Understanding ADHD Diagnosis, Comorbidities and Treatment options in Children and Adolescents

Janaki Nimmagadda, MD, FAPA
Assistant Professor
Director, Child and Family Assessment Clinic
UAB Department of Psychiatry
Division of Child and Adolescent Psychiatry

Disclosures

• No conflicts of interest to disclose
• The discussion will have brand names of medications along with their generic names
• Off-label use medications will also be discussed

Objectives

Participants will be able to
• Understand ADHD diagnosis in children and adolescents
• Identify common psychiatric conditions that co-exist with ADHD in children and adolescents
• Understand management options for ADHD and its comorbidities in children and adolescents

Attention-deficit Hyperactivity Disorder (ADHD)
Developmentally inappropriate symptoms in two or more settings:

School
- Difficult peer relationships
- Rejected / made fun of

Home
- Poor relationship with parents
- Excessive discipline --> negative self image
Academic/Occupational Impairment

Poor grades
Lose interest in school/
effects self esteem

Report Card
Math: D  
English: C –  
Science: F  
History: D +

Psychiatric disorders that mimic ADHD

• Depression
• Anxiety, including PTSD
• Bipolar Disorder
• Autism/ Pervasive developmental Disorder
• Psychosis- Prodromal phase
• Sleep disorders

Synaptogenesis in Prefrontal Cortex and the Development of Executive Functions

Impact of Development on ADHD

Comorbidities

- ADHD affects 5-12% of children worldwide (1)
- >2/3 of patients with ADHD have comorbidities
- Clinical presentation becomes more complex and poses a diagnostic challenge
- Treatment strategies vary based upon the specific comorbidity

2. Prevalence of Comorbid Disorders in ADHD patients:
   - ODD (Oppositional Defiant Disorder)-50%- 60%
   - Conduct disorder- 20-50%
   - Anxiety Disorder- 10-40%
   - Learning Disorder- 20-25%
   - Depression-16-26%
   - Tic Disorders- 20%
   - OCD (Obsessive Compulsive Disorder)- 6-15%

### Prevalence of ADHD in other Psychiatric Disorders

- 20% of Bipolar Disorder
- 87% of Disruptive Mood Dysregulation Disorder
- 55% of Tourette’s Syndrome
- 58% of Autism
- 50% of Developmental Coordination Disorder
- 50% of Adolescents with Substance use disorder
- 20% of children with brain injury develop ADHD


### Baseline Assessment

- Information from parents, teachers
- Rating scales (Conner’s, Vanderbilt)
  - From at least two settings
  - Ensure same person completes scales over time to reduce inter-rater variability
- Assess for co-morbidities

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#### Vanderbilt Assessment Scale—Parent form

**Vanderbilt Assessment Scale—Parent form**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Never</th>
<th>Occasionally</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does not give attention in school or make careless mistakes in homework</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Has difficulty keeping attention in what needs to be done</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Does not seem to listen when spoken to clearly</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Doesn’t follow through, when given directions and fails to finish tasks</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Is not able to start or finish a task</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Is not able to keep up with the class</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Is not interested in school or after school activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Is not interested in hobbies or other activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

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#### Vanderbilt Assessment Scale—Teacher form

**Vanderbilt Assessment Scale—Teacher form**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Never</th>
<th>Occasionally</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fails to give attention in school or make careless mistakes in homework</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Has difficulty sustaining attention in tasks or activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3. Does not seem to listen when spoken to clearly</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4. Doesn’t follow through, when given directions and fails to finish tasks (not due to oppositional behavior or failure to understand)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5. Is not able to start or finish a task</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>6. Has difficulty completing tasks and activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>7. Is not interested in school or after school activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>8. Is not interested in hobbies or other activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>9. Is not interested in school or after school activities</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Testing

- Psychological Testing
- Neuropsychiatric EEG based Assessment (NEBA)
- Test of variables and Attention (TOVA)

Baseline Assessment

- Required prior to stimulant treatment:
  - Height
  - Weight
  - Heart Rate
  - Blood Pressure
  - Labs: CBC, CMP, Lead levels, Thyroid profile
  - Personal and Family cardiovascular history
  - EKG

Treatment Options

- Parent Training
- Pharmacological
- Therapy for the child/adolescent
- Academic support

Medications available

- **Stimulants**
  - Methylphenidates - Less potent
  - Amphetamines - More Potent

- **Nonstimulants**
  - Alpha Agonists - Clonidine, Guanfacine (only ER formulations are FDA approved)
  - Atomoxetine (Strattera)
  - Bupropion (Wellbutrin - off label)
ADHD and Developmental Coordination Disorder (DCD)

- DCD Prevalence is 2-5%
- 50% of patients with DCD have ADHD
- Gross & fine motor co-ordination problems can restrict their ability to perform daily activities in self care and academics

Gross motor co-ordination problems

- Consider a referral to Occupational Therapy
- Rule out any associated problems-
  1. Dyslexia
  2. Language disorder
  3. Sensory integration difficulties
Case of ADHD with DCD - Take home points

• Fine and gross motor coordination problems can be easily missed in a patient with ADHD

• These children cannot reach their full potential if we only rely on ADHD treatment and many times these children can later be labeled as treatment resistant

How to Diagnose Specific Learning Disorder?

• Performs at grade level

How to Diagnose Specific Learning Disorder?

• Performs below grade level but does not qualify for SLD services

How to Diagnose Specific Learning Disorder?

Qualifies for Specific Learning Disorder - Reading Disorder
Alabama Disabilities Advocacy Program
website: http://adap.ua.edu

Prevalence of Tics-
4-24% in School Age Children

Case of ADHD with Tics-Take home points
- Reassurance for mild cases
- Habit Reversal Therapy- identify the urges and learn to produce an incompatible physical response
- Consider less potent and short acting stimulants if possible
- If potent/long acting stimulants have to be used- consider lowest possible doses
- Consider combined pharmacotherapy with stimulant and alpha agonist


Case of ADHD with Tics-Take home points
- Atomoxetine (Strattera) for ADHD with Tics
- Consider Anxiety d/o in the differential and add SSRI if there are significant symptoms
- Reserve Antipsychotics as last resort- small dose
- Subset of patients do better with increase in stimulants, especially if the ADHD symptoms are a cause of stress for worsening of tics


Stimulants in Tourette Syndrome

- Stimulants are relatively contraindicated in Tourette’s syndrome
- Double blind Clinical trials have shown that both immediate and long acting stimulants have not increased the rate of tics relative to placebo


ADHD and Anxiety

- Combination of therapy and stimulants is better than just stimulants (MTA Study)
- SSRI- Selective Serotonin Reuptake Inhibitors along with stimulants
- Atomoxetine (Strattera) for ADHD and Anxiety symptoms
- Alpha Agonists helpful for hyperactivity of ADHD and Anxiety

Case of ADHD and ODD- Take home points

- Expect compliance issues with adolescent patients
- Negotiate treatment options
- Alliance and positive reinforcement are your friends
- Combined medication management and psychotherapy is helpful (MTA)

ADHD and Substance use disorders

- Long acting Stimulants like Vyvanse and Concerta as they have low abuse potential
- Non stimulants-
  1. Strattera
  2. Alpha agonists
  3. Wellbutrin (off label for ADHD)
- Psychotherapy

Preschool Age Children with ADHD

- Parent Management Training
- Parent Child Interaction Therapy
- Only Immediate Release Amphetamines are FDA approved below age 6
- Methylphenidate is used as a first line medication in Preschool Psychopharmacology Working Group (PPWG) Algorithm and Preschool ADHD treatment study (PATS)

Developmental Pharmacokinetics

<table>
<thead>
<tr>
<th>Compared with adults, children have</th>
<th>Pharmacokinetics Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small body size</td>
<td>Small volume of distribution $\rightarrow$ higher peak plasma concentration</td>
</tr>
<tr>
<td>Relatively more body water and less adipose tissue</td>
<td>Less accumulation of drug $\rightarrow$ Faster elimination</td>
</tr>
<tr>
<td>More liver parenchyma relative to body size</td>
<td>Greater first pass liver drug extraction $\rightarrow$ reduced bioavailability $\rightarrow$ faster metabolism</td>
</tr>
<tr>
<td>More kidney parenchyma relative to body size</td>
<td>Relatively greater clearance capacity $\rightarrow$ Faster elimination</td>
</tr>
</tbody>
</table>

Adapted from the textbook ‘Clinical Manual of Child and Adolescent Psychopharmacology, 3rd Edition’

<table>
<thead>
<tr>
<th>Brand name</th>
<th>Initial release (%)</th>
<th>Delayed Release (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adderall XR</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Adzenys XR ODT</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Mydayis</td>
<td>33</td>
<td>33 - 1st delayed release</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33 - 2nd delayed release</td>
</tr>
<tr>
<td>Methylphenidates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ritalin LA</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Focalin XR</td>
<td>50</td>
<td>50</td>
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<tr>
<td>Concerta</td>
<td>22</td>
<td>78</td>
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<tr>
<td>Metdate CD</td>
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<td>70</td>
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<td>Cotempla XR ODT</td>
<td>25</td>
<td>75</td>
</tr>
<tr>
<td>Aptensio XR</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

Alternative treatments

- Elimination diets- food dyes and additives (azo dyes, tartrazine, carmoisine, sunset yellow, brilliant blue, indigotine, allura red, quinoline yellow or ponceau 4)
- Omega 3 fatty acids
- Studies show a small effect size and there is need for high-quality randomized trials
- Balance between benefits, costs, and potential harms before starting treatment

Non-pharmacological treatments

- ADHD children do better with 1:1 instruction
- Early reading instruction can make a difference for children who are struggling with Learning Disorders
- Free Online Tutoring- http://webmini.apls.state.al.us/apls_web/apls/apls/homework/
- Educational Websites

The Impact of Tutoring on Early Reading Achievement for Children With and Without Attention Problems. Journal of Abnormal Child Psychology, June 2004
Early reading instruction for children with reading difficulties: meeting the needs of diverse learners. Choutka CM. et. al. J Learn Disabil.. 2004

Non-pharmacological treatments

- Organizational skills training
- Social skills training
- Physical activity or exercise has positive effect on processing speed, working memory, planning and problem solving in young people with ADHD.

2-Social skill training for Attention Deficit Hyperactivity Disorder (ADHD) in children aged 5 to 18 years. Gluud C. et. al. Cochrane Database Syst Rev. 2011

Non-pharmacological treatments

- Support/advocacy Organizations for peer education- CHADD.org
- Educational resources/books- Taking charge of ADHD- Russell A. Barkley, PhD

Summarizing non-pharmacological treatment options

- Multimodal treatment study of ADHD (MTA) showed that combined treatment is better than just stimulants for patients with comorbidities.
- It also gives a powerful message to patients & their families that we care about their overall wellbeing and we want them to succeed.
Thank you!