ADHD

Components of the Multifaceted Diagnosis and Treatment

Nancy Beyer, M.D.
Clinical Associate Professor
University of Iowa Department of Child and Adolescent Psychiatry,
Community Psychiatry
Disclosures

• None
ADHD

- Case Presentations
- Diagnosis of ADHD
  - DSM Criteria
  - Controversy
- Epidemiology
- Etiology
  - Biology
  - Environment
- Treatment
  - Pharmacologic treatment
  - Psychosocial, educational, educational
ADHD?
ADHD and the Brain

AREAS AFFECTED

Caudate nucleus and globus pallidus select which commands are passed on

Prefrontal cortex is the brain’s command center

Vermis region helps coordinate those actions
3 Cases, Same Dx?

1. 6 yo male presented for emergent eval for thoughts of self-harm; disruptive in classroom, doesn’t listen, forgets, loses things, intrusive

2. 11 yo female, brought to clinic for academic problems, struggling in math, seeming “lazy”

3. 29 yo male father of 2 (2 diff moms) working FT, relationship difficulties, anger problems
DSM V Criteria

Presence of either 1 or 2
1. Six (or more) of the following symptoms of inattention have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level (5 for age 17 yr and above):

- Often fails to give close attention to details or makes careless mistakes in schoolwork, work or other activities
- Often has difficulty sustaining attention in tasks or play activities
- Often does not seem to listen when spoken to directly
- Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
- Often has difficulty organizing tasks and activity
- Often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
- Often loses things necessary for tasks or activities (eg, toys, school assignments, pencils, books, or tools)
- Is often easily distracted by extraneous stimuli
- Is often forgetful in daily activities
2. Six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least six months to a degree that is maladaptive and inconsistent with developmental level (5 for age 17 yr and above):

**Hyperactivity:**
- Often **fidgets** with hands or feet or squirms in seat.
- Often **leaves seat** in classroom or in other situations in which remaining seated is expected.
- Often **runs about or climbs** excessively in situations in which it is inappropriate (in adolescents, or adults, may be limited to subjective feelings of restlessness).
- Often has **difficulty playing** or engaging in leisure activities **quietly**.
- Is often "**on the go**" or often acts as if "driven by a motor."
- Often **talks** excessively

**Impulsivity:**
- Often **blurts** out answers before questions have been completed.
- Often has **difficulty awaiting** turn.
- Often **interrupts or intrudes** on others (eg, butts into conversations or games)
Additional Criteria

• Several hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 12 years.

• Some impairment from the symptoms is present in two or more settings (eg, at school [or work] and at home).

• There must be clear evidence of clinically significant impairment in social, academic or occupational functioning.
Changes in Symptoms with Age

• Presentation varies with age
• Preschool: Short play, not listening, and no sense of danger; whirlwind
• Primary school: Forgetful, distracted, brief activities; restless; rule breaking, intrusive
• Adolescence: Less persistence, poor attention to detail; poor self-control, reckless; fidgets
Presentation of the ADHD-Inattentive Child

• Based on teachers ratings, more socially withdrawn, with more reading difficulties

• Sluggish cognitive tempo (drowsy, lethargic, hypoactive) examined during work on DSM-IV but not included

• Differentiation: inattention associated with internalizing disorders
Diagnostic Debate

• First emphasized hyperactivity (II), then attention problems (III), to combined type, lumping hyperactivity and impulsivity

• Current debate whether to emphasize “deficient inhibitory processes” vs. emphasis on inattention as core problem
Who Cares?

• Potentially affects studies that combine types; may be flawed
• Impacts understanding, conceptualization of disorder
• More time needed to understand the disorder
• Comorbidities:
  ADHD associated w/externalizing d.o.
  Both assoc w/LD, but math worse w/Inattentive (right hemisphere?)
  Social function: both struggle, but
  Combined type more aggression, active rejection
Clinical Relevance?

- Treatment: limited info but suggests more conservative tx effective w/inattentive type

- Hyperactive/impulsive factor greater predictor of negative outcomes

- ADD (hyperactivity): more unresponsive to MPH or responded best to lowest dose, while ADD/H showed best response to mod or highest dose
Real Life

• “Hyperactive” as measured by actometer? Increased activity awake and asleep, decreasing with age

• Concentration problems in environments with low level novelty, reinforcement, motivation (see criteria)

• Impulsive, verbally, physically, cognitively

• Socially impaired, lacking persistence, needing immediacy, with variable performance, leading to frustration

• Cognitive problems, eg conceptualizing, processing temporally, with short-term memory problems

• Affectively dysregulated: temper, labile mood, reactive, “bossy”, intrusive, insensitive, uncooperative

Psychoeducational testing recommended, settle for Conners or Vanderbilt
AHDH: Clinical Practice Guideline

• Should consider ADHD for “any child 4 through 18 years of age who presents with academic or behavioral problems and symptoms of inattention. “

• Recommendations for treatment vary with age, i.e. nonpharmacologic treatment attempts first for preschool-aged

Pediatrics 128 (5) Nov 2011
Challenges

• Increased time requirements
• Benefit of developing system of care, coordinating with school, care providers
• Controlled use of medications
Screening

• SWAN rating scale or SNAPIV or Vanderbilt
IOWA Conners

• Aggression often comorbid; adverse outcomes if continues include “early school dropout, teenage pregnancy, delinquency, lower occupational attainment, development of antisocial personality, sub abuse, criminality”

• IOWA Conners not patented

• 2 Subscales: Inatttn/Overactivity, Aggression (WA)

• Scoring
Iowa Conners Teacher's Rating Scale Revised

Information obtained: [Month] [Day] [Year]
Child's Name: ____________________________
Completed by: ____________________________

<table>
<thead>
<tr>
<th>Degree of Activity</th>
<th>Not at All</th>
<th>Just a Little</th>
<th>Pretty Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fidgeting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Humms and makes other odd noises</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Excitable, impulsive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Inattentive, easily distracted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fails to finish things s/he starts (short attention span)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Quarrelsome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Acts &quot;smart&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Temper outbursts (explosive &amp; unpredictable behavior)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Defiant</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Uncooperative</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Demands must be met immediately- easily frustrated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Disturbs other children</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Restless or overactive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Mood changes quickly and drastically</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments: ____________________________
VANDERBILT ADHD DIAGNOSTIC PARENT RATING SCALE

Patient Name: _______________________________________________ Today’s Date: ________________________________

Date of Birth: ________________________________________________ Age: _______________________________________

Grade: ________________________________________________________________________________________________

Each rating should be considered in the context of what is appropriate for the age of your child.

Frequency Code: 0 = Never; 1 = Occasionally; 2 = Often; 3 = Very Often

1. Does not pay attention to details or makes careless mistakes, such as in homework 0 1 2 3
2. Has difficulty sustaining attention to tasks or activities
3. Does not seem to listen when spoken to directly
4. Does not follow through on instruction and fails to finish schoolwork (not due to oppositional behavior or failure to understand)
5. Has difficulty organizing tasks and activities
6. Avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort
7. Loses things necessary for tasks or activities (school assignments, pencils, or books)
8. Is easily distracted by extraneous stimuli
9. Is forgetful in daily activities
10. Fidgets with hands or feet or squirms in seat
11. Leaves seat when remaining seated is expected
12. Runs about or climbs excessively in situations when remaining seated is expected
13. Has difficulty playing or engaging in leisure activities quietly
14. Is “on the go” or often acts as if “driven by a motor”
15. Talks too much
16. Blurts out answers before questions have been completed
17. Has difficulty waiting his or her turn
18. Interrupts or intrudes on others (butts into conversations or games)
19. Argues with adults
20. Loses temper
21. Actively defies or refuses to comply with adults’ requests or rules
Scoring Vanderbilt

• Inattentive type: score 2-3 on 6 of 9 questions on questions 1-9 AND 4 or 5 on questions 48-55
• Hyperactive/impulsive: score 2 or 3 on 6 of 9 questions on questions 10-18 AND 4 or 5 on 48-55
• Combined Type: above criteria for inattention and hyperactivity/impulsivity
Reality “Testing”

- Kids with ADHD, combined or inattentive, consistently demonstrate academic underachievement.

- Inattentive subtype associated with math LD, but both associated w/LD (i.e. difference in “processing”, right hemispheric function)
The (somewhat) Boring (controversial) Details

• Huge variation in estimates of prevalence, but 3-5% of school-age population; up to 30-50% of referrals for mental health services; males more prevalent (~3-4:1) particularly Combined type (esp. in clinic)
  
  Boys (9.5%) are more likely than girls (5.9%) to have been diagnosed with ADHD.

• Estimates of 4% of adults

  Longitudinal studies suggest 58-70% of childhood cases persist into young adulthood
More Data

• AACAP Practice Parameters cite various studies, with up to 10% of children in N.Carolina elementary school children w/Dx; 7% medicated

• Center for Disease Control & Prevention: >100,000 children, 7.8% w/Dx, 55% of them treated
Etiology (like we know)

• Twin and family genetics reveal mean heritability (The proportion of phenotypic variance attributable to variance in genotypes) of ADHD around 80%

• ~1/3 of adults with ADHD have min 1 child w/ADHD (1/3 of children with ADHD have at least one affected parent).

• Multiple candidate genes, i.e. Thyroid receptor, Dopamine Type D2 receptor (DRD2), Dopamine transport and DRD4, serotonin transporter, SNAP25

• NEUROANATOMICAL: complex interaction for focus vs executive fx vs encoding, vs shifting vs sustaining
Environmental Factors

• Lead exposure

• Complications from pregnancy and delivery ("perinatal stress" low birth weight, prematurity**TBI)

• Maternal smoking during pregnancy

• Parenting, social context, comorbid dx can contribute
Attention

• WE need to pay attention

• Given heritability, likely family members deal with same disorder

• These same family members are primary resource for treatment

• http://kidsconference.kajabi.com/sq/45918-parental-adhd-screening-linking-adhd-odd
Multiple Problems, One Diagnosis

- Translates as impairments in executive functioning processes which control “response inhibition”, vigilance, working memory, and measures of planning
- Russell Barkley identifies 5 areas of executive function including inhibition, visual imagery, talking to oneself or verbal comprehension, planning and control
Neurobiology

• Nothing diagnostic
• Frontal-striatal dysfunction
• ADHD symptoms are alleviated by dopaminergic and noradrenergic agonists such as methylphenidate, amphetamine and atomoxetine
Comorbidity

• 40-50% also have oppositional defiant disorder
• Next most common comorbid disorder includes anxiety disorders, followed by conduct disorder and major depression, bipolar
Pharmacologic Treatment

• Stimulants – 75% respond to first trial, additional 10% with alternative agent; 90% of those remaining respond to adjustments
  • MPH 1-2mg/kg/day as target, but rec: start low and titrate
    • Concerta uses “oral osmotic release system” ; solid capsules
    • Ritalin LA, Metadate CD have beads, Quillivant liquid
  • Dextroamphetamine 0.5-1mg/kg/day
    • Adderall XR 10-12 hr
    • Spansules also have beads
    • Vyvanse relies on metabolism to activate
  • Improve cognition, vigilance, reaction time, memory, learning with linear response curve w/doses .7-.9mg/kg
  • Improve impulsive behavior, noisiness, noncompliance, disruptiveness, parent interaction, peer & self perception
Adverse Effects

- Common: Decreased appetite, wt loss, delayed sleep onset headache, GI upset, slight increase in vs, increased irritability, crying
- Less common: tics, “rebound” (deterioration beyond base line) occurring late p.m. or evening, treated w/“booster”or use of long-acting formulations
- Infrequent: choreiform movement, “self-directed behavior” (lip smacking/biting, picking)–reduce dose
- Rare: psychosis with tactile delusions, thought disorg, manic sx, anxiety; bone marrow suppression, thrombocytopenia
- Long-term: dose related decrease in wt/ht; tx with holidays
- Presumed to be associated with drug use, but evidence contradicts.
- “SUDDEN DEATH”???
Methylphenidate Transdermal System

Dosing: individualized titration

• Typically, 9 hr “wear-time” for tx around 12hr, 2 hr onset interval

• “Doses”
  • 12.6 cm² 10 mg (1.1 mg/hr) - 25 cm² 20 mg (2.2 mg/hr)
  • 18.75 cm² 15 mg (1.6 mg/hr) - 37.5 cm² 30 mg (3.3 mg/hr)
“The Patch”

Advantages:
• Once-daily dosing
• Potential enhancement of compliance
• Dosing flexibility
• Ease of administration

Disadvantages:
• Skin reactions
• Variable absorption
• Monitoring
Nonstimulant treatment: “Antidepressants”

- Atomoxetine (Strattera) – NE reuptake inhibitor (SNRI)
  - Similar adverse effects
  - Cytochrome P450 2D6 metab, so variable levels, & caution with meds inhibiting CYP 2D6
  - Warnings re: hepatotoxicity & SI
  - Treat anxiety?
  - Start 0.5mg/kg, up to 1.2-1.4

- Tricyclic AD – lower doses than to treat mood; Imipramine most frequently used
  - 10mg/d up to 25mg BID up to 100-150mg/day

- Bupropion (not recommended for children?) starting at 75mg/d
Nonstimulant treatment: Guanfacine et al.

- Alpha 2 agonists: decrease impulsivity and hyperactivity;
  - clonidine more sedating shorter acting than guanfacine
    - Start with 0.05mg
  - Guanfacine: Titrate by 0.5mg Q 4-6 days
    - Target dose: 0.5mg BID if <40kg (may advance slowly)
      - 1mg BID if >40 kg
      - Up to 4mg daily (adult dose)
  - Intuniv ("long acting" guanfacine) start at 1mg daily and advance up to 4mg daily

- Monitor bp, heart rate
- Slow taper to prevent rebound
- AE include HA, GI upset, sedation
Psychosocial treatment

• Psychoeducation:
  • parent, child, care givers, teachers:
    • diagnosis, treatment, side effects, prognosis, comorbidity
  • Educational strategies meant to be proactive, eg reduction in task demands, increase stimulation, choices, token program, daily report card
Psychosocial treatment

• PARENT CHILD INTERACTION THERAPY

• Academic Organizational skills and Remediation
  ~25% of children with ADHD have LD
  Associated with increased grade repetition, placement in special ed, tutoring

• Parent Training
  Behavior training
    ID target behavior
    Relevant reward system
    Contingency attn
    Time out
  Improves home functioning
Psychosocial Interventions (con’d)

- **Family Therapy** – Barkley found structured FT, problem-solving and communication training reduced conflict, anger, negative communication, externalizing & internalizing sx but limited
- **CBT**
- **Social skills** – sportsmanship, accepting consequences, assertions, ignoring provocation, problem solving, processing emotional responses
- **Individual Therapy**
- **Physical activity**
- **Multimodal**
Information for Parents

- http://www.aacap.org
- http://www.brightfutures.org/mentalhealth
- http://www.CHADD.org
Resource for Providers

www.aacap.org
www.childmind.org
www.brightfutures.org/mentalhealth
www.2massgeneral.org/schoolpsychiatry
www.chadd.org

National Initiative for Children’s Healthcare Quality
Diagnostic & Clinical Features

• Pattern of negativistic, hostile, and defiant behavior for at least 6 mos
• At least 4 of symptoms during interaction with individual who is NOT a sibling
• Symptoms divided into subdivisions
• Severity r/t number of setting (1-3)
• Associated w/increased risk for suicide attempt (anxiety, depression
Preschoolers with ADHD

- Estimate of 2-6% in community samples
- High comorbidity with oppositional behavior, communication disorders, anxiety
- Greater impairment implying more severe
Multimodal Treatment Study of Children with ADHD (MTA)

• 1st longer-term investigation of efficacy of pharmacotherapy and behavior therapy, alone vs combined
• NIMH and Dept of Education: randomized clinical trial
Results

• “Robust” support of pharm tx over behav. based on parent, teacher ratings of hyperactivity, impulsivity; otherwise not significant difference on other outcomes
• Combined treatment and med mgmt did not differ significantly but combined did outperform behavioral w/ODD/aggression, internalizing sx, WIAT
• Lower med doses if combined.
PATS: Preschool ADHD treatment Study

- Examined efficacy of methylphenidate in 3-5-year-old using immediate release methylphenidate
- Greater problems with side effects, including GI, sleep, emotional reactivity
- Non-pharm alternatives include parent training, PCIT
Variety of Integrative therapies

- Melatonin 3-6mg
- Omega-3 fatty acids
- Biofeedback
- Gluten-free diets
- Alternative diet
References

IACAPAP textbook of child and adolescent mental health
MTA Cooperative Group. A 14-month randomized clinical trial of treatment strategies for attention-deficit/hyperactivity disorder. Arch Gen Psychiatry 1999 Dec 56 1073-86 Practice Parameter for the Assessment and Treatment of Children and Adolescents With Attention-Deficit/Hyperactivity DisorderFabiano
Plizka et al, J Am Acad Child Adolesc Psychiatry 46:7 July 2007 Practice Parameter for the Assessment and Treatment of Children and Adolescents With Attention-Deficit/Hyperactivity Disorderthis
Sadock Benjamin et al. Comprehensive textbook of psychiatry, 8th ed, 2005
http://www.mentalhealthamerica.net/go/information/get-info/ad/hd/adult-ad/hd-in-the-workplace
Steiner H et al. Practice parameters for the assessment and treatment of children and adolescence with conduct disorder. JAmAcad Child Adolesc Psychiatry. 1997 122S-130 9S