Attention-Deficit / Hyperactivity Disorder

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If I have ever made any valuable discoveries, it has been owing more to patient attention, than to any other talent.

—Isaac Newton

Learning Objectives:
1. Understand the diagnostic criteria for attention-deficit/hyperactivity disorder (ADHD) and the use of ADHD-specific rating scales
2. Learn how to guide parents in advocating for their children with special needs
3. Utilize appropriate treatment regimens for ADHD and understand the potential side effects of those regimens
4. Develop the skills to diagnose and manage most patients with ADHD

Primary References:

CASE ONE:

Noah Atenshun, a 7-year-old boy, comes to your clinic with his parents who are concerned about his behavior. Mrs. Atenshun reports that he is “out of control.” He will not sit still long enough to eat dinner with the family (unlike his 2-year-old sister, Maura), and he is always running around the house tormenting Maura and his mom. When his dad took him to see The Incredibles 2, Noah ran to the front of the ticket line, and he talked during the entire movie; that is when he wasn’t skipping around the theater. Noah’s parents are exhausted, and they don’t know what to do. “Help us!”

1. What symptoms does Noah have that point to ADHD? What other information do you need to make the diagnosis?

Noah meets six of the nine criteria for the hyperactivity/impulsivity category of ADHD, as described by the DSM-5. Review the DSM-5 criteria for ADHD with learners, highlighting the subtle changes from DSM-IV. The criteria are succinctly summarized in the CDC summary sheet in the Primary References.

Noah often leaves his seat, runs excessively, has difficulty with quiet leisure activities, is always “on the go,” talks excessively, and has difficulty waiting his turn. However, in order to make the diagnosis, you need to inquire about Noah’s functioning in other settings. How does he do in school? Is he able to complete his homework assignments? Has the teacher said anything to his parents about his behavior? How are his relationships with his peers, and how does his behavior compare to that of his peers? You also need to find out how long these symptoms have been occurring. The diagnosis requires the presence of at least some of the symptoms before age 12 as well as their presence in 2 or more settings (e.g., home, camp, school). The symptoms must cause significant impairment in functioning, with maladaptive behavior not appropriate for age and developmental level. Getting a sense of the duration of symptoms can also be quite helpful. The DSM-5 requires the presence of symptoms for at least 6 months, though further questioning may reveal that they have been present in some capacity for much longer.

Despite widespread awareness of the diagnostic criteria, and public concern about over-prescription of ADHD medications, recent National Health and Nutrition Examination Survey data suggests that far more children meet DSM criteria than are being treated. Studies estimate that 8% of children are
affected by ADHD. Children in the lowest income quintile are more likely to meet diagnostic criteria, but are less likely to receive treatment.

CASE continued:

Noah’s parents explain that Noah’s 2nd grade teacher emails them weekly to report that Noah disrupts class. He gets up to use the restroom multiple times during reading group every day, and he interrupts the other students when they are answering questions without raising his hand. The other students get angry with Noah because he cuts in front of them in the lunch line, and he fidgets during spelling tests. Last summer, Noah’s camp counselor reported that he didn’t share well and that he always hogged the ball in the camp soccer games. Noah’s parents had hoped that his behavior would improve after he turned 7 last month, but it seems to be getting worse.

2. How can you gather information from “more than one setting” as outlined in the DSM criteria?

Although Noah seems to meet the diagnostic criteria for ADHD as outlined in the DSM-5, it is important to gather further information from the patient’s parents and teachers before making a final diagnosis. Parents and teachers often do not agree on the presence or severity of the various symptoms of ADHD, underscoring the importance of including teacher assessments in the diagnostic evaluation of ADHD. ADHD-specific rating scales can be helpful in assessing the specific symptoms that Noah has, both at school and at home, though the AAP does not recommend using them alone for diagnosis. Several rating scales exist, and providers should become comfortable with the use of and interpretation of at least one of these. The National Initiative for Children’s Healthcare Quality Vanderbilt Assessment Scale (Vanderbilt), available in both English and Spanish, allows parents and teachers to evaluate a child’s symptoms in several different domains. The tool is uncomplicated and can be completed efficiently. Clinicians then use the scoring guidelines provided with the Vanderbilt to interpret the results. While primarily designed to assist with the diagnosis of ADHD, the Vanderbilt rating scale is also helpful in identifying alternative diagnoses and/or comorbid conditions which frequently coexist with ADHD.

Other checklists are available and may be preferable in certain circumstances. For example, the Conners Rating Scale-Revised has been validated for use across a broad age range, including pre-school children. The Child Behavior Checklist-Attention Problem is a more comprehensive instrument frequently utilized by mental health professionals. Both of these checklists have moderate to high sensitivity and specificity for diagnosing children with ADHD, though they are considerably longer than the Vanderbilt and must be purchased for use.

3. What other diagnoses do you have to consider in the differential diagnosis? What further testing would you include as part of your work-up?

Oppositional defiant disorder, conduct disorder, anxiety disorder, and depressive disorder may coexist with ADHD in up to one-third of patients. In addition, patients with ADHD may have concomitant learning disorders or social stressors. One must take a careful history to identify these conditions, as well as others that may cause or exacerbate behavioral problems. Stressors at home or school (e.g., divorce, bullying, abuse) may bring about symptoms similar to those seen in ADHD, as can caffeine consumption. The role of excessive sugar intake as it relates to behavior and cognition has been a source of controversy. A meta-analysis in JAMA concluded that “sugar does not affect the behavior or cognitive performance of children. The strong belief of parents may be due to expectancy and common association.” Obstructive sleep apnea has also been associated with symptoms like those seen in ADHD, and surgical treatment has demonstrated improvement in these symptoms in many children. Finally, it is important to identify any unrealistic expectations that parents or teachers may have of children, as these may lead to falsely identifying a child as having ADHD.

Since ADHD has a genetic component (linked to abnormalities in dopaminergic, serotonergic, and noradrenergic pathways), ask if other family members have been diagnosed with ADHD, depression, anxiety disorder, or bipolar disorder. Children who were born premature, or who had prenatal exposure to drugs, alcohol, or tobacco may exhibit learning or behavioral problems that may mimic
ADHD. Once you have considered these alternatives, and a patient meets the clinical criteria to diagnose ADHD, no standard labs or tests are necessary. For example, you do not need to test for lead toxicity or thyroid disease, unless there are other signs or symptoms that may suggest these diagnoses. Neuroimaging and EEG are not helpful and not recommended, unless there are focal signs on exam.

4. How would you approach Noah’s treatment with his parents and with the school?

The 2011 AAP Clinical Practice Guideline on ADHD stresses the importance of emphasizing to families that ADHD is a chronic health condition and that children and adolescents with ADHD should be considered children with special health care needs. As such, these children and their families should be managed using the chronic care disease model and as part of a medical home. Providers should assist families in accessing specialized education evaluation and services. Specific procedures and services vary by state, although the federal Individuals with Disabilities Education Act (IDEA) guarantees a free and appropriate public education for all children in the United States. Every child is eligible for an evaluation if requested by the parents. After the evaluation, a group meeting should be held to determine a child’s eligibility for special education services, develop a child’s Individualized Education Program (IEP), and reassess the child’s progress and needs as necessary. Attendees should include the child’s parent(s), an administrator, a teacher, and sometimes the child. If needed, occupational, physical, or speech therapists may attend. The parents may have any other person they designate as an advocate attend with them (e.g., lawyer, professional parent advocate). Through this meeting, the child’s parent and school personnel may identify a need for further testing (e.g., for learning disabilities) if applicable. Children may also qualify for classroom adaptations as part of the 504 Rehabilitation Act Plan.

You should also contact Noah’s teacher to gain a better understanding of the school environment and Noah’s behavioral problems at school, although you may already have some of this information from the teacher’s ADHD-specific questionnaire returned after Noah’s initial evaluation. Identifying specific goals will aid in following response to therapy, and, ideally, you would meet with Noah’s parents and teacher to determine the specific goals of therapy. However, such a meeting is often not feasible. Children who are old enough can be involved in this process as well.

As in any chronic condition, education of the parents is key. Noah’s parents should be made aware of the prognosis. Treatment will not necessarily improve his academic performance as measured by tests. It is important for everyone to have realistic expectations. The provider should also address the stress that a child with difficult behavior can have on the family unit. Many emotions are commonly expressed by a parent of a child with chronic illness, including anger, frustration, and guilt, which may be directed at the child, towards a spouse, or at oneself. Treatment options (both proven and fad) should be discussed with the family. Specific treatment goals should be identified and documented in order to monitor the child’s progress once treatment is initiated.

A 2018 systematic review of nonpharmacologic treatment for ADHD found little evidence to support nutritional supplements and behavioral therapy. In the large Multimodal Treatment Study of Children with ADHD (MTA Study), combined treatment with behavioral therapy and medications did not demonstrate a significant improvement in efficacy compared with medications alone. However, further analysis of the study showed that parents and teachers were more satisfied with the treatment plan with combination therapy, and that children receiving combination therapy required lower doses of medications, which limited side effects. At the very least, discussion of simple strategies such as seating the child near the front of the classroom, having a distraction-free homework zone, and reviewing reinforcement of positive behavior with the parents and teacher may be warranted.

5. If you choose to treat him medically, what medication would you start with? What side effects would you warn his parents about?

Stimulant medications are the first line of therapy and are highly effective in most patients. As stimulant dosing is not weight-based, one would start with the lowest dose of either methylphenidate or dextroamphetamine, preferably using a long-acting formulation. Treatment should start on a Saturday, so that the family can monitor response and immediate side effects. Side effects, which include decreased appetite, sleep disturbance, and gastrointestinal upset, may be severe initially but
typically improve over time. Direct learners to Table 2 of the article by Feldman and Reiff, which highlights medications available for treatment of ADHD.

Initially, there should be weekly contact with the family to determine response. Up to 80% of children will show improved attention, and improvement is usually noted within 3 to 7 days. One may choose to increase the dose if there is a weak response, and it may be necessary to change to the other category of stimulants if there is no response or if side effects are intolerable. Children should be followed at least monthly while titrating therapy. Once symptoms are controlled on a stable dose, patients can be seen every 3 months with special attention paid to side effects, such as those on appetite, sleep, and growth, and exploration of cardiovascular effects, such as those on blood pressure. Although there has been some concern about the impact of stimulant medications on growth, a recent longitudinal cohort study by Harstad, et al. did not find any association between treatment with stimulant medications for children with ADHD and a change in growth velocity or adult height.

**CASE continued:**

Noah develops intolerable side effects on methylphenidate, and his symptoms are still significant.

6. **What can you do now?**

Side effects with stimulant medications often subside with dose reduction; however, this may not be an option if Noah’s ADHD symptoms are still present. A switch to dextroamphetamine with titration of the dose as tolerated and as needed may be successful. While studies show equal efficacy of methylphenidate and dextroamphetamine, certain individuals seem to respond better to one or the other. If therapy is still not effective once a patient’s dose has been maximized, you should assess for other reasons for treatment failure, such as poor adherence, coexisting conditions, or an incorrect diagnosis.

If stimulant medication is ineffective or causes excessive side effects, and you are confident of the diagnosis, non-stimulant medications are available. Atomoxetine (Strattera), a norepinephrine-reuptake inhibitor, is a second line choice and the most commonly used non-stimulant for ADHD. Providers should be aware that atomoxetine contains a black box warning regarding the possibility of suicidal ideation at the initiation of therapy. This medication should be avoided in cases when there is any concern about suicidal ideation, though a 2016 study in Pediatrics demonstrated no increased risk of suicidal events with atomoxetine compared with stimulants. Guanfacine (Intuniv) and clonidine (Kapvay) are alpha2 agonists also used as second line agents for management of ADHD. Children taking non-stimulant medications may take longer (4 to 6 weeks) to demonstrate a maximum response than with stimulant medications.

Once a patient is stable on therapy, follow-up should be arranged approximately every 3 months to assess improvement and side effects. The Vanderbilt provides follow-up questionnaires to reassess a child’s performance several months after diagnosis and intervention for both parents and teachers.

**CASE continued:**

After speaking with Noah’s teacher, you adjust the medication regimen, and Noah’s behavior improves dramatically over the next few months. One morning, his mom calls you frantically about a story she saw on the news about “a boy who died because of his ADHD medicine.”

7. **What is the controversy regarding medications used to treat ADHD? What cardiac risk is there to initiation of treatment for ADHD?**

Tremendous controversy has emerged regarding the safety profile of stimulants used to treat ADHD, dating back to the FDA’s 2006 review of several case reports of adverse cardiac events associated with the use of stimulants. However, sudden death in patients taking stimulant medications is exceedingly
rare, and it is unclear whether or not stimulant medications increased the risk of sudden death in the cases that have been reported.

In the 2011 Clinical Practice Guideline, the AAP advised providers to obtain a thorough personal and family history specific to cardiac disease, including a thorough review of cardiac symptoms as well as evaluation for a personal or family history of sudden cardiac death, Wolff-Parkinson-White, hypertrophic cardiomyopathy, or long QT syndrome. Should any concern emerge, further evaluation may be indicated prior to initiation of stimulant medications. If no concern exists based on the patient’s history and exam, no further work-up (including electrocardiogram) is necessary prior to the initiation of pharmacologic therapy. Providers must balance the convincing data that supports aggressive pharmacologic treatment of ADHD against the possible, but as yet unproven, risk of an exceedingly rare serious side effect when addressing parental and societal fear surrounding the use of stimulants.

**CASE continued:**

Mrs. Atenshun comes to see you 2 years later, this time about Noah’s now 4-year-old sister Maura and his 15-year-old sister Louisa. Both Maura’s and Louisa’s teachers have expressed some concern that they too might have ADHD.

8. What are the unique diagnostic and management issues with ADHD in preschoolers and adolescents?

In the 2011 report, the AAP broadened the range of ages in which primary care physicians should consider a diagnosis of ADHD in a child with academic or behavioral concerns to include children ages 4 to 18 years. For children 4 to 5 years old, the same criteria that apply to school-aged children can be used for diagnosis. However, the first line treatment for preschoolers is behavioral therapy. Children who continue to have a severe disturbance in their behavior after behavioral therapy may be appropriate candidates for medication. Although dextroamphetamine is the only FDA-approved medication for preschoolers, the Clinical Practice Guideline points to methylphenidate as the recommended medication for preschoolers because several studies have demonstrated safety and efficacy. Providers should be aware that use of methylphenidate in this age group remains off-label at this time.

Similar diagnostic criteria and management plans can be used with adolescents as with school-aged children. However, adolescents above age 17 years need only present with five symptoms of either hyperactivity, inattention, or both (rather than six for younger children) to meet diagnostic criteria for ADHD. Medications, preferably in conjunction with behavioral therapy, should be used for adolescents with ADHD. Special consideration must be given to making the correct diagnosis in adolescents, as they typically spend less time with their parents or with one teacher who can provide accurate information with regard to their behavior. Coaches, guidance counselors, and other adult mentors may be valuable sources of information to guide diagnosis. In addition, the provider must consider substance use disorders, depression, and anxiety as alternate or comorbid diagnoses in adolescents. If substance use is suspected, it must be addressed prior to initiation of treatment for ADHD. A concern for misuse or diversion of stimulant medications may lead to selection of a non-stimulant medication for treatment. Many adolescents will need to continue therapy into adulthood, and adults with childhood ADHD are at risk for significant morbidity and mortality. Discussing self-care and transition planning are important considerations to mitigate these risks as the patient moves into adulthood.

**Additional References:**


2. AAP Subcommittee on Attention-Deficit/Hyperactivity Disorder, Steering Committee on Quality Improvement and Management. ADHD: Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. Process of


Resources:
1. Information for families from AAP. http://www.aap.org/healthtopics/adhd.cfm
2. Medication safety information from AAP. http://www.aap.org/family/safetypillsadhd.htm