

Attention Deficit Hyperactivity Disorder (ADHD) for the General Practitioner

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What is ADHD?

- Neurobehavioral disorder characterized by inappropriate impulsivity, overactivity, inattention, and altered executive functions
- Causes problems at home, at school, and with peer relationships



Case

Noah is an 8 year old boy who has been brought in by his mother for a yearly checkup. His mother reports that his promotion to the third grade is "in doubt". Noah's teacher complains that he has difficulty sitting still in class, constantly talks to children around him, and blurts out answers. At home, he is constantly in motion, although he can sit still for hours to play video games.

A neighbor has suggested that Noah may have ADHD. His mother wants to know if you think her neighbor is right.

Facts about ADHD

- ADHD is the most commonly diagnosed behavioral disorder of childhood
- Estimated that 4% to 12% of school aged children meet criteria for ADHD
- Rates higher in males than females usually ratio of 2:1 or 3:1, but may reflect the fact that girls tend to more inattentive and may not be identified

Role of the Pediatrician in ADHD

- "In a child 6 to 12 years who presents with inattention, hyperactivity, impulsivity, academic achievement, or behavior problems, primary care clinicians should initiate an evaluation for ADHD."

American Academy of Pediatrics, 2000

Long Term Effects of ADHD

- Many patients continue to have features and impairments into adulthood
- ADHD patients are more likely to be physically aggressive, be cited for reckless or drunk driving, attempt suicide, abuse drugs, have traffic accidents, sexually transmitted diseases, and unwanted pregnancies (Barkley, 2002)

What causes ADHD?

- Genetic
- Neurobiological basis
- There is no evidence that ADHD is caused by too much sugar or food additives

Neurobiological Basis of ADHD

- Catecholamine hypothesis: Dopaminergic and noradrenergic pathways in the brain are responsible for the symptoms of ADHD
- In some studies functional neuroimaging has revealed abnormalities in various brain regions, including prefrontal-striatal circuit, cerebellum, and brainstem in children with ADHD

Genetics and ADHD

- Approximately 25% of all children with ADHD have at least one parent who has ADHD or exhibits its symptoms
- Twin studies: Concordance rates 50 % in identical twins, 33% in non identical
- Siblings studies: 20% to 30% chance of siblings of children with ADHD being identified as having ADHD (Greenhill, 2004)

Making the Diagnosis: History

- Parental Concerns- Child's strengths and weaknesses, duration and onset of symptoms, level of impairment, goals for treatment
- Behavioral History- ADHD symptoms, psychiatric symptoms, sleep issues, temperament
- Medical History
- Developmental History- Milestones

Molecular Genetic Basis of ADHD

- Several genes are believed to enhance susceptibility
- Chromosome 5: Dopamine transporter gene
- Chromosome 11: Dopamine receptor gene



Relevant History Continued

- Educational History-Current school performance, repeated grades, areas of strengths and weaknesses-
Get information directly from the teacher, and ask for report cards, previous evaluations
- Family History- ADHD, mental illness, neurologic disorders, learning disabilities
- Personal and social history

Making the Diagnosis Continued

- Physical Exam-VS, Ht, Wt, HC, vision, hearing
- Neurologic Exam
- Behavioral Observation in office- may be normal
- Family Assessment
- School Assessment

ADHD: DSM V Criteria

- 6 or more symptoms of inattention AND/OR 6 or more symptoms of impulsivity/hyperactivity
- Have persisted for > 6 months
- Have onset prior to age 7
- Cause some impairment in 2 or more settings
- Cause significant impairment in social, academic, or occupational functioning
- Are not better accounted for by another mental disorder (ex. Mood disorder, anxiety disorder, personality disorder)

Case Continued

You know from seeing Noah previously that he was born FT via a NSVD. He has had no major illnesses. His motor and language milestones were normal. His mother reports that he has been “on the go since the day he was born”. Mom denies that there is any family history of ADHD, or learning disabilities, but she does mention that Noah’s father “never liked school”.

On physical exam Noah’s weight and height are both 75%. His neuro exam is normal. He has no dysmorphic features. Noah is able to sit still during the entire evaluation.

What do you do next?

ADHD: DSM V Subtypes

- ADHD Predominantly Inattentive Type
- ADHD Predominantly Hyperactive- Impulsive Type
- ADHD Combined Type: Inattentive, Hyperactive and Impulsive

How Do You Make the Diagnosis?

- “The diagnosis of ADHD requires that a child meet the criteria of the Diagnostic and Statistical Manual of Mental Disorders, 4th edition” (DSM-V)

AAP, 2000

ADHD Inattentive Type

- 6 or more of the following symptoms:**
- Inattention to detail or careless mistakes
 - Difficulty sustaining attention
 - Does not seem to listen
 - Fails to finish tasks
 - Difficulty organizing tasks
 - Avoids tasks requiring attention
 - Loses things
 - Easily distracted
 - Forgetful

ADHD Hyperactive-Impulsive Type

6 or more of the following symptoms

Hyperactivity –

- Fidgets
- Unable to stay seated
- Excessive running, climbing or restlessness
- Difficulty engaging in quiet activities
- Talks excessively

Impulsivity-

- Blurts out answers
- Difficulty awaiting turn
- Interrupts others

Behavior Rating Scales

- Many rating scales exist- Vanderbilt, Conners', Swanson, Nolan and Pehlam, Disruptive Behavior Disorder Scale, ADHD Rating Scale
- Each rating scale has advantages and disadvantages with respect to cost, differentiated symptoms by age and gender, and screening for co-existing conditions
- Vanderbilt is included in the AAP toolkit

ADHD Combined Type

- Meets criteria for 6 or more symptoms for both Inattentive Type, and Hyperactive-Impulsive Type
- Most common subtype



Screening for Co-Morbidities

- AAP guidelines call for an association of associated conditions when evaluating for ADHD
- At least 1/3 of children with ADHD have one or more coexisting conditions
- Oppositional Defiant Disorder-32.5 %
- Conduct Disorder- 27.5 %
- Anxiety Disorders -25.8 %
- Depression-18.2 %
- Learning Disabilities -12-50%

U.S. Department of Health and Human Services, 1999

Using Behavior Rating Scales

- The AAP guidelines recommend that the assessment of ADHD requires “evidence directly obtained from the parents and the teachers of impairment”
- Behavior rating scales (Vanderbilt, Conners', ADHD rating scales) should be used to get information about ADHD symptoms
- Parent and teacher versions must be obtained

Additional Assessments to Consider

- AAP: Other diagnostic tests are not routinely indicated to make diagnosis of ADHD, but may be used to assess for coexisting conditions
- Psychoeducational Evaluation
 - IQ testing
 - Achievement Testing
- Speech-Language Evaluation
- Occupational Therapy Evaluation
- Mental Health Evaluation

Case Continued

You give a Parent Vanderbilt form to Noah's mother to complete, and give her a Teacher form to bring to school. You schedule a follow-up appointment for 2 weeks.

At the follow-up appointment you score the Vanderbilt forms, and note that his teacher's Vanderbilt is positive for ADHD, but his mother's is not. Based on the teacher report he also seems to be having difficulty with reading.

You know that you need impairments from the symptoms in two or more settings to make the diagnosis.

What do you do?

Treatment of ADHD

- Primary care pediatricians are on the front line, and must be familiar with the range of treatment options
- AAP calls for clinicians to treat ADHD as a chronic condition, and treat the patient in all settings in which impairments occur (AAP, 2011)



What to Do with Inconsistent Diagnostic Information

- Parents and teachers often disagree about children's impairments
- In the MultiModal Treatment Study of Children with ADHD (MTA study), discrepancies were present in 1/3 of evaluated children
- Discrepancies may arise from diverse expectations, levels of imposed structure, and environment
- Reviewing the conflicting results with the parents may help clarify the reason

Goals of Treatment

- Alleviate core symptoms of ADHD (diminish hyperactivity, inattentiveness, and impulsive behavior)
- Lessen accompanying behavior (oppositional behavior, compliance problems)
- Help the child achieve normal peer and family relationships
- Enhance academic success

Case Continued

When you review the Parent Vanderbilt with Noah's mother, she admits that his symptoms may be more severe than she had indicated.

You confirm the diagnosis of ADHD. Noah's wants to know how it can be treated.

What do you tell her?

Goals of Treatment

- Recognize and treat any coexisting conditions that may interfere with successful treatment
- Improve organizational skills and overall executive functioning
- Enhance self-esteem



Initial Management of ADHD

- First demystify the diagnosis by explaining it to the parents, child, and school
- Importance to establish an alliance between everyone
- Reinforce the idea that the child is NOT lazy

Use of Medications to Treat ADHD

- AAP Treatment Guidelines for ADHD recommend stimulant medication and/or behavior therapy for most children
- MTA study (1999) found that medication management was superior to behavioral management alone



Treatment Approaches

- Treatment of ADHD requires a multimodal approach:
 - Medication
 - Parent Education
 - Educational Intervention
 - Behavioral Therapy

Use of Medications Continued

- Clinician, parents, child and teacher should be clear about the target symptoms
- Regular feedback should be obtained from home and school using rating scales
- Parents need to observe the child while they are taking the medication
- Range of dose/and or different medications may have to be tried before the optimal response is seen

Treatment for Preschool Children

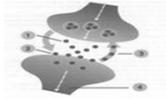
- Behavior management is 1st line therapy for children btwn 4-5 years old
 - Parent management: Availability of affordable behavior programs for parents is limited
 - Teacher management: Low income families often have access to Head Start where teachers may have more training than in unregulated day care programs

Stimulant Medications

- Methylphenidate, mixed amphetamine salts, and Dextroamphetamine are the stimulants approved to treat ADHD by the FDA
- Taken alone 70 % of children with ADHD will respond to either type
- Success rate improves to 90% if taken successively (ex. If one does not work, try the other one)
- Do not use a positive response to medications to make a diagnosis of ADHD

Mechanism of Action of Stimulants

- Methylphenidate increases the concentration of dopamine by blocking its reuptake in the frontal lobe
- Amphetamines release cytoplasmic dopamine, and block dopamine and norepinephrine reuptake



Cardiovascular Adverse Effects?

- Cardiovascular risks- now shown to have NO increased clinically significant risks even in populations like children with congenital heart disease.
- HOWEVER, it is still standard of care to get personal and family cardiac hx
- If the child has a heart murmur, history of dizziness, syncope, or family history of sudden cardiac death, send to cardiology prior to starting

Types of Stimulants

- **Methylphenidate:**
 - Ritalin, Ritalin LA
 - Focalin, Focalin XR
 - Concerta
 - Metadate
 - Daytrana
 - Methylin
- **Amphetamines:**
 - Adderall, Adderall XR-mixed amphetamine salts
 - Dexedrine -dextroamphetamine
 - Dextrostat -dextroamphetamine

Non-Stimulant Medications

- Atomoxetine (Strattera) and Guanfacine (Tenex or Intuniv) are nonstimulant medications approved to treat ADHD
- Most common side effects are fatigue and gastrointestinal upset
- For Strattera --Case reports of hepatotoxicity reported-check baseline LFT's
- Levels need to build up so maximal effects may not be seen for 2 weeks for Guanfacine, and 6 weeks for Strattera

Disadvantages of Stimulants

- Side effect profile of decreased appetite, poor weight gain, slight changes in blood pressure, rebound moodiness, poor sleep, headache, abdominal pain, irritability, fatigue
- Must monitor height, weight, and blood pressure
- May worsen pre-existing tics, or unmask them

Case Continued

Noah's mother has decided that she would like to start him on medication to help him pay attention. What medication should you choose?

How Do you Choose a Medication to Start With?

- There is no “right” medication to start with
- Consider desired duration of effect, age of child, insurance plan, ability to swallow pills
- “Start low and go slow”- Start with the smallest dose and titrate up to maximal dose before considering switch
- Long acting medication is usually preferred for school age children



Sustained Release Methylphenidate: Concerta

- Tablets (cannot be crushed) dosed once per day
- 22% of the medication is released within 1 hour, 78% released in two more doses throughout the day
- Good for after school coverage, but may not be enough coverage for mornings for some children
- Duration of action is 8-12 hours

Immediate Release Stimulants: Methylphenidate

- Methylphenidates reach peak levels within 1 hour

Ritalin, Methylin- tablet dosed 1-2 times per day
Duration of action 3-4 hours

Focalin- tablet dosed 1-2 times per day
Duration of action 3-4 hours
Dose half that of Ritalin

Sustained Release Methylphenidate: Ritalin LA

- Capsules which can be sprinkled dosed once per day
- Released in a bimodal distribution with 50% released immediately, half released 4 hours later
- Duration of action is 8 hours

Immediate Release Medications: Amphetamines

- Amphetamines reach peak levels in 1 hour

Adderall tablet dosed 1-2 times per day
Duration of action 4-6 hours

Dexedrine, Dextrostat tablet dosed 1-2 times per day
Duration of action 4-5 hours

Sustained Release Methylphenidate: Metadate CD

- Tablet dosed once per day
- 30% of the beads released immediately, 70% enter the system 3 hours later
- Duration of action 7-8 hours

Sustained Release Methylphenidate: Focalin XR

- Focalin XR is single isomer of methylphenidate-dexmethylphenidate Hydrochloride
- Capsules which can be sprinkled dosed once per day
- 50% of the beads enter the system immediately, the rest is released about 4 hours later
- Duration of action is 12 hours
- Dose is half of that of Ritalin

Atomoxetine: Strattera

- Capsules which cannot be crushed or sprinkled dosed once per day
- Effects last 18-24 hours
- Maximum dose is 1.4 mg/kg/day

Sustained Release Mixed Amphetamine Salts: Adderall XR

- Capsules which can be sprinkled dosed once per day
- 50% of the beads are released immediately and the other half are released about 4 hours later
- Duration of action 10-12 hours

Guanfacine (Tenex or Intuniv)

- Tenex short-acting tablet so can be cut or crushed
 - Start with 0.5 mg BID, then can increase by 0.5 mg Qweekly to max of 1.5 mg/day
- Intuniv long-acting; cannot be cut or crushed
 - Must start with 1 mg Q24, then increase by 1 mg Qweekly

Sustained Release Methylphenidate: Daytrana

- Methylphenidate transdermal system- patch placed on once per day
- Patch is worn for 9 hours per day, but works for 3 hours after with a total duration of 12 hours



Case Continued

You decide to start Noah on a long acting stimulant. You discuss the risks and benefits of stimulant medications with his mother. You choose Focalin XR because he cannot swallow pills, and he needs coverage for an after-school program. You start with the lowest dose, 5 mg. You schedule him for a follow-up appointment in 1 week to check for side effects, and to determine if the dose needs to be increased.

Noah's mother wants to know what else she can do for him at home and at school.

Parent Education and Counseling

- Structure and routine are very important
- Communicate requests clearly
- Ignore mild inappropriate behaviors
- Try to avoid yelling



Educational Interventions

- No Homework tantrums! 10 minutes/grade
 - 1st grade = 10 minutes
 - 2nd grade = 20 minutes
- Unfinished classwork
 - NOT sent home as extra homework
 - NEVER the reason to miss recess
- DO NOT check the Homework

Parent Education and Counseling Continued

- Give frequent praise and positive feedback
- Have clear consequences for breaking and following family rules
- Consistency is key

Educational Interventions Continued

- Not all children with ADHD will qualify for services under the IDEA, but they may be covered by Section 504 of the Rehabilitation Act of 1973
- Can entitle child to extended time for tests, preferential seating, one to one classroom aide
- Pediatricians can fill out simple paperwork confirming the diagnosis to access these services

Educational Interventions

- Children with ADHD need structured classroom, with clear expectations
- Many children will require special education services due to learning disabilities- covered by the Individual with Disabilities Special Education Act (IDEA)
- Pediatricians can help with appropriate school placements by referring to the Committee on Special Education

Behavioral Therapy

- Parent Training to teach simple techniques such as time out, reward systems, token economies
- Parent training can be done with a psychologist or in classes
- Summer camp for children
- Cognitive and “play therapy” have not been shown to be effective for ADHD
- Individual psychotherapy is not effective for core symptoms of ADHD, but can help with low self-esteem, depression, or anxiety

Case Continued

When you see Noah one week later his mother reports that she and his teacher have noted some improvement, but he continues to have difficulty sitting still in class. You decide to increase the dose of Focalin XR, and give his mother Parent and Teacher follow-up Vanderbilts to track his improvement. You schedule another appointment in one month.

You also help his mother write a letter to the Committee on Special Education to evaluate him for a learning disability which his mother can bring to the school.

Noah's mother thanks you for all of your help.

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