ADHD and Comorbid Conditions: How to Identify, Diagnose and Treat

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Disclosures

Will be discussing the use of off label medications

Learning Objectives

- Review the incidence and prevalence of ADHD in children and adolescents in the US
- Identify comorbid conditions that occur with ADHD and the symptoms of these disorders
- Describe use of standardized instruments to assist in making accurate diagnoses of comorbid disorders in children and adolescents with ADHD
- Review psychopharmacologic and non-pharmacologic interventions that can be used for children with ADHD and comorbid conditions
Prevalence of Attention Deficit Hyperactivity Disorder (ADHD)

One of the most commonly diagnosed neurodevelopmental conditions in childhood: strong genetic association

More than 1 in 10 (11%) US school-aged children had received an ADHD diagnosis (2011)

6.4 million children reported by parents to have ever received a health care provider diagnosis of ADHD, including:
- 1 in 5 high school boys
- 1 in 11 high school girls

The percentage of US children 4-17 years of age with an ADHD diagnosis continues to increase.

A history of ADHD diagnosis by a health care provider increased by 42% between 2003 and 2011:
- 7.8% had ever had a diagnosis in 2003
- 9.5% had ever had a diagnosis in 2007

State of Mental Health Care, 2017

National shortage of child psychiatrists and psychiatric NPs

At the current rate of service utilization, ~12,624 child and adolescent psychiatrists are needed

The # of available psychiatrists through 2020 is projected as 8,312 (AACAP, 2009)

Shortage of mental health services, especially in rural areas

Long wait times for evaluations and treatment

Stigma associated with psychiatric services

State of Mental Health Care, 2017

Shortage of emergency mental health services; decreased access to emergency services

Fragmentation of services and care between behavioral health and medical care

Children from low income families/underserved have decreased access

Shortage of school based MH services

Primary Care Providers (PCPs) identify lack of time, lack of reimbursement, need to use screening tools, lack of expertise, use of psychopharmacology, and lack of mental health resources as barriers

NPs are in a great position to develop expertise in caring for these children
Pearls for NPs to Accurately Diagnose and Treat ADHD

- Perform comprehensive history, exam, differential diagnosis using screening tools, recommend behavioral interventions, pharmacologic interventions as appropriate
- Can bill using counseling and coordination of care for longer visits (30 minutes or 60 minutes)
- Apply chronic care principles in a patient-centered health care home
- Assess for co-morbidity

ADHD Practice Guidelines

American Academy of Pediatrics developed evidence based practice guidelines in October, 2011:
http://pediatrics.aappublications.org/content/early/2011/10/14/peds.2011-2654

The AAP worked with the National Initiative for Children’s Healthcare Quality (NICHQ) to develop the ADHD Toolkit for use by primary care providers. Available for download at: http://www.nichq.org/childrens-health/adhd/resources/adhd-toolkit


American Academy of Pediatrics (AAP)
Six Key Action Statements (2011)

1. Pediatricians and primary care providers should initiate evaluation for ADHD for children age 4-18
   Based on evidence indicating existing diagnostic criteria are effective in accurately diagnosing children in this expanded age range
## Assessment for ADHD

### Chief Complaint
- Academic problems
- Symptoms of ADHD
- Behavioral issues
- Functional impairment

### Medical History
- Birth history: prematurity, LBW
- Developmental history
- Medical conditions
- ROS: diet, sleep, elimination

### Family Medical History
- History of ADHD, mental health disorders

### Social History
- Exposure to toxic stressors: child maltreatment, violence, family stressors, community stressors
- Parenting practices

### Behavioral History
- Open-ended questions re: behavior in all settings (school, home)
  
Assess family routine, functioning

### Unique to Adolescents

#### Comprehensive history
- HEEADDSSS (Home, Education, Employment/Exercise, Activities, Drugs/Alcohol, Depression, Sex/Sexuality, Suicide, Safety, Strengths)

#### Assess
- Gender identity/sexual attraction
- Substance Use Disorder – drug seeking, stimulant diversion
- Pornography viewing/addiction

### ADHD-DSM V

Has persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development

In addition to meeting diagnostic criteria, the following conditions must be met:

1. Several inattentive or hyperactive-impulsive symptoms were present before age 12 years.
2. Several symptoms are present in two or more settings (e.g., at home, school or work; with friends or relatives; in other activities).
3. There is clear evidence that the symptoms interfere with, or reduce the quality of social, school, or work functioning.
4. The symptoms do not happen only during the course of schizophrenia or another psychotic disorder. The symptoms are not better explained by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Inattention

Six or more symptoms of inattention for children up to age 16, or five or more for adolescents 17 and older and adults; symptoms of inattention have been present for at least 6 months, and they are inappropriate for developmental level:

- Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or with other activities.
- Often has trouble holding attention on 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 (e.g., loses focus, sidetracked).

Is often easily distracted
Is often forgetful in daily activities.

Hyperactivity and Impulsivity

Six or more symptoms of hyperactivity-impulsivity for children up to age 16, or five or more for adolescents 17 and older and adults; symptoms of hyperactivity-impulsivity have been present for at least 6 months to an extent that is disruptive and inappropriate for the person’s developmental level:

- Often fidgets with or taps hands or feet, or squirms in seat.
- Often leaves seat in situations when remaining seated is expected.
- Often runs about or climbs in situations where it is not appropriate (adolescents or adults may be limited to feeling restless).

Hyperactivity and Impulsivity

Often unable to play or take part in leisure activities quietly.
Is often "on the go" acting as if "driven by a motor".
Often talks excessively.
Often blurts out an answer before a question has been completed.
Often has trouble waiting his/her turn.
Often interrupts or intrudes on others (e.g., butts into conversations or games)

Assess for Executive Function

- Executive function: central control processes that activate, integrate, and manage other brain functions
- The use of self directed actions (self – regulation) to choose, enact, and sustain actions across time toward a goal (Barkley, 2012)
- The components of executive function that impact functioning at school or work:
  - working memory, recall [holding facts in mind while manipulating information; accessing facts stored in long-term memory]
  - activation, arousal, effort [getting started; paying attention; completing work]
  - emotion control [tolerating frustration; thinking before acting/speaking]
  - internalizing language [using self-talk to control behavior, direct future actions]
  - complex problem solving [taking an issue apart, analyzing the pieces]

Physical Exam

Complete physical exam

- Comprehensive neurological exam
  - Disorders of tone, posture, persistence of primitive reflexes
  - Abnormal DTR's, asymmetries, gait abnormalities
  - Tremors, soft neurological signs
  - Performance of neurodevelopmental tasks i.e. sequencing, written and oral expression
Physical Exam
Examine for dysmorphic features
Facies- nose, philtrum, ears, lips
Hands and feet- incuration, webbing, palmar crease, clinodactyly, hyperextensibility of joints
Growth parameters and body proportion-head growth, trunk and limb size
If find more than 2 dysmorphic features, consider genetic syndrome
May order Chromosomal microarray, Fragile X or refer to genetics
No evidence of basis for laboratory tests or imaging studies i.e. CBC, thyroid, brain imaging studies, EEG

American Academy of Pediatrics (AAP)
Six Key Action Statements (2011)
1. Diagnosis of ADHD should follow established guidelines in DSM-5 including the requirements for symptom documentation over time and in more than 1 major setting (e.g. home and school/preschool)

Information from Teachers
To make an accurate diagnosis, information about the child will be needed directly from the child’s classroom teacher or another school/daycare professional
Child’s academic and classroom behavior is necessary to corroborate diagnosis and identify potential learning disabilities
NICHQ Vanderbilt Assessment Scales

Developed for initial evaluation and follow-up of ADHD in preschool and school age children

- Parent Initial and Follow-up Scales
- Teacher Initial and Follow-up Scales

Screens for coexisting conditions (conduct disorder, oppositional-defiant disorder, anxiety/depression)

ADHD diagnoses:
- Predominately inattentive subtype
- Predominately hyperactive/impulsive subtype
- ADHD combined inattention/hyperactivity

Vanderbilt Scales

Obtain Parent and Teacher Initial Vanderbilt Scales -most helpful if scored before visit

If clinically significant, may use to help establish diagnosis of ADHD. Useful as screen for anxiety, depression, ODD, conduct disorder


May want to obtain multiple scales from different teachers.

May use to track progress

AAP Six Key Action Statements (2011)

3. Evaluation should include assessment of other conditions which commonly co-occur with ADHD, including emotional and behavioral conditions, developmental disorders, and physical conditions
Physical Conditions
Assess diet, elimination, sleep, physical activity
Obstructive sleep apnea- moves a lot in sleep, snores, daytime sleepiness, may or may not have enlarged tonsils
ADHD associated with overweight (Cortese et al, 2016)
Anemia (complaints of fatigue, irritability, diet concerns): can check CBC, Pb
May check for thyroid function

If jerky movements or vocalizations are a problem...
Consider Tourette’s Disorder (TD): 60% of children with TD have ADHD
- Has two or more motor tics (for example, blinking or shrugging the shoulders) and at least one vocal tic (like clearing the throat or yelling out a word or phrase), although they might not always happen at the same time.
- Has had tics for at least a year. The tics can occur many times a day (usually in bouts) nearly every day, or off and on.
- Has tics that began before 18 years of age.
- Has symptoms that are not due to taking medication or another medical condition
Persistent Chronic Motor Tic or Vocal Tic Disorder
- Motor or vocal tic, but not both
Provisional Tic Disorder
- Has one or more motor or vocal tics for no longer than 12 months in a row

If sensitivity to touch, sound, smell, taste is a problem...
Consider sensory integration dysfunction (SID) also known as regulatory sensory processing disorder, sensory processing dysfunction, or sensory processing dysfunction
Is a neurological disorder that involves impairment in processing data from the different senses (vision, auditory, touch, olfaction, and taste), the vestibular system (movement), and proprioception (body awareness)
Refer to OT for evaluation
Not evidence based
If learning is a problem..

Consider a Learning Disorder
25% to 35% of children with ADHD have a specific learning disorder
Neurologically-based processing problems
Can interfere with learning basic skills such as reading, writing and/or math
Can also interfere with higher level skills such as organization, time planning, abstract reasoning, long or short term memory and attention
Diagnosing learning disabilities requires specific academic testing performed by a psychologist, usually during third grade

If the social use of language is a problem..

Consider Autism Spectrum Disorder (ASD)
- About 1 in 68 children has been identified with ASD (CDC’s Autism and Developmental Disabilities Monitoring [ADDM] Network)
- Increase likely due to broader definition & better efforts in diagnosis
- Occurs in all racial, ethnic, and socioeconomic groups (CDC, 2015)
- Is ~ 5 times more common among boys (1 in 42) than girls (1 in 189) (CDC, 2015)
A group of complex disorders of brain development. These disorders are characterized, in varying degrees, by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors.
ASD can be associated with intellectual disability, difficulties in motor coordination and attention and physical health issues such as sleep and gastrointestinal disturbances.
Some persons with ASD excel in visual skills, music, math and art.

Autism and ADHD

May struggle with staying on task, paying attention
Some studies ~50% of children/teens with autism have ADHD
ADHD symptoms may not emerge until school age
Higher functioning may present for ADHD evaluation but have mild form of ASD that has not been diagnosed
Can use Vanderbilt’s for evaluation of ADHD
Can use screening tools to assist with evaluation for ASD:
http://www.firstsigns.org/screening/tools/vc.htm#asd_screen
MCHAT, SCQ, ASSQ
ADOS is gold standard for diagnosis of ASD
If worrying and being anxious is a problem...

Consider an anxiety disorder

30% of children with ADHD have an anxiety disorder

Experience fear, nervousness, and shyness, and they start to avoid places and activities

Associated with higher levels of somatic symptoms in children and adolescents

Anxiety Disorders

1. Anxiety Disorders [separation anxiety disorder, selective mutism, specific phobia, social phobia, panic disorder, agoraphobia, and generalized anxiety disorder].
2. Obsessive-Compulsive Disorders [obsessive-compulsive disorder, body dysmorphic disorder, hoarding disorder, trichotillomania, and excoriation disorder].
3. Trauma and Stressor-Related Disorders [reactive attachment disorder, disinhibited social engagement disorder, PTSD, acute stress disorder, and adjustment disorder].

Behavioral Rating Scale for Anxiety: SCARed

Screen for Child Anxiety Related Disorders (SCARed)

Valid in 8-18 years, child and parent form

Takes 10 minutes to complete

Researched and found to be effective in primary care

Measures general anxiety, separation, social phobia, school phobia

Available at: http://www.pediatricbipolar.pitt.edu/content.asp?id=2333
Is a child or teen is sad, losing interest...
Consider Depressive Disorder - 2/3 have a co-morbid condition including ADHD
Depressive disorders include common and serious medical conditions that that negatively affect how a person feels, the way a person thinks and acts
Depression causes feelings of sadness, irritability, decreased concentration and/or a loss of interest in activities once enjoyed
Can lead to a variety of emotional and physical problems and can decrease a person's ability to function at work and at home
Depression symptoms can vary from mild to severe

Assessment for Depression
Use SIG E-CAPS for history:
- Sleep disorder
- Interest deficit (anhedonia)
- Guilt (worthlessness, hopelessness, regret)
- Energy deficit
- Concentration deficit
- Appetite disorder
- Psychomotor retardation or agitation
- Suicidality

Screening Tools for Depression
Patient Health Questionnaire – 9 Modified for Teens
- Symptom persistence for past 2 weeks.
- More effective than informal interview
Mood Disorders Questionnaire
- 15 Y/N items evaluating mania, appropriate for teens >12
Center for Epidemiological Studies Depression Scale for Children (CES-DC)
- 20-item self-report depression inventory, 6-17 years
If negativity, defiant behaviors are a problem...

**Consider Oppositional Defiant Disorder**

- 30-40% of children and adolescents with ADHD have ODD
- A pattern of angry/irritable mood, argumentative/defiant behavior, or vindictiveness lasting at least 6 months as evidenced by at least four symptoms from any of the following:
  - **Angry/Irritable Mood**
    - Often loses temper, is often touchy or easily annoyed, is often angry and resentful.
  - **Argumentative/Defiant Behavior**
    - Often argues with authority figures or, for children and adolescents, with adults, often actively defies or refuses to comply with requests from authority figures or with rules, often deliberately annoys others, or often blames others for his or her mistakes or misbehavior
  - **Vindictiveness**
    - Has been spiteful or vindictive at least twice within the past 6 months.

**ODD - continued**

For children <5 years, the behavior should occur on most days for a period of at least 6 months, if > 5 years, the behavior should occur at least once per week for at least 6 months.

The disturbance in behavior is associated with distress in the individual or others in his or her immediate social context (e.g., family, peer group, work colleagues), or it impacts negatively on functioning.

**Consider other behavioral disorders**

**Bipolar Disorder**

Children with bipolar disorder go through unusual mood swings that are more extreme and are accompanied by changes in sleep, energy level, and the ability to think clearly.

**Gender Dysphoria**

Discomfort or distress because there’s a mismatch between biological sex and gender identity. Also known as gender identity disorder (GID), gender incongruence, or transgenderism. Gender nonconforming (GNC) is a broader term that includes people with gender dysphoria; can also describe people who feel that they are neither only male or only female (DSM-V).

**Conduct Disorder**

**Substance-Related and Addictive Disorders**

**Genetic Disorder** (e.g., Fragile X)

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American Academy of Pediatrics (AAP) Six Key Action Statements (2011)

4. Pediatricians and primary care providers should see ADHD as a condition requiring chronic care and should use a chronic care and medical home model in the coordination of care from all involved

Remind parents child’s behavior is not a choice, not intentional

Behavior change needs to occur with family to make accommodations and support child

Reassure parents of frequent monitoring by practice

AAP Six Key Action Statements (2011)

5. Recommendations for treatment vary, depending on the child’s age.

a. Preschool aged children (4-5 yrs): parent or teacher administered behavioral intervention should be the first line of treatment; medication (methylphenidate) may be considered if first line treatments are not available or insufficient

b. Elementary school-aged children (6-11 yrs): the combination of medication and behavioral interventions have the best outcome

c. Adolescents (12-18 yrs): FDA-approved medications for this age group should be prescribed, preferably along with behavior therapy

Management of ADHD

- Management usually involves 3 focus areas:
  - Behavioral Management
  - School
  - Medications

- Family
  - Education regarding disorder for parents, siblings, extended family
  - Behavioral management training and counseling

Behavioral management
- Child:
  - Psychotherapy
  - Behavioral therapy
  - Social Skills Training

- Parents:
  - Support groups
  - Parent skills training
  - Behavioral strategies for child
Behavioral Interventions in Home

- Schedule/routine
  - Morning routine often difficult: develop a clear written or visual schedule
  - Irritability in the late afternoon, early evening: organize everyday items, one folder for different classes
- Use homework and notebook organizers
- Consistent rules (clear, brief) and expectations
- Homework routine: minimize distractions
- Use incentives to get work done
- Catch them being good
- Build in an unconditional time

Parent Training for ADHD

Parent training in effective child behavior management is essential. Recognizes that ADHD affects entire family, behavioral therapy involving all members of the household may restore balance.

- Starts with parent understanding of ADHD as a neurophysiologic deficiency
- Evidence Based Programs include: New Forrest Therapy, Triple P, The Incredible Years Series, Parent Child Interactive Therapy (PCIT).
- https://www.samhsa.gov/data/evidence-based-programs-nrepp

Educational Recommendations

- Parent(s) are child’s advocate
- If academic issues, may request evaluation by school’s multidisciplinary evaluation team
- Parent submits a letter to principal
- Permission must be given (with signature) before process starts
- Comprehensive evaluation done within 60 days
- If child qualifies for special education services, an Individual Education Plan (IEP) can be developed
IEP

- If child meets criteria for IEP, may be with LD diagnosis
- May qualify for IEP using ADHD as diagnosis under “Other Health Impaired”
- IEP may incorporate resource teacher support, particularly in MS/HS, where student meets one period a day for organizational assistance, test taking, homework
- IEP can be revised at parental request any time throughout year

Educational Recommendations

If does not meet criteria for special education, same process except an IEP is not written. Section 504 Service Plan may be developed that designates:
- reasonable accommodations in the educational program
- related aids and services if deemed necessary (OT, PT, Speech)

Challenge using 504 is that amount of time services given not designated, nor individual identified to carry out plan

Communication is key between parent/teachers

AAP Six Key Action Statements (2011)

6. If medication is prescribed, it should be titrated to ensure the child receives the maximum benefit with the least degree of adverse side effects.

The initial psychopharmacological treatment of ADHD should be a trial with an agent approved by the FDA for treatment of ADHD
ADHD and Neurotransmitters

In ADHD both systems of stimulation and repression in brain not working correctly
Dopamine and norepinephrine contribute to maintaining alertness, increasing focus, and sustaining thought, effort, and motivation
Low levels of norepinephrine and dopamine cause inattention and distractibility, impulsivity
Psychostimulants increase levels of dopamine and norepinephrine to normal range in brain for children with ADHD
Result in increased attention and decreased impulsivity

Medication Therapy

Medical Therapy
- Use of medications effective in 70-80% of children
- Evaluate effectiveness by behavioral changes: motor activity, attention span, concentration, reduced distractibility (school and home)

Psychostimulants
- Immediate Release, Intermediate Release and Sustained Release
- Non-stimulant –Strattera
- Alpha Adrenergics

Psychostimulants
Common side effects: anorexia, weight loss or poor weight gain, delayed sleep onset, headache, stomachache, jitteriness or moodiness
15-30% experience motor tics (may be transient)
Basic principles in use of stimulants:
- Dosages are not weight dependent
- Start with low dose and titrate upward because of marked variability in response
- “Start low, go slow” particularly with younger children
Immediate Release Medications

- **Methylphenidate**
  - Ritalin tablets - scored (5, 10 and 20 mg)
  - Methylin tablets - scored (5, 10 and 20 mg)
  - Focalin (dexmethyphenidate hydrochloride) tablets - (2.5, 5 and 10 mg)
  - Duration 3-4 hours

- **Dextroamphetamine**
  - Dexedrine tablets - (5 mg)
  - Dextrostat tablets - scored (5 and 10 mg)
  - Duration 4-5 hours

Intermediate Acting Medication

- **Adderall**
  - Tablets - scored (5-, 7.5-, 10-, 12.5-, 15-, 20-, and 30-mg tablets)
  - Mixed salts of amphetamine (Dextroamphetamine/levoamphetamine)
  - Duration 4-6 hours
  - Adderall is 75 percent dextroamphetamine and 25 percent levoamphetamine

Intermediate Release Medication

- **Evekeo (amphetamine sulfate) Tablets:** 5mg, 10mg, scored
  - 50 percent of dextroamphetamine and levoamphetamine
  - Not recommended for children under 3 years of age
  - In children from 3 to 5 years of age, start with 2.5 mg daily; daily dosage may be raised in increments of 2.5 mg at weekly intervals until optimal response is obtained.
  - In children 6 years of age or older, start with 5 mg once or twice daily; daily dosage may be raised in increments of 5 mg at weekly intervals until optimal response is obtained. Do not exceed a total of 40 milligrams per day.
  - With tablets give first dose on awakening; additional doses (1 to 2) at intervals of 4 to 6 hours.
## Sustained Release Medications

<table>
<thead>
<tr>
<th>Medication</th>
<th>Formulation</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylphenidate ER capsules</td>
<td>10, 20, 30, 40, 50 mg</td>
<td>8-10 hours</td>
</tr>
<tr>
<td>Concerta (Methylphenidate ER) capsules</td>
<td>noncrushable (18, 27, 36 and 54 mg)</td>
<td>9-12 hrs</td>
</tr>
<tr>
<td>Ritalin LA capsules</td>
<td>can be sprinkled (10, 20, 30 and 40 mg)</td>
<td>8 hrs</td>
</tr>
<tr>
<td>Metadate ER tablets</td>
<td>(10 and 20 mg)</td>
<td>4-8 hrs</td>
</tr>
<tr>
<td>Metadate CD capsules</td>
<td>(10, 20, 30, 40, 50, 60 mg)</td>
<td>4-8 hrs Can be sprinkled</td>
</tr>
<tr>
<td>Focalin XR capsules</td>
<td>(5, 10, 15, and 20 mg extended-release)</td>
<td>6-10 hours</td>
</tr>
</tbody>
</table>

## Daytrana Patch

<table>
<thead>
<tr>
<th>Medication</th>
<th>Formulation</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylphenidate in a transdermal form</td>
<td>10, 15, 20 and 30 mg patches</td>
<td>6-12 year old children</td>
</tr>
</tbody>
</table>

Apply 2 hours before expected effects.  
Remove after 9 hours. Effects last another 2 hours  
Skin care: vitamin E

## Quillivant XR

<table>
<thead>
<tr>
<th>Medication</th>
<th>Formulation</th>
<th>Duration</th>
</tr>
</thead>
</table>
| Methylphenidate hydrochloride for extended release oral suspension | (after reconstitution with water): 25 mg per 5 mL (5 mg per mL)  
Recommended for patients 6 years and above, recommended starting dose is 20 mg given orally once daily in the morning |

Daily dosage above 60 mg is not recommended
Aptensio XR

Aptensio XR (Methylphenidate Hydrochloride Extended Release Capsules)
Immediate-release layer contains approximately 40% dose
Controlled release layer contains approximately 60% dose
10, 15, 20, 30, 40, 50, 60 mg Extended-Release Capsules
Lasts 8-12 hours

<table>
<thead>
<tr>
<th>Products</th>
<th>Concerta®</th>
<th>Metadate CD</th>
<th>Ritalin®LA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dose</td>
<td>18, 27, 36, 54 mg</td>
<td>10, 20, 30 mg</td>
<td>20, 30, 40 mg</td>
</tr>
<tr>
<td>Immediate release</td>
<td>22%</td>
<td>60%</td>
<td>95%</td>
</tr>
<tr>
<td>40, 8, 12 mg</td>
<td>6 mg</td>
<td>10, 15, 20 mg</td>
<td></td>
</tr>
<tr>
<td>Sustained/2nd release</td>
<td>76%</td>
<td>79%</td>
<td>98%</td>
</tr>
<tr>
<td>14, 21, 28, 42 mg</td>
<td>14 mg</td>
<td>10, 15, 20 mg</td>
<td></td>
</tr>
</tbody>
</table>

Release time for long-acting Methylphenidate

<table>
<thead>
<tr>
<th>Methylphenidate Dosing Parameters</th>
<th>Dosage Form</th>
<th>Maximum Recommended Dose</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-acting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Focalin XR (Novartis, East Hanover, NJ)</td>
<td>2.5, 5, 10 mg tablets</td>
<td>2 mg/kg or 60 mg/day</td>
<td>Capsule may be opened and contents dissolved</td>
</tr>
<tr>
<td>Methylphenidate Extended Release (Novartis)</td>
<td>20, 40, 60 mg tablets</td>
<td>2 mg/kg or 60 mg/day</td>
<td>Tablets must be swallowed whole</td>
</tr>
<tr>
<td>Ritalin® SR (Novartis, East Hanover, NJ)</td>
<td>20 mg tablets</td>
<td>2 mg/kg or 60 mg/day</td>
<td>Capsule may be opened and contents dissolved</td>
</tr>
<tr>
<td>Methylin ER (AlliantPhr, Alpharetta, GA)</td>
<td>5, 10, 20 mg tablets</td>
<td>2 mg/kg or 60 mg/day</td>
<td>Special patch applied to chest and removed 9 hours later</td>
</tr>
<tr>
<td>Daytrana (Shire US, Wayne, PA)</td>
<td>10, 15, 20 mg patches</td>
<td>30 mg/day</td>
<td>Topical patch applied to chest</td>
</tr>
<tr>
<td>Quillivant (Pfizer, New York, NY)</td>
<td>25 mg/mL suspension</td>
<td>Initial dose 20 mg OSAX (OSAX = 20 mg/day)</td>
<td>Oral formulation</td>
</tr>
<tr>
<td>Methylin (AlliantPhr, Alpharetta, GA)</td>
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<td>2 mg/kg or 60 mg/day</td>
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Extended Release Medications

Dextroamphetamine
- Dexedrine spansule - can be sprinkled (5, 10 and 15 mg) Duration 8-10 hours

Mixed salts of amphetamine (Dextroamphetamine/levoamphetamine)
- Adderall XR capsules - can be sprinkled (5, 10, 15, 20, 25, and 30-mg capsules)
- Duration - 8-12 hours

Dyanavel XR (Amphetamine extended release oral suspension 2.5 mg/ml)

Lisdexamfetamine dimesylate Capsules (Vyvanse)

Produg Stimulant
Produg is a pharmacologic substance that is administered in an inactive or significantly less active form
Metabolized in vivo into the active compound. It is designed to improve oral bioavailability.
Side effects are similar to stimulants
10, 20, 30, 40, 50, 60, 70 mg capsules

Amphetamines

<table>
<thead>
<tr>
<th></th>
<th>Long-acting</th>
<th>Short-acting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vyvanse</td>
<td>10, 20, 30, 40, 50, 60, and 70-mg capsules</td>
<td>1 mg/kg or 70 mg/day</td>
</tr>
<tr>
<td>Adderall XR</td>
<td>5, 10, 15, 20, 25, and 30-mg capsules</td>
<td>1 mg/kg or 30 mg/day</td>
</tr>
<tr>
<td>Dexedrine</td>
<td>5, 10, and 15-mg capsules</td>
<td>1 mg/kg or 30 mg/day</td>
</tr>
<tr>
<td>Adderall</td>
<td>5, 7.5, 10, 15, 20, and 30-mg tablets</td>
<td>1 mg/kg or 50 mg/day</td>
</tr>
<tr>
<td>Dextroamphetamine</td>
<td>5 and 10-mg tabs</td>
<td>1 mg/kg or 50 mg/day</td>
</tr>
<tr>
<td>ProCentra</td>
<td>5-mg/5-mL solution</td>
<td>1 mg/kg or 50 mg/day</td>
</tr>
<tr>
<td>Side Effects of Stimulants</td>
<td>Management</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td>gastrointestinal distress</td>
<td>typically self-resolves</td>
<td></td>
</tr>
<tr>
<td>headache</td>
<td>typically self-resolves</td>
<td></td>
</tr>
<tr>
<td>appetite suppression</td>
<td>counsel on high-protein, high-calorie nutrition and frequent snacks</td>
<td></td>
</tr>
<tr>
<td>insomnia</td>
<td>counsel on sleep hygiene</td>
<td></td>
</tr>
<tr>
<td>elevated blood pressure and heart rate</td>
<td>no action if within age-appropriate norms and asymptomatic</td>
<td></td>
</tr>
<tr>
<td>agitation or mood disturbance</td>
<td>consider melatonin as needed</td>
<td></td>
</tr>
</tbody>
</table>

For Strattera (atomoxetine hcl):
- Selective norepinephrine reuptake inhibitor
- Unknown mechanism of action in ADHD but thought to be related to selective inhibition of the pre-synaptic norepinephrine transport
- Approved for treatment of ADHD in children, adolescents, and adults
- Not a stimulant
- Side effects: upset stomach, decreased appetite, nausea or vomiting, dizziness, tiredness, and mood swings
- FDA past warning for potential for severe liver injury
- Must take 24/7
- Takes 2-6 weeks to see improvement
- Doses: 10, 18, 25, 40, 60, 80, 100 mg

For Alpha Adrenergic Agonists:
- Inhibit adenylyl cyclase activity
- Reduce brainstem vasomotor center-mediated CNS activation; used as antihypertensives, sedatives
- First line therapy for children with Tourette's Disorder alone
- Tic reducing effect was found secondarily
Alpha Adrenergic Agonists

- Can be used in conjunction with stimulants
- Short Acting:
  - Clonidine HCL (Catapres)
    - Oral scored tablets (0.1, 0.2, 0.3 mg tablets) given BID, TID
    - Transdermal patch (0.3 mg patch once every 5 to 7 days)
- Long Acting:
  - Kapvay (0.1 mg, 0.2 mg extended release given BID) recently approved by FDA 6-17 years
  - Clonidine HCL QHS may help with sleep

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Alpha Adrenergic Agonists

Short Acting:
- Guanfacine HCL (Tenex) 1, 2 mg tablets given BID or TID
Long Acting:
- Intuniv 6-17 years - approved 6 years and up
  - Comes in 1, 2, 3, 4 mg once daily
Start 0.25-0.5 mg Tenex, or .025-.05 of Clonidine
Slowly progress dose (may increase every 5-7 days) to BID, TID

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Alpha Adrenergic Agonists

Side effects:
- dry mouth, nausea, stomach pain, vomiting, constipation
- tiredness, weakness
- headache, irritability
More serious side effects:
- fainting, blurred vision, rash, slow heart rate
Alpha Adrenergic Agonists

Start with low dose usually at bedtime, make weekly adjustments. If discontinuing, should taper.

Monitor weekly

May take up to 4 weeks to see effect

<table>
<thead>
<tr>
<th>Generic (Brand)</th>
<th>Initial Dose</th>
<th>Titration</th>
<th>Maximum Recommended Dose</th>
<th>Dosage Forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guanfacine ER</td>
<td>1 mg qHS</td>
<td>3 mg</td>
<td>27–40.5 kg, 2 mg</td>
<td>5–20 mg qHS</td>
</tr>
<tr>
<td>(Intuniv)</td>
<td></td>
<td></td>
<td>40.5–45 kg, 3 mg</td>
<td>20–30 mg qHS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;45 kg, 4 mg qHS</td>
<td>30–40 mg qHS</td>
</tr>
<tr>
<td>Clonidine ER</td>
<td>0.1 mg qHS</td>
<td>0.1 mg</td>
<td>27–40.5 kg, 0.2 mg</td>
<td>0.1 mg qHS</td>
</tr>
<tr>
<td>(Kapvay)</td>
<td></td>
<td></td>
<td>40.5–45 kg, 0.3 mg</td>
<td>0.2 mg qHS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;45 kg, 0.4 mg</td>
<td>0.3 mg qHS</td>
</tr>
<tr>
<td>Atomoxetine</td>
<td>0.5 mg/kg</td>
<td>1.2 mg/kg</td>
<td>1.4–4.4 mg/kg or 100 mg</td>
<td>10–100 mg qHS</td>
</tr>
<tr>
<td>(Strattera)</td>
<td>or 40 mg</td>
<td>or 80 mg</td>
<td>TDD</td>
<td>10 mg qHS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10–18, 25–40, 60–80, 100–120 mg</td>
<td>10 mg qHS</td>
</tr>
</tbody>
</table>

Non-Simulant Side Effects

<table>
<thead>
<tr>
<th>Non-Simulant Side Effects</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal distress</td>
<td>Typically self resolves</td>
</tr>
<tr>
<td>Headache</td>
<td>Typically self resolves</td>
</tr>
<tr>
<td>Decreased blood pressure or heart rate</td>
<td>No action if within age appropriate norms and asymptomatic</td>
</tr>
<tr>
<td>Sedation</td>
<td>Typically self resolves</td>
</tr>
<tr>
<td>Administration at bedtime</td>
<td></td>
</tr>
<tr>
<td>Nonseventeen side effects</td>
<td>Typically self resolves</td>
</tr>
<tr>
<td>Gastrointestinal distress</td>
<td>Typically self resolves</td>
</tr>
<tr>
<td>Headache</td>
<td>Typically self resolves</td>
</tr>
<tr>
<td>Sedation</td>
<td>Administration at bedtime</td>
</tr>
<tr>
<td>Tadalafil</td>
<td>Rare but warrants evaluation and potential medication discontinue</td>
</tr>
<tr>
<td>Hepatotoxicity (rare)</td>
<td>Self-related symptoms with usual precautions; discontinue medication</td>
</tr>
<tr>
<td>Seizure/convulsion effects</td>
<td>No action</td>
</tr>
<tr>
<td>Transient blood pressure or heart rate</td>
<td>No action if within age appropriate norms and asymptomatic</td>
</tr>
</tbody>
</table>
Side Effects and Warnings- Stimulants

Cardiovascular Issues
- Recommendation from the American Heart Association followed by the American Academy of Pediatrics for screening include:
  - targeted cardiac history (eg, patient history of previously detected cardiac disease, palpitations, syncope, or seizures; a family history of sudden death in children or young adults; hypertrophic cardiomyopathy; long QT syndrome)
  - physical examination, including a careful cardiac examination
  - Refer for screening ECG or for cardiovascular evaluation if pre-existing conditions or concerns
  - Monitor pulse and BP

American Academy of Pediatrics (AAP)
Six Key Action Statements (2011)

6. During a psychopharmacological intervention for ADHD, the patient should be monitored for treatment-emergent side effects.
   - May use low doses of clonidine or Melatonin (1-3 mg, may go higher to 6 mg) for delay of sleep onset.
   - Alpha agonists such as clonidine and guanfacine may be used for tics, as adjunct or for comorbid aggression
   - Monitor growth

Challenges in Medication Management

What are difficulties with medication management?

- Wear off- Need to increase dose to maximum (MPH: 3-6 mg/kg/dose BID dextroamphetamine: 1-3mg/kg/dose BID) and then change medication)
- Titration- with children <6 years, may want to start with short acting BID until you get a sense of adequate response, then can change to long acting
### Challenges in Medication Management

- Extended release may not last long enough—wears off in 4-6 hours
- Some are fast metabolizers
- Side effects—tics
- Mood changes
- Children with co-morbidity have unique responses to meds—start low, go slow. Can add SSRIs for anxiety, depression; Intuniv for tics
- Parents: require frequent consultation and availability of provider for concerns when starting medication

### American Academy of Pediatrics (AAP)
**Six Key Action Statements (2011)**

- **6.** If patient with ADHD has robust response to psychopharmacological treatment & subsequently shows normative functioning in the academic, family and social functioning, then psychopharmacological treatment of ADHD alone is satisfactory
- **6.** If patient with ADHD has less than optimal response to medication, has a co-morbid disorder, or experiences stressors in family life, then psychosocial treatment in conjunction with medication treatment is often beneficial

### Evaluation of Response

If none of the agents routinely use to treat ADHD, the clinician should undertake a careful review of the diagnosis and then consider behavior therapy and/or the use of medications not approved by the FDA for the treatment of ADHD.

May want to refer to psychiatry or specialty service.
Primary Care Management

Patients treated with medication should have height and weight monitored (using growth charts), BP, Pulse

Patients should be assessed periodically to determine if continued need for treatment or if symptoms have remitted

Treatment should continue as long as symptoms remain present and cause impairment

AAP recommends every 3-6 month follow-up

Primary Care Management

Make appropriate referrals for diagnosis and treatment
Contact school personnel, initiate IST, MDE, review IEP
Monitor medication every 1-2 months until stable, then every 3-6 months

Monitor side effects
Monitor school performance
Monitor child and family functioning

NPs can be the key to comprehensive ADHD management

The need is great
The time is now
Good luck!
Thank you for your attention! Questions?