In addition, other resources were used to gather more information.[6,7]

Primary care clinicians cannot work alone in the treatment of school-aged children with ADHD. Ongoing communication with parents, teachers, and other school-based professionals is necessary to monitor the progress and effectiveness of specific interventions. Parents are key partners in the management plan as sources of information and as the child's primary caregiver. Integration of services with psychologists, child psychiatrists, neurologists, educational specialists, developmental-behavioral pediatricians, and other mental health professionals may be appropriate for children with ADHD who have coexisting conditions and may continue to have problems in functioning despite treatment. Attention to the child's social development in community settings other than school requires clinical knowledge of a variety of activities and services in the community.

METHODOLOGY

The AAP collaborated with several organizations to develop a working subcommittee representing a wide range of primary care and subspecialty groups. The subcommittee, chaired by 2 general pediatricians, included representatives from the American Academy of Family Physicians, the American Academy of Child and Adolescent Psychiatry, the Child Neurology Society, the Society for Pediatric Psychology, the Society for Developmental and Behavioral Pediatrics, and the Society for Developmental Pediatrics.

This subcommittee met over a period of 3 years, during which it reviewed basic literature on current practices in the treatment of children with ADHD. The subcommittee developed a series of research questions to direct an extensive evidence-based review, in partnership with the Agency for Healthcare Research and Quality.

In 1997, the McMaster University Evidence-based Practice Center received the contract for reviewing the literature related to treatment of children with ADHD. The McMaster report[2] focused on the evidence from comparative studies on the effectiveness and safety of pharmacological and nonpharmacological interventions for ADHD in children and adults and whether combined interventions are more effective than individual interventions. This resulted in several questions in the following 7 areas: 1) studies with drug-to-drug comparisons of pharmacological interventions; 2) placebo-controlled studies evaluating the effect of tricyclic antidepressants; 3) studies comparing pharmacological and nonpharmacological interventions; 4) studies evaluating the effect of long-term therapies; 5) studies evaluating therapies for ADHD in adults (ie, those older than 18 years of age); 6) studies evaluating therapies given in combination; and 7) studies evaluating adverse effects of pharmacological interventions.

Several systematic reviews and meta-analyses have examined placebo-controlled trials of stimulant medication and have established the short-term efficacy of these agents for core symptoms. Placebo-controlled trials of stimulant medication were reviewed in the McMaster report only if they met the criteria for inclusion in any of the other 6 areas. The report also focused on head-to-head comparisons of pharmacological interventions and of pharmacological and nonpharmacological interventions because these were identified as of prime interest to clinicians.

The McMaster report of the literature on treatment of ADHD followed current standards for analyzing research evidence.[2] Studies in this report were selected for evaluation if they were randomized, controlled trials that focused on the treatment of ADHD in humans and if they were published in peer-reviewed journals. Nonrandomized, controlled trials were included only if they provided data on adverse effects that were collected for more than 16 weeks. Studies of multiple conditions that included separate analyses for patients with ADHD were also included. The literature search was conducted using MEDLINE (from 1966), CINAHL (from 1982), HEALTHSTAR (from 1975), PsycINFO (from 1984), and EMBASE (from 1984). The Cochrane Library (issue 4, 1997) was also used in reviewing the literature. A total of 2405 citations were identified by the search strategies, and 92 reports, describing 78 different studies, were identified for further analysis.

In addition to the McMaster report, other sources of data were used to support clinical practice guideline recommendations. Although the McMaster report included results of the multimodal treatment study of children with ADHD (MTA),[3,7] the subcommittee also carefully evaluated the results of this large study separately.[8–16] The subcommittee used data from the Canadian Coordinating Office for Health Technology Assessment (CCOHTA) study.[4] The CCOHTA review addressed the following 3 major issues related to treatment of children with ADHD: 1) a clinical evaluation of the use of methylphenidate for ADHD; 2) the efficacy of stimulant medications and other therapies; and 3) an economic evaluation of the pharmacological and behavioral therapies for ADHD. Many studies of behavioral interventions for ADHD use crossover techniques, where effects were determined on the same children when they did and did not receive treatment.[6,17] The McMaster report excluded these crossover trials.[2]

The draft clinical practice guideline underwent extensive peer review by committees and sections within the AAP, numerous outside organizations, and other individuals identified by the subcommittee. Liaisons to the subcommittee were also invited to distribute the draft to entities within their organizations. Comments were compiled and reviewed by the subcommittee cochairpersons, and relevant changes were incorporated into the guideline.

The recommendations contained in this guideline (see Fig 1) are based on the best available data. For

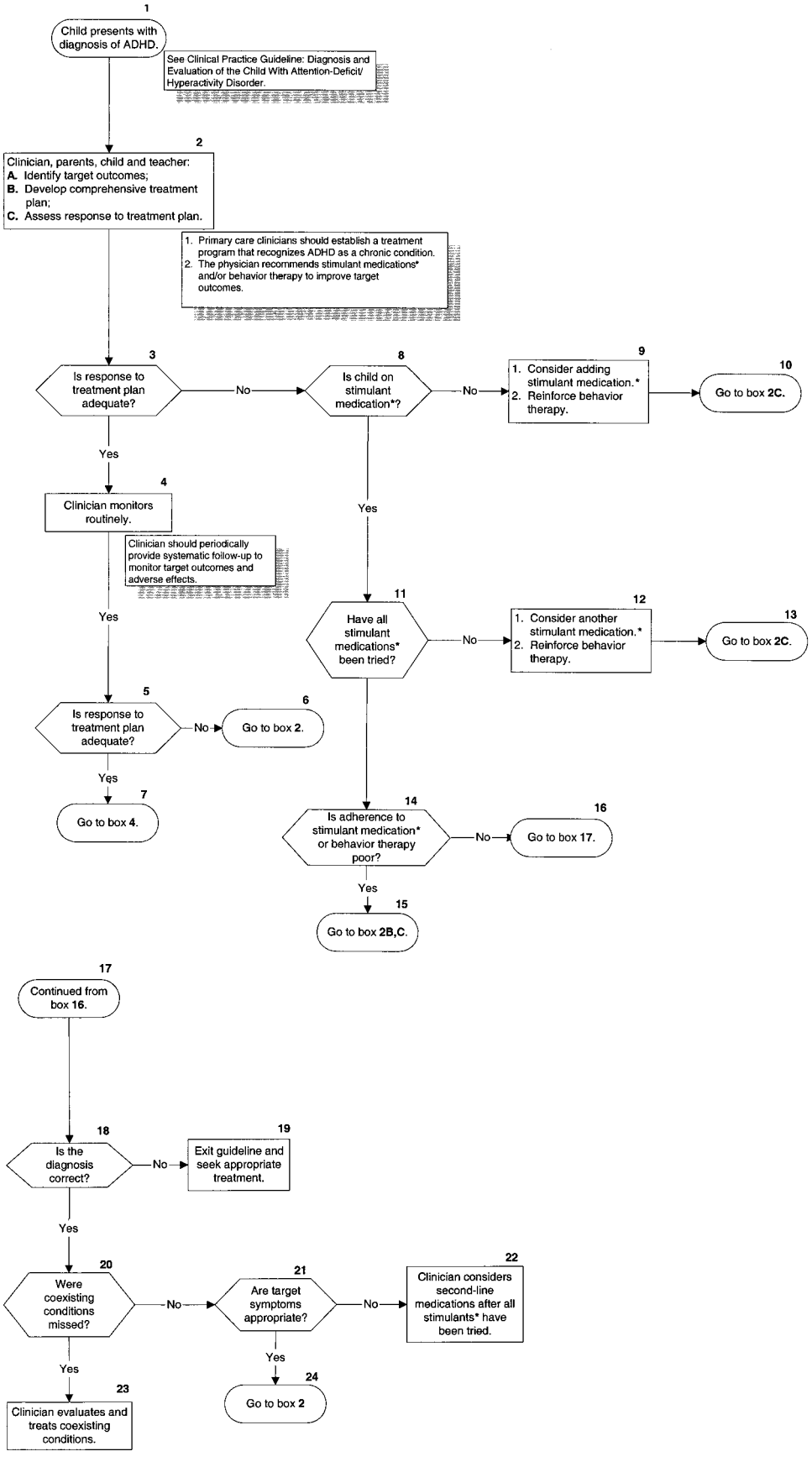

Fig 1. Algorithm for the treatment of the school-aged child with Attention-Deficit/Hyperactivity Disorder.

each recommendation, the subcommittee graded the *quality of evidence* on which the recommendation was based and the *strength* of the recommendation. Grades of evidence were grouped into 3 categories—good, fair, or poor. Recommendations were made at 3 levels. Strong recommendations were based on high-quality scientific evidence or, in the absence of high-quality data, strong expert consensus. Fair and weak recommendations were based on lesser quality or limited data and expert consensus. Clinical options are identified as interventions for which the subcommittee could not find compelling evidence for or against. Clinical options are defined as interventions that a reasonable health care provider might or might not wish to implement in his or her practice.

RECOMMENDATION 1: Primary care clinicians should establish a management program that recognizes ADHD as a chronic condition (strength of evidence: good; strength of recommendation: strong).

Attention-deficit/hyperactivity disorder is one of the more common chronic conditions of childhood. Studies using parent reports indicate persistence of ADHD of 60% to 80% into adolescence.[18–20] Given the high prevalence of ADHD among school-aged children (4% to 12%),[1] primary care clinicians will encounter children with ADHD in their practices regularly and should have a strategy for diagnosis and long-term management of this condition. The primary care of children with ADHD includes attention to the main principles of care for children with any chronic condition, such as

- Providing information about the condition
- Updating and monitoring family knowledge and understanding on a periodic basis
- Counseling about family response to the condition
- Developmentally appropriate education of the child about ADHD, with updates as the child grows
- Availability to answer family questions
- Ensuring coordination of health and other services
- Helping families set specific goals in areas related to the child's condition and its effects on daily activities
- Linking families with other families with children who have similar chronic conditions as needed and available[21–26]

As with other chronic conditions, treatment of ADHD requires the development of child-specific treatment plans that describe methods and goals of treatment and means of monitoring care over time, including specific plans for follow-up (See Recommendation 5.)

Primary care clinicians should educate parents and children about the ways in which ADHD can affect learning, behavior, self-esteem, social skills, and family function. This initial phase of patient education is critical to demystifying the diagnosis and providing parents and children with knowledge about the condition. Education enables parents to work with clinicians, educators, and, in some cases, mental health professionals to develop an effective treatment plan. A therapeutic alliance among clinicians, parents, and the child is enhanced when attention is directed toward cultural values that affect the child's health and health care. The long-term care of a child with ADHD requires an ongoing partnership among clinicians, parents, teachers, and the child. Other school personnel—nurses, psychologists, and counselors—can also help with developing and monitoring plans.

Studies of children and adults with several chronic conditions indicate better adherence to treatment plans, improved health and disease status measures, and higher levels of satisfaction in the context of a comprehensive treatment plan with specific goals, follow-up activities, and monitoring.[27–28] Thus, careful attention to the key elements of chronic care can lead to improved outcomes for children and families.

Activities specific to the care of children with ADHD include providing current information on the etiology of ADHD, its treatment, long-term outcomes, and effects on daily life and family activities. Thorough family understanding of the problem is essential before discussing treatment options and side effects. What distinguishes this condition from most other chronic conditions managed by primary care clinicians is the important role that the education system plays in the treatment and monitoring of children with ADHD.

Like other chronic conditions, new research on ADHD will change the information available to parents and clinicians over time and fill many gaps in diagnosing and understanding the etiology, treatment, long-term effects, and complications related to ADHD. Families should have access to this information. In addition, national, grassroots, parent-run associations provide support and/or education to caregivers and families of individuals with ADHD (eg, Children and Adults with Attention-Deficit/Hyperactivity Disorder [CHADD]). The clinician should be aware of community resources that provide these services and know how to make referrals. Primary care providers may offer this information directly or collaborate with other providers, especially subspecialists and mental health providers, to ensure families' access to needed information.

RECOMMENDATION 2: The treating clinician, parents, and the child, in collaboration with school personnel, should specify appropriate target outcomes to guide management (strength of evidence: good; strength of recommendation: strong).

The core symptoms of ADHD (ie, inattention, impulsivity, hyperactivity) can result in multiple areas of dysfunction relating to a child's performance in the home, school, or community. The primary goal of treatment should be to maximize function. Desired results include

- improvements in relationships with parents, siblings, teachers, and peers
- decreased disruptive behaviors
- improved academic performance, particularly in volume of work, efficiency, completion, and accuracy

- increased independence in self-care or homework
- improved self-esteem
- enhanced safety in the community, such as in crossing streets or riding bicycles. Target outcomes should follow from the key symptoms the child manifests and the specific impairments these symptoms cause.

The process of developing target outcomes requires input from parents, children, and teachers, as well as other school personnel where available and appropriate.[29] They should agree on at least 3 to 6 key targets and desired changes as prerequisites to constructing the treatment plan. The goals should be realistic, attainable, and measurable. The methods of treatment and of monitoring change will vary as a function of the target outcomes.

RECOMMENDATION 3: The clinician should recommend stimulant medication (strength of evidence: good) and/or behavior therapy (strength of evidence: fair), as appropriate, to improve target outcomes in children with ADHD (strength of recommendation: strong).

The clinician should develop a comprehensive management plan focused on the target outcomes. For most children, stimulant medication is highly effective in the management of the core symptoms of ADHD. For many children, behavioral interventions are valuable as primary treatment or as an adjunct in the management of ADHD, based on the nature of coexisting conditions, specific target outcomes, and family circumstances.

Stimulant Medication

Many studies have documented the efficacy of stimulants in reducing the core symptoms of ADHD. In many cases, stimulant medication also improves the child's ability to follow rules and decreases emotional overreactivity, thereby leading to improved relationships with peers and parents. Three formal meta-analyses[30–32] and 1 review of reviews[33] support the short-term efficacy of stimulant medications in reducing core symptoms of ADHD as well as improving function in a number of domains. The most powerful effects[4] are found on measures of observable social and classroom behaviors and on core symptoms of attention, hyperactivity, and impulsivity.* The effects on intelligence and achievement tests are more modest. Most studies of stimulants have been short-term, demonstrating efficacy over several days or weeks. The MTA study extends the demonstrated efficacy to 14 months.[3] In that study, 579 children 7 to 9.9 years of age with ADHD were randomized to 4 treatment groups: medication management alone, medication and behavior management, behavior management alone, and a standard community care group. The medication management groups followed specific protocols and algorithms in distinction to routine community practice based on clinicians' best judgments. School-aged children with ADHD showed a marked reduction in core ADHD symptoms over a 14-month period when they were treated with medication management alone or a combination of medication and behavior management. Eighty-five percent of the children treated with medication received a stimulant medication.[3] Despite the efficacy of stimulant medications in improving behaviors, many children who receive them do not demonstrate fully normal behavior (eg, only 38% of medically managed children in the MTA study received scores in the normal range at 1-year follow-up). Although the MTA study demonstrated that efficacy of stimulants lasts at least to 14 months, the longer term effects of stimulants remain unclear, attributable in part to methodologic difficulties in other studies.[35]

Stimulant medications currently available include short-, intermediate-, and long-acting methylphenidate, and short-, intermediate-, and long-acting dextroamphetamine. The latter 2 formulations are mixed amphetamine salts (75% dextroamphetamine and 25% levoamphetamine). Pemoline, a long-acting stimulant, is rarely used now because of its rare but potentially fatal hepatotoxicity.[36] Primary care clinicians should not use it routinely, and this guideline does not include it as a first- or second-line treatment for ADHD. Table 1 indicates available medications and their doses. The McMaster report reviewed 22 studies and showed no differences comparing methylphenidate with dextroamphetamine or among different forms of these stimulants.[2] Each stimulant improved core symptoms equally. Individual children, however, may respond to one of the stimulants but not to another. Recommended stimulants require no serologic, hematologic, or electrocardiogram monitoring. Current evidence supports the use of only 2 other medications for ADHD, tricyclic antidepressants[2] and bupropion.[37] Nine studies carefully evaluated tricyclic antidepressants (6 evaluated desipramine, 3 evaluated imipramine); all indicated positive effects on ADHD symptoms.[2] Four trials comparing tricyclic antidepressants with methylphenidate indicated either no differences in response or slightly better results with stimulant use.[2] The use of nonstimulant medications falls outside this practice guideline, although clinicians should select tricyclic antidepressants after the failure of 2 or 3 stimulants and only if they are familiar with their use. Desipramine use has been associated, in rare cases, with sudden death.[38] Clonidine, one of the antihypertensive drugs occasionally used in the treatment of ADHD, also falls outside the scope of this guideline. Limited studies of clonidine indicate that it is better than placebo in the treatment of core symptoms (although with effect sizes lower than those for stimulants). Its use has been documented mainly in children with ADHD and coexisting conditions, especially sleep disturbances.[39,40]

Detailed instructions for determining the dose and schedule of stimulant medications are beyond the scope of this guideline. However, a few basic principles guide the available clinical options.

*The effect size for classroom and social behavior in the CCOHTA meta-analysis averaged 0.81; for core symptoms, 0.78; and for intelligence and achievement, 0.34. The first two of these would be considered a large change, the third, a minor to moderate change.[34]

TABLE 1. Medications Used in the Treatment of Attention-Deficit/Hyperactivity Disorder

Generic Class (Brand Name)	Daily Dosage Schedule	Duration	Prescribing Schedule
Stimulants (First-Line Treatment)			
Methylphenidate			
Short-acting (Ritalin, Metadate, Methylin)	Twice a day (BID) to 3 times a day (TID)	3–5 hr	5–20 mg BID to TID
Intermediate-acting (Ritalin SR, Metadate ER, Methylin ER)	Once a day (QD) to BID	3–8 hr	20–40 mg QD or 40 mg in the morning and 20 early afternoon
Extended Release (Concerta, Metadate CD, Ritalin LA*)	QD	8–12 hr	18–72 mg QD
Amphetamine			
Short-acting (Dexedrine, Dextrostat)	BID to TID	4–6 hr	5–15 mg BID or 5–10 mg TID
Intermediate-acting (Adderall, Dexedrine spansule)	QD to BID	6–8 hr	5–30 mg QD or 5–15 mg BID
Extended Release (Adderall-XR*)	QD		10–30 mg QD
Antidepressants (Second-Line Treatment)			
Tricyclics (TCAs) Imipramine, Desipramine	BID to TID		2–5 mg/kg/day†
Bupropion			
(Wellbutrin)	QD to TID		50–100 mg TID
(Wellbutrin SR)	BID		100–150 mg BID

* Not FDA approved at time of publication.
† Prescribing and monitoring information in *Physicians' Desk Reference*.

Unlike most other medications, stimulant dosages usually are not weight dependent. Clinicians should begin with a low dose of medication and titrate upward because of the marked individual variability in the dose-response relationship. The first dose that a child's symptoms respond to may not be the best dose to improve function. Clinicians should continue to use higher doses to achieve better responses.[3] This strategy may require reducing the dose when a higher dose produces side effects or no further improvement. The best dose of medication for a given child is the one that leads to optimal effects with minimal side effects. The dosing schedules vary depending on target outcomes, although no consistent controlled studies compare different dosing schedules. For example, if there is a need for relief of symptoms only during school, a 5-day schedule may be sufficient. By contrast, a need for relief of symptoms at home and school suggests a 7-day schedule.

Stimulants are generally considered safe medications, with few contraindications to their use. Side effects occur early in treatment and tend to be mild and short-lived.[35] The most common side effects are decreased appetite, stomachache or headache, delayed sleep onset, jitteriness, or social withdrawal. Most of these symptoms can be successfully managed through adjustments in the dosage or schedule of medication. Approximately 15% to 30% of children experience motor tics, most of which are transient, while on stimulant medications. In addition, approximately half of children with Tourette syndrome have ADHD. The effects of medication on tics are unpredictable. The presence of tics before or during medical management of ADHD is not an absolute contraindication to the use of stimulant medications.[41,42] A review of 7 studies comparing stimulants with placebo or with other medications indicated no increase in tics in children treated with stimulants.[2]

According to the *Physicians' Desk Reference*[43] and medication package insert, methylphenidate is contraindicated in children with seizure disorders, a history of seizure disorder, or abnormal electroencephalograms. Studies of the use of methylphenidate have not, however, demonstrated an increase in seizure frequency or severity when it is added to appropriate anticonvulsant medications.[44–46]

Children who receive too high a dose or who are overly sensitive may become overfocused on the medication or appear dull or overly restricted. Many times this side effect can be addressed by lowering the dose. Rarely, with high doses, some children experience psychotic reactions, mood disturbances, or hallucinations.

No consistent reports of behavioral rebound, motor tics, or dose-related growth delays have been found in controlled studies,[47] although they are reported clinically.[33] Appetite suppression and weight loss are common side effects of stimulant medication, with no apparent difference between methylphenidate and dextroamphetamine. Concern for growth delay has been raised, but a prospective follow-up study into adult life[48] has found no significant impairment of height attained. Studies of stimulant use have found little or no decrease in expected height, with any decrease in growth early in treatment compensated for later on.[49–54] Many clinicians recommend drug holidays during summers, although no controlled trials exist to indicate whether holidays have gains or risks, especially related to weight gain.

3A: For children on stimulants, if one stimulant does not work at the highest feasible dose, the clinician should recommend another.

At least 80%[3] of children will respond to one of the stimulants if they are tried in a systematic way. Chil-

dren who fail to show positive effects or who experience intolerable side effects on one stimulant medication should be tried on another of the recommended stimulant medications. The reasons for this recommendation include the following:

- The finding that most children who fail to respond to one medication will have a positive response to an alternative stimulant
- The safety and efficacy of stimulants in the treatment of ADHD compared with nonstimulant medications
- The numerous crossover trials that indicate the efficacy of different stimulants in the same child[2,4]
- The idiosyncratic responses to medication[55]

Children who fail 2 stimulant medications can be tried on a third type or formulation of stimulant medication for the same reason. (As indicated in Recommendation 4, lack of response to treatment also should lead clinicians to assess the accuracy of the diagnosis and the possibility of undiagnosed coexisting conditions.)

Behavior Therapy

Behavior therapy represents a broad set of specific interventions that have a common goal of modifying the physical and social environment to alter or change behavior. Along with behavior therapy, most clinicians, parents, and schools address a variety of changes in the child's home and school environment, including more structure, closer attention, and limitations of distractions. Such environmental modifications have not undergone careful efficacy assessment, but most treatment plans include them.

Behavior therapy usually is implemented by training parents and teachers in specific techniques of improving behavior. Behavior therapy then involves providing rewards for demonstrating the desired behavior (eg, positive reinforcement) or consequences for failure to meet the goals (eg, punishment). Repetitive application of the rewards and consequences gradually shapes behavior. Although behavior therapy shares a set of principles, it includes different techniques with many of the strategies often combined into a comprehensive program.

Behavior therapy should be differentiated from psychological interventions directed to the child and designed to change the child's emotional status (eg, play therapy) or thought patterns (eg, cognitive therapy or cognitive-behavior therapy). Although these psychological interventions have great intuitive appeal, they have little documented efficacy in the treatment of children with ADHD,[56] and gains achieved in the treatment setting usually do not transfer into the classroom or home. By contrast, parent training in behavior therapy and classroom behavior interventions have successfully changed the behavior of children with ADHD.[6]

Parent training typically begins with 8 to 12 weekly group sessions with a trained therapist. The focus is on the child's behavior problems and difficulties in family relationships. A typical program aims to improve the parents' or caregivers' understanding of the child's behavior and teaching them skills to deal with the behavioral difficulties posed by ADHD. Programs offer specific techniques for giving commands, reinforcing adaptive and positive social behavior, and decreasing or eliminating inappropriate behavior. Programs plan for maintenance and relapse prevention. Parent training improves the child's functioning and decreases disruptive behavior but (as with stimulant medications) does not necessarily bring the behavior of a child with ADHD into the normal range on parent rating scales.[56,57]

Classroom management also focuses on the child's behavior and may be integrated into classroom routines for all students or targeted for a selected child in the classroom. Classroom management often begins with increasing the structure of activities. Systematic rewards and consequences, including point systems or use of token economy (see Table 2), are included to increase appropriate behavior and eliminate inappropriate behavior. A periodic (often daily) report card can record the child's progress or performance with regard to goals and communicate the child's progress to the parents, who then provide reinforcers or consequences based on that day's performance. Classroom behavior management also may improve a child's functioning but may not bring the child's behavior into the normal range on teacher behavior rating scales.[57] Table 2 outlines specific behavior therapies that have been demonstrated as effective for ADHD.[17]

Evidence for the effectiveness of behavior therapy in children with ADHD comes from a variety of studies. The diversity of interventions and outcome

TABLE 2. Effective Behavioral Techniques for Children With Attention-Deficit/Hyperactivity Disorder

Technique	Description	Example
Positive reinforcement	Providing rewards or privileges contingent on the child's performance.	Child completes an assignment and is permitted to play on the computer.
Time-out	Removing access to positive reinforcement contingent on performance of unwanted or problem behavior.	Child hits sibling impulsively and is required to sit for 5 minutes in the corner of the room.
Response cost	Withdrawing rewards or privileges contingent on the performance of unwanted or problem behavior.	Child loses free time privileges for not completing homework.
Token economy	Combining positive reinforcement and response cost. The child earns rewards and privileges contingent on performing desired behaviors and loses the rewards and privileges based on undesirable behavior.	Child earns stars for completing assignments and loses stars for getting out of seat. The child cashes in the sum of stars at the end of the week for a prize.

measures makes meta-analysis of the effects of behavior therapy alone or in association with medications very difficult. Double-blind, randomized, placebo-controlled trials are difficult to perform, in part because of the difficulty of keeping examiners and participants unaware of whether the child is receiving treatment or placebo. Thus, the usual evidence-based medicine searches turn up few studies for review.[2] Alternative experimental methods, such as rigorous single-subject designs, are used frequently in the psychological literature. Studies that compare the behavior of children during periods on and off behavior therapy demonstrate the effectiveness of behavior therapy[17]; however, behavior therapy has been demonstrated to be effective only while it is implemented and maintained.

A number of individual studies indicate positive effects of behavior therapy in addition to medications. Almost all studies comparing behavior therapy with stimulants alone indicate a much stronger effect from stimulants than from behavior therapy. When comparing behavior therapy to stimulant medications, efficacy of their combined treatment could not be demonstrated to be greater than medication alone for the core symptoms of ADHD.[2] The MTA study[3] found that the combined treatment (medication management with behavior therapy), compared with medication alone, offered improved scores on academic measures, measures of conduct, and some specific ADHD symptoms (although not on global ADHD symptom scales). Although these trends were consistent, few reached statistical significance. In addition, parents and teachers of children receiving combined therapy were significantly more satisfied with the treatment plan.[13,14,58–60]

A wide range of clinicians, including psychologists, school personnel, community mental health therapists, or the primary care clinician, can implement behavior therapy directly or train others to implement behavior therapy. Many clinicians prefer to refer to community resources for behavior therapy because behavior therapy with parents is time-consuming and often does not lend itself to the structure and schedule of the primary care office. Schools may provide behavior therapy with teachers in the context of a Rehabilitation Act (Section 504) plan or an individual education plan. Where ADHD has a significant impact on a child's educational abilities, Section 504 requires schools to make classroom adaptations to help children with ADHD function in that setting. Adaptations may include preferential seating, decreased assignment and homework load, and behavior therapy implemented by the teacher.

RECOMMENDATION 4: When the selected management for a child with ADHD has not met target outcomes, clinicians should evaluate the original diagnosis, use of all appropriate treatments, adherence to the treatment plan, and presence of coexisting conditions (strength of evidence: weak; strength of recommendation: strong).

Most school-aged children with ADHD respond to a therapeutic regimen that includes stimulant medications and/or behavioral/environmental interventions. As noted in 3A, when one stimulant medication appears ineffective (despite appropriate titration), clinicians should carry out a trial of a second stimulant medication. Continuing lack of response to treatment may reflect 1) unrealistic target symptoms; 2) lack of information about the child's behavior; 3) an incorrect diagnosis; 4) a coexisting condition affecting the treatment of the ADHD; 5) lack of adherence to the treatment regimen; or 6) a treatment failure. As discussed previously, treatment of ADHD, while decreasing a child's level of impairment, may not fully eliminate the core symptoms of inattention, hyperactivity, and impulsivity. Similarly, children with ADHD may continue to have difficulties with peer relationships despite adequate treatment, and treatment for ADHD frequently shows no association with improvements in academic achievement as measured by standardized instruments.

Evaluation of treatment outcomes requires a careful collection of information from multiple sources, including parents, teachers, other adults in the child's environment (eg, coaches), and the child. If the target symptoms are realistic and the lack of effectiveness is clear, the primary care clinician should reassess the accuracy of the diagnosis of ADHD. This reassessment should include review of the data initially obtained to make the diagnosis, as described in the AAP clinical practice guideline for the diagnosis of children with ADHD.[1] Reassessment usually will require gathering new information from the child, school, and family about the core symptoms of ADHD and their impact on the child's functioning. Clinicians should reconsider other conditions that can mimic ADHD.

As indicated in the diagnostic clinical practice guideline,[1] other conditions commonly accompany ADHD in children, especially oppositional/conduct disorders, anxiety, depression, and learning disorders. These conditions often complicate the treatment of ADHD; clinicians should determine if children who do not respond to treatment have these conditions, either by direct determination in their offices or by referral to appropriate subspecialists (eg, developmental-behavioral pediatricians, child psychiatrists, psychologists, or other mental health clinicians) or the school system (eg, school psychologists for learning disabilities) for further evaluation. These coexisting conditions may not have been fully evaluated initially because of the severity of the ADHD, or the child may have developed another condition with time. Standard psycho-educational testing may clarify the role of learning and language disorders, although other disorders require different assessments.

Treatment plans for ADHD typically require children, families, and schools to enter into a long-term plan that includes a complex medication schedule along with environmental and behavioral interventions. Environmental and behavioral interventions will require ongoing efforts by parents, teachers, and the child. A common cause of nonresponse to treatment is lack of adherence to the treatment plan.

Ongoing monitoring of a child's progress should assess the implementation of the plan and determine key problems with, and barriers to, implementation. The clinician should assess adherence to medication and behavior therapy. Lack of adherence is not the equivalent of treatment failure; clinicians should help families find solutions to adherence problems before considering a plan as a failure.

The following can be considered true treatment failure: 1) lack of response to 2 or 3 stimulant medications at maximum dose without side effects or at any dose with intolerable side effects; 2) inability of behavioral therapy or combination therapy to control the child's behaviors; and 3) the interference of a coexisting condition. In each of these situations, referral to mental health specialists who are knowledgeable about behavioral interventions in children is the next step unless the primary care clinician has expertise and experience in managing these situations.

RECOMMENDATION 5: The clinician should periodically provide a systematic follow-up for the child with ADHD. Monitoring should be directed to target outcomes and adverse effects by obtaining specific information from parents, teachers, and the child (strength of evidence: fair; strength of recommendation: strong).

Clinicians should establish a plan for periodic monitoring of the effects of treatment. Research on adherence to medical regimens in chronic diseases highlights the importance of identifying patient and family concerns and goals and jointly designing a management plan in a way that addresses these concerns and promotes these goals.[61] Plans should include obtaining information about target behaviors, educational output, and medication side effects periodically through office visits, written reports, and phone calls. Monitoring data should include the date of refills, the medication type, dosage, frequency, quantity, and responses to treatment (both medication and behavior therapy). Data can be recorded in a flow sheet, ideally, or in a progress note within each patient's chart. The plan also should include a system for communication among parent, child, and clinician between visits as well as a method for periodic contact with the teacher or other school personnel before a follow-up visit. The monitoring plan should consider normal developmental changes in behavior over time, educational expectations that increase with each grade, and the dynamic nature of a child's home and school environment, because changes in any of these factors may alter target behaviors. All participants should share the plan agenda. Clinicians should provide information and support at frequent intervals in a way that enables the child and family to make informed decisions that promote the child's long-term health and well-being.

Information about target symptoms will continue to come from the parents, child, and teacher. Office interviews, telephone conversations, teacher narratives, and periodic behavior report cards and checklists are among the methods used to obtain needed information. As with the diagnosis of ADHD, clinicians should have active and direct communication with schools. The MTA study indicates the benefit of teacher information over parent-derived information when titrating the medication to maximum benefit.[3,62] Adherence to medication and the behavior therapy program should be reviewed at each encounter.

The frequency of monitoring depends on the degree of dysfunction, complications, and adherence. No controlled trials clearly document the appropriate frequency of follow-up visits. In the MTA trial, children in the medical management groups had better outcomes and more frequent follow-up than those in the standard community category, but whether the frequency of follow-up was a determining factor in outcomes cannot be determined from currently published materials.[3] Once the child is stable, an office visit every 3 to 6 months allows for assessment of learning and behavior. These visits also allow assessment of potential side effects of stimulants, such as decreased appetite and alteration of weight, height, and growth velocity. Periodic requests for medication refills offer an additional opportunity for communication with the family. At the refill request, the family can be asked about the child's functioning in school and interpersonal relationships, as well as updates on communication from the school. If any of the follow-up evaluations reveal a decrease in the targeted outcomes, the clinician must first establish that the family is adhering to the treatment plan.

AREAS FOR FUTURE RESEARCH

Tailoring Treatments to Children and Outcomes

At the present time, the clinician's initial choice of a specific treatment program—the exact stimulant medication and the precise form of behavior therapy—is an area of uncertainty. Research to date has not shown clear advantages of one stimulant medication over others. The process of prescribing an effective and comprehensive plan based on the characteristics of the child and family and tailored in terms of type, intensity, and frequency would help clinicians to improve treatment plans. What is required is information relating specific sociodemographic characteristics (eg, age or sex) or clinical characteristics (eg, subtype of ADHD) to optimal responses to stimulant medication or type of behavior therapy. Moreover, relating treatments to specific behaviors or components of ADHD rather than the whole symptom complex would allow the clinician to better tailor the treatment plan.

Many children with ADHD have coexisting conditions, including anxiety, depression, oppositional defiant disorder, conduct disorder, and learning disabilities. The literature provides minimal information about how to treat these coexisting conditions in conjunction with ADHD and how the conditions affect the effectiveness and safety of treatments. Research on how ADHD and coexisting conditions interact to affect treatment and outcomes will help determine if children require multiple concurrent treatments. Such studies can identify sensible, effec-

tive, and comprehensive treatment plans for children with these conditions.

Expanded Treatment Options

A major research challenge pertaining to the treatment of ADHD is the development and evaluation of new treatments for this condition. The 2 current treatments (stimulant medication and behavior therapy) reduce the symptoms and functional consequences of ADHD, but only for as long as they are administered. Treatments with more lasting or even curative effects are needed. A significant number of children do not respond to stimulant medications or have severe side effects. Some families cannot implement behavioral programs. Expanding the available medical and behavioral treatment regimens with additional safe and effective options would be useful for such a prevalent chronic condition where not all children respond to current treatments or adhere to them. Studying common-sense approaches, such as decreasing environmental distraction, should be done. There is also the need for well-designed rigorous studies of currently promoted but less well-established therapies such as occupational therapy, biofeedback, herbs, vitamins, and food supplements. These interventions are not supported by evidence-based studies at the present time.

Long-term Outcomes

Most studies about ADHD and its treatment have been short-term. The long-term outcome of children with ADHD with or without coexisting conditions has not been well studied. Furthermore, there is minimal information about the role of stimulant medication and/or behavior therapy in the natural history of the disorder. Future research should correct these deficits. For this chronic condition, efficacy and safety studies must be extended from weeks or months to years. Long-term outcome studies must be prospective in design and consider changes over time in core symptoms of ADHD, coexisting conditions, and functional outcomes such as occupational successes and long-term relationships.

Service Delivery

Another major research area should address the optimal services and procedures for successful management of ADHD in the real world (ie, in clinical practice and classrooms). Much of the popular controversy over the inappropriate use of stimulant medication relates to how clinicians actually prescribe them. Future research needs to study how medications are actually prescribed and what factors affect physician practice patterns. Research that includes monitoring the outcomes of training will lead to the ability to develop better methods to assist clinicians in using effective treatment practices. Specifically, basic information such as who are the most appropriate clinicians to manage ADHD; the best schedule for follow-up; and the most valid, reliable, sensitive, and cost-effective ways to monitor treatment is essential. Such research must go beyond physician self-reporting and into scrutinizing and evaluating actual practices in clinics and offices. The most effective and efficient methods for affecting change in clinician practices need to be determined. This determination must be broad, taking into account clinician, practice, family, community, and policy issues that affect treatment. Research also should evaluate the role of school- and community-based professionals, as well as primary care clinicians, in delivering treatment services. Little is known about how short- or long-term effectiveness varies as a function of the school and community-based professional involvement. Further, the studies of service delivery need to include a public health and service system approach. They should consider child and family outcomes and cost-effectiveness of care. Linking outcomes to service parameters is an important step in encouraging practice or system change.

Epidemiology and Etiology

The great growth in the diagnosis of ADHD has led to major new work in the study of treatments. As indicated previously, these efforts should continue and expand. Less investigation has addressed the etiology of ADHD (ie, its biological and socioenvironmental causes) and the opportunities arising from that understanding for prevention. For example, would different social and behavioral arrangements in young families affect the onset of ADHD symptoms? Would early intervention in some way decrease rates of ADHD? A clear need exists for active work in understanding the etiology and prevention of ADHD.

CONCLUSION

This clinical practice guideline offers recommendations for the treatment of school-aged children with ADHD in primary care practice. The guideline emphasizes 1) consideration of ADHD as a chronic condition; 2) explicit negotiations about target symptoms; 3) use of stimulant medication and behavior therapy; and 4) close monitoring of treatment outcomes and failures. The guideline further provides suggestions for pediatric office-based management of ADHD. It should help primary care clinicians in their treatment of a common child health problem.

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