

ADHD: Putting the Pieces Together

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Hyperactivity, impulsivity, disruptive behavior, lack of focus—the symptoms of attention-deficit/hyperactivity disorder can negatively impact children and their families. Primary care providers have the opportunity to bring a semblance of order to chaos, and improve quality of life for all involved, by identifying affected patients and providing effective treatment options. Here is everything you need to know.

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LEARNING OBJECTIVES

- Explain the attention-deficit/hyperactivity disorder (ADHD) diagnostic criteria of inattention, hyperactivity, and/or impulsivity as defined in the *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR)*, and the *DSM-5* update.
- Discuss the American Academy of Pediatrics clinical practice guideline for evaluation, diagnosis, treatment, and monitoring of children and adolescents with ADHD.
- Describe the classes of medications available to treat ADHD, the indications for each, and the forms available (eg, short- versus long-acting, tablets, capsules, patches, liquids).
- Identify environmental factors at home and in school that can affect a child's ADHD and know how to address them.
- Understand and provide support for the parent's role in managing a child's ADHD.

Attention-deficit/hyperactivity disorder (ADHD) is a diagnosis on the rise. In 2011, approximately 11% of school-aged children had ever been diagnosed with ADHD—an increase of 2 million children since 2003.¹ Another analysis found that, while more children ages 8 to 15 years were diagnosed with ADHD than with any other mental health disorder, only about half had received treatment for it.² Since the majority of children—65% to 85%—are diagnosed in the primary care setting,³ there is a clear need for primary care clinicians to be up-to-date on the diagnosis and treatment of this disorder.

To enhance both evidence-based practice and quality outcomes for the child and family dealing with this chronic and challenging disorder, an overview of the latest information about ADHD is presented here. In addition to diagnostic criteria, clinical presentation, screening methods, and treatment options, a discussion of the parental role in ADHD management and a medication reference guide are also provided (the latter to facilitate appropriate selection of initial pharmacologic therapy).

INTRODUCTION

ADHD is characterized by persistent patterns of hyperactivity-impulsivity and/or inattention⁴ and is di-

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agnosed about twice as often in boys as in girls.² The hyperactive-impulsive form usually manifests before age 7, while the inattentive form may not be apparent until age 8 or 9.⁵ Although symptoms may wane with maturity, they persist into adulthood for about 50% of patients.⁶

ADHD can impair academic performance, disrupt familial and interpersonal relationships, and lead to social isolation and low self-esteem.⁴ Clinicians should be mindful of the potential negative long-term effects of ADHD, which include increased risk for substance abuse and other antisocial activities and fewer vocational opportunities.⁷

The economic impact of ADHD is also significant. An often-cited 2007 cost-of-illness analysis estimated a minimum annual societal cost of \$42.5 billion for pediatric ADHD. A more likely estimate is twice that and highlights the public health importance of ADHD to health care practitioners, families, and society.⁸

ETIOLOGY

Currently, a single cause for ADHD has not been established, although research supports a genetic basis, with secondary factors (eg, environmental influences) also involved.⁹ Ongoing studies have identified numerous genes that contribute to ADHD.¹⁰ The disorder has also been seen in children with brain damage, including perinatal brain damage, fetal alcohol syndrome, and Down syndrome.¹¹

MRI studies have shown brain patterns that link ADHD with decreased functioning in the cingulo-frontal-parietal (CFP) cognitive-attention network. Specifically, impairment in the dorsal anterior midcingulate cortex, termed the *damCC*, is responsible for inappropriate or excessive motor behavior, while alterations in the dorsolateral prefrontal cortex, or *DLPFC*, have adverse effects on the ability to think ahead, plan, and reason.¹² With this knowledge, clinicians can choose medications that target specific areas of the brain, if appropriate.

Environmental influences

Two factors hypothesized to influence ADHD symptoms are nutrition and the home environment. Many studies have examined the effects of refined sugar, additives, and preservatives on ADHD symptoms. Results indicate that, while monitoring a child's intake of these ingredients may be beneficial from a nutritional standpoint, it is unlikely that they significantly affect ADHD symptoms.^{10,13,14}

Given ADHD's genetic component, parents may

TABLE 1
Pretreatment Evaluation of Pediatric Patients Newly Diagnosed with ADHD

General	Neurologic
Developmental milestones	Communication skills (speech, language)
Dysmorphic features	Complete neurologic examination
Family medical history	Fine and gross motor coordination (writing)
Head circumference	Hearing
Height	Mental status observations (affect)
Medical history	Seizures
Neurocutaneous abnormalities	Tics
Review of systems	Vision
Vital signs	
Weight	
Cardiovascular	Psychologic
Blood pressure	Adolescents: assess for substance abuse
Cardiovascular rate/rhythm	Behavioral evaluation
Chest pain	Family mental health history
Fainting and dizziness with exercise	Presence of comorbid conditions (eg, learning problems; disruptive behavior; anxiety, language, mood, developmental coordination, or sleep disorders)
Family history of sudden cardiac death	Psychosocial history
Heart murmur	
Palpitations	
Rheumatic fever	
Shortness of breath or unexplained exercise intolerance	

Sources: Krull. UpToDate⁵; American Academy of Pediatrics. 2011²³; Berger. UpToDate.²⁸

have ADHD themselves—making it more difficult for them to provide consistency and structure in the home environment.^{15,16} Chaotic living situations can exacerbate ADHD symptoms,¹¹ and research indicates that mothers with ADHD are more likely to engage in negative parenting, with higher demands and little praise, than mothers without the disorder.¹⁵ They may exhibit less patience and feel the need to control the child's environment, even during playtime.¹⁷ Preschool hyperactivity has been identified in

children whose parents exhibit coercive, overstimulating, negative, or inconsistent parenting.¹⁸

MAKING THE DIAGNOSIS

Presenting behaviors

Symptoms of ADHD typically manifest in academic settings. The greater frequency of ADHD diagnosis and treatment in boys may derive from differences in how the genders externalize behaviors.¹⁹ While boys often exhibit more impulsive and aggressive behavior, girls internalize symptoms and are more likely to be inattentive. As a result, girls are less likely to be disruptive in the classroom and may not be referred for evaluation. Boys, on the other hand, may be overdiagnosed due to their disruptive behaviors.¹⁹ Daley indicates that inattention (eg, daydreaming) and hyperactivity (eg, fidgeting) symptoms become more apparent in structured settings, such as a classroom.¹⁵

Any child who requires a mental health assessment should also be screened for ADHD; if the results of the screening suggest ADHD, a full evaluation is warranted.²⁰

Diagnostic criteria

According to the American Psychiatric Association's criteria—outlined in the *Diagnostic and Statistical Manual of Mental Disorders-IV (Text Revision) (DSM-IV-TR)* and the subsequent *DSM-5*—the diagnosis of ADHD requires that the patient have at least six symptoms of inattention, hyperactivity, and/or impulsivity.^{4,21,22} For patients ages 17 or older, the *DSM-5* requires five symptoms of inattention or hyperactivity-impulsivity.²¹

Children are usually unable to complete one task prior to starting another and are easily distracted by noises otherwise ignored by others (eg, lawnmowing, background conversation).⁴ They may also exhibit excessive fidgeting and interrupt formal conversations or lectures.⁴ Inappropriate behavior relative to the child's developmental level must have been present for at least six months prior to age 7 (according to *DSM-IV-TR*)⁴ or age 12 (*DSM-5*).²¹

In addition to exhibiting the above symptoms for a minimum of six months, impairment must be observed in at least two settings (home, school, or work), with obvious clinical impairment in social, academic, or occupational functioning.⁴ ADHD symptoms can vary depending on the setting; the child may have more difficulty paying attention and following directions in a classroom filled with chil-

dren than in an environment with less stimuli (eg, one-on-one home situations).¹¹

Children who exhibit ADHD symptoms in only one setting may actually have problems secondary to cognition, emotional maturity, or feelings of well-being in a particular setting.¹¹ Therefore, the clinician must rely on multiple sources of information (eg, parents, teachers, other caregivers) in order to make the diagnosis of ADHD.²³ A teacher should have had regular contact with the child for at least four to six months in order to provide an accurate evaluation of symptoms and their persistence.⁵

Assessment scales

Validated parent and teacher instruments, along with the *DSM-IV-TR* criteria, can be used to obtain data to support a diagnosis of ADHD.^{5,24}

The Conners Comprehensive Behavior Rating Scales and the **ADHD Rating Scale IV (DSM-IV)** can be used by teachers and parents to document behaviors of preschool-aged children.⁵

The Vanderbilt Assessment Scales, which have been validated in both primary care and referral settings, may be used for children older than 4.⁵

More information about rating scales is available at the National Resource Center on ADHD website (www.help4adhd.org/en/treatment/scales).

In addition to parent- or teacher-reported data, further evidence of functional impairment may be gleaned through a review of report cards, standardized testing, and school records (eg, attendance or disciplinary actions).²⁴

Differential diagnosis

The differential diagnosis should include other mental health conditions, sleep disorders, and any possible underlying medical or developmental problems.²⁴ Hyperthyroidism and lead toxicity, as examples, could elicit symptoms consistent with ADHD.¹¹ When the diagnosis is in doubt, coexisting conditions are present, or treatment options are in question, the primary care clinician should refer the patient to a pediatric or mental health specialist for further evaluation.²³

BEFORE TREATMENT

After the diagnosis is made but before treatment commences, a complete review of systems, physical and psychologic evaluation, cardiac and sleep history, thorough family history pertaining to mental health and medical conditions, and an age-appro-

appropriate interview are required.²⁴ The exam results assist in identifying other concerns that would indicate the need for appropriate diagnostic testing and/or referral (see Table 1, page 29).

Although stimulant treatment for ADHD has not been shown to increase cardiovascular events in otherwise healthy young people,²⁵ experts differ in their opinions about the need for screening ECG prior to treatment initiation. The American Heart Association recommends a screening ECG before stimulant therapy is initiated,²⁶ while the American Academy of Pediatrics (AAP) does not, as long as the history and exam results yield no cardiac findings.²⁷ Since the Prescribing Information for most ADHD medications cautions against use in patients with known serious cardiac abnormalities, if exam findings suggest the possibility of cardiovascular disease, further evaluation with ECG and referral to a pediatric cardiologist are indicated.^{26,28}

In the interview, the clinician should explore the patient's perception of his or her behavior in response to family and social relationships and academic performance (eg, parent-teacher communication, report cards, detentions, suspensions). The psychosocial history may provide an explanation for acute onset of symptoms or coexisting disorders. Family history provides valuable insight regarding the health and cognitive abilities of family members, as well as the possibility of genetic influences on the child.²⁴

Parents should be advised that ADHD is a chronic condition that requires a long-term treatment approach for symptoms that may last into adulthood. Identification of goals and treatment success depend on collaborative efforts with parents, teachers, clinicians, caregivers, and mental health clinicians.²⁴

PARENTS AND ADHD

Stress

Caregivers for a child with ADHD are burdened with the ongoing challenges of the child's inability to follow rules and his or her continual struggles with academics and peer relationships.²⁹ These hardships stress parents' patience, often resulting in parental impulsive reactivity (eg, physical punishment of the child).

In addition, social isolation for both children and parents is common because of the judgmental scrutiny of other parents whose children are not affected by ADHD.³⁰ Parents' career and social activities may be interrupted, adding to the sense of guilt, blame, burnout, and depression often associated with parenting a child with ADHD.²⁹

➤ ADHD Process of Care

The AAP created a helpful ADHD process-of-care algorithm that can be used as a companion piece to its diagnostic and treatment guidelines. It is available at <http://pediatrics.aappublications.org/content/suppl/2011/10/11/peds.2011-2654.DC1/zpe611117822p.pdf>.²⁴

While some parenting stress is expected, those who are unable to cope with everyday events are more likely to experience conflict and anger, further increasing the child's anxiety and emotional state.³¹ This dysfunctional environment prohibits the adoption of positive parenting techniques and ultimately contributes to more psychologic distress and harm to the parent-child relationship.³¹

Support

Once a child is diagnosed with ADHD, parents require adequate education to bolster their understanding of how to manage their child's symptoms.²⁹ Establishing effective support systems—whether a spouse, family member, friend, or another parent whose child has ADHD—is imperative to enable parents to cope with the stress and to promote positive parenting, which has been shown to decrease symptomatic behavior.³²

Furthermore, understanding the individual child's traits will help the parents channel his or her energy into personal areas of interest, such as sports or creative outlets (art, dance, theater).³²

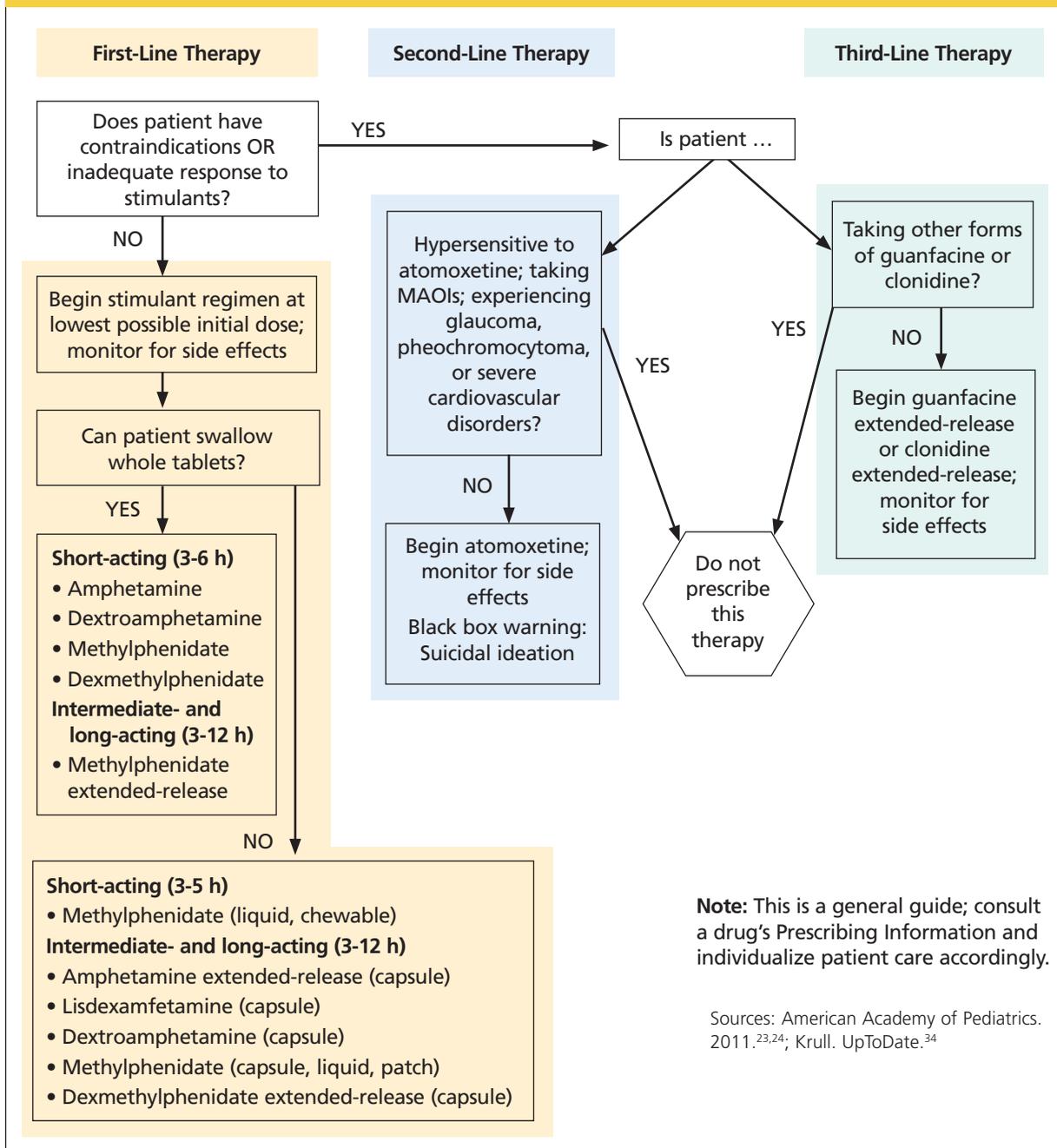
Training

Parenting styles may play a role in the management of a child's ADHD.^{9,11} Encouraging parents to learn how to change their responses to their child's behavior through evidence-based behavioral training can be one of the most effective interventions for both parents and children.³³ Parents who participate in this training gain greater behavioral understanding and treatment satisfaction, and their children experience significant improvement in conduct and other symptoms.²³

TREATMENT OPTIONS

Choice of treatment depends on patient age, the severity of functional impairment, and the individual needs of the child. Treatment may include behav-

FIGURE
Treatment Choices for Children and Adolescents With ADHD



ioral therapy, medication administration, or a combination of the two.²³

Behavioral therapy

Behavioral therapists can provide parents and teachers with evidence-based training to understand and

manage ADHD conduct.³⁴ Parents and teachers are taught to recognize the effects of environmental factors on behavior and then to modify environments and daily schedules and set appropriate limits. They learn how to reinforce positive behavior, identify triggers, and decrease inappropriate behavior, using

calm disciplinary approaches that lead to positive parent-child and teacher-student relationships.^{23,34}

Collaborative efforts between parents and teachers are crucial to the child's treatment plan, and individualized educational plans should be implemented to enhance academic performance, social skills, and self-esteem. For example, teachers can send home daily report cards to assist parents with monitoring core symptoms and treatment efficacy.³⁵

Behavioral therapy classes for both parent and child, or for parents only, usually meet weekly for eight to 20 weeks. Parents learn how to build positive relationships, set limits, and respond consistently with rewards or punishments (eg, consequences, time-outs). Less effective outcomes were noted when such interventions were tried by parents without adequate training.^{14,24,33}

Medications have been found to be more effective to treat ADHD symptoms than behavioral therapy alone, and parents and teachers report higher satisfaction with treatment plans that combine behavior modification with pharmacologic therapy.²³

MEDICATION RECOMMENDATIONS

AAP medication recommendations are age-specific and should be used only if the patient meets *DSM-IV-TR* criteria.²⁴ An overview of both stimulant and non-stimulant treatment options for ADHD is provided in the Figure.

When an ADHD treatment regimen does not result in improved symptoms and functioning, the clinician should revisit the treatment plan and differential diagnosis. After reevaluation, the clinician may choose to add or change medication type or dose, adjust behavioral therapy, or consider the possibility of language or learning disabilities, mental health disorders, other psychosocial stressors, or poor adherence to the treatment plan.²⁴

Parents may refuse stimulant therapy for their child, fearing future drug use (or abuse) in adolescence.²⁴ Clinicians should respect parents' decisions to defer stimulant therapy, while at the same time clarifying concerns or misunderstandings in order to provide optimal care for the child.²⁴ Studies have demonstrated that stimulant treatment for ADHD has a protective effect, with outcomes suggesting significantly decreased risk for drug or alcohol dependence.³⁶

Clinician-provided anticipatory education about dose titration, expected treatment results, and potential adverse effects will help prepare parents for

TABLE 2
ADHD Medications:
Classes and Characteristics

Drug class	Characteristics/special considerations
Stimulants	<p>Schedule II federally controlled substances</p> <p>Potential for abuse or dependence</p> <p>Short-, intermediate-, and long-acting forms</p> <p>Monitor blood pressure and heart rate</p> <p>Consider possibility of misuse if patient is increasing doses or requesting frequent refills</p>
Nonstimulants	
Atomoxetine	<p>Not a controlled substance</p> <p>No abuse potential</p> <p>Black box warning for increased risk of suicidal ideation in children and adolescents</p> <p>May require ≤ 2 weeks for initial response; ≤ 8 weeks for maximum effect</p> <p>Consider continuing stimulant, if applicable, until full effect is reached</p> <p>No drug holidays</p>
α ₂ -Adrenergic agonists	<p>Not controlled substances</p> <p>Used as monotherapy (long-acting formulations) or as adjunct to stimulants</p> <p>May be useful when coexisting conditions are present (tic or developmental disorders)</p> <p>No drug holidays</p> <p>Withdraw gradually</p>

Sources: American Academy of Pediatrics. 2011^{23,24}; Krull. UpToDate.³⁹

the ADHD medication management process.²³ The length of time needed for dose titration varies by class of ADHD medication (see Table 2). For stimulants, effects on core symptoms may be seen within the first week. Nonstimulants take longer: up to six weeks for atomoxetine and up to four weeks for the α₂-adrenergic agonists.²⁴

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TABLE 3
Follow-up Visits for ADHD Medication Management

	Considerations
Titration	Increase dose weekly, over 1-3 mo, based on parent/teacher feedback and rating scales
Optimal dosage reached or Another medication initiated	Shows maximum improvement in core symptoms with few adverse effects If response has been inadequate, identify an alternate medication and repeat titration process
Follow-up	Initial: Weekly during titration until positive response Stabilized: Every 1-3 mo during the 1st y, then every 6 mo, then periodically as determined by family and clinician
Monitoring	Blood pressure, heart rate, height, weight Worsening aggressive behavior or agitation
Laboratory tests	Complete blood cell count, platelet count

Sources: American Academy of Pediatrics. 2011^{23,24}; Krull. UpToDate.³⁹

Stimulants

Evidence strongly supports stimulants as first-line treatment for ADHD in children ages 6 and older.²³ Stimulants are safe and efficacious in reducing the core symptoms of inattention, hyperactivity, and impulsivity.²³ The initial choice of stimulant depends on the individual child's needs. It should be noted that, although decreased growth rates have been observed in children taking stimulants, this effect ends by the third year of treatment.³⁸ If maximum doses are reached and desired effects are not achieved with the first stimulant, choosing an alternate drug in the stimulant class may be an effective option.²⁴ Clinicians may also consider other drug classes based on the comprehensive exam, adverse effects profile, contraindications, and individual responses.

Nonstimulants

Nonstimulant medications include atomoxetine and the α_2 -adrenergic agonists extended-release clonidine and extended-release guanfacine.²⁴

Atomoxetine. Atomoxetine is a selective norepinephrine-reuptake inhibitor that may be prescribed if substance abuse or diversion is suspected or if stimulant therapy is contraindicated, undesirable, or unsuccessful.^{24,39} Using weight-based dosing for titration,³⁷ the first week of therapy should begin with a half-dose to minimize sedation or gastrointestinal

symptoms.²⁴ While atomoxetine can be quite effective, caution should be used when prescribing this agent, as it carries a black box warning for suicidal ideation.²⁴

α_2 -Adrenergic agonists. Both extended-release clonidine and extended-release guanfacine are α_2 -adrenergic agonists that may be beneficial when stimulants and atomoxetine have failed or when there are coexisting conditions.³⁷ Either clonidine or guanfacine can be given in combination with a stimulant, if stimulant or atomoxetine treatment alone is unsuccessful or if adverse effects are unacceptable.^{24,39} Sedative effects and withdrawal irritability are more common with clonidine than with guanfacine, and when discontinued, these medications should be tapered to avoid blood pressure changes.^{24,40}

Age-specific recommendations

Medications should be selected based on age ranges. In preschool-age children (ages 4 to 5), methylphenidate is recommended when target behaviors and impaired functioning persist for nine months in both home and day care/school settings, despite behavioral therapy.^{23,24} As examples, medication may be warranted if the child poses a significant risk of injury to other children or caregivers and/or faces expulsion from preschool or day care because of his or her behaviors.³⁴

Risks and benefits should be considered carefully before medical therapy is initiated in this group. Further, the lowest possible starting dose of methylphenidate is preferred for preschoolers due to their slower metabolism.²⁴ While dextroamphetamine is FDA approved for children younger than 6, efficacy and safety have not been proven in this age group and the AAP does not recommend it.²³

For children ages 6 to 18, the AAP recommends combined treatment with medication and evidence-based behavioral training for the patient, parent, and teacher. In the adolescent population, evidence supports use of stimulants as first-line therapy, but with close monitoring for medication misuse.²³ Misuse may become apparent through increased prescription refills; if identified, ADHD medication should be discontinued and substance abuse treatment initiated before ADHD therapy recommences.²⁴

Dosing and special considerations

Initiation of ADHD medication is usually begun over the weekend to allow parents time to observe for adverse effects, to better manage the drug titration process, and to minimize academic disruptions.⁴¹ Although more expensive, the extended-release formulas are often selected to eliminate the need for multiple doses and to decrease perceived stigma associated with medication administration at school.²⁴ Longer-acting formulations have also been shown to increase treatment adherence. Adding shorter-acting doses in late afternoon, however, may be helpful if the child experiences difficulty concentrating (eg, on homework, sports, driving).²⁴

Although drug holidays are not usually recommended, children can be evaluated for this individually. For example, a child whose ADHD symptoms primarily involve inattention may only require medication on school days.³⁷

Follow-up

During the titration process, which can take up to three months, weekly clinician contacts—some by phone—to monitor effectiveness, adherence, and adverse effects are recommended (see Table 3). Blood pressure and heart rate should be monitored carefully and titration continued as needed until optimal response to treatment has been achieved.²⁴ Monitoring should continue every three months for the first year of treatment and biannually thereafter.²⁴ After several years, it is reasonable to consider a closely monitored drug-free trial period to deter-

mine if medication is still necessary.²⁴ Finally, clinicians should remain cognizant of the potential cardiovascular effects of longer-term stimulant use and adhere to clinical guidelines.⁴²

If coexisting conditions such as severe mood or anxiety disorders are present and improvement is not noted in core ADHD symptoms after three months of treatment, the patient should be referred to a mental health specialist.²³

CONCLUSION

Primary care providers must be knowledgeable about ADHD and offer appropriate evidence-based interventions, treatments, and supportive measures to patients and families dealing with this disorder. Clinicians should know what resources are available for parents of children with ADHD. Psychoeducation for parents, families, and teachers is imperative to ensure positive home and school environments. Each treatment plan requires an individual approach, and optimal use of all available resources is desirable. Implementing evidence-based recommendations will increase the overall quality of life for children and families dealing with ADHD and optimize behavioral outcomes. **CR**

The authors would like to thank Laurie Rockelli, PhD, RN, PMHCNS-BC, and William Campbell, EdD, RN, for their revisions and support in the completion of this article.

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