HELPING CHILDREN WITH ATTENTIONAL CHALLENGES IN A MONTESSORI CLASSROOM

Part II of II: The Role of the Physician
Maureen Murphy-Ryan, M.D.
Virginia Tech-Carilion
PGY-2 Psychiatry Resident

DISCLOSURES

- This presentation is sponsored by the Virginia Tech-Carilion Clinic’s Psychiatry Residency Program, which has approved the content as representative of current knowledge and best practices in this area.
- No other financial or other relationships that would create a conflict of interest.

PRESENTER BACKGROUND

- Montessori preschool and kindergarten
- Pre-medical training at Duke University
- Developed the 2005 Human Evolution curriculum for the International Montessori Institute
- Completed medical school at the Mayo Clinic in 2012
- Psychiatry residency training at Washington University in St. Louis, transferred to Virginia Tech-Carilion in 2015
- Special research interest in medical genetics and the inheritance of severe mental illness
  - My perspective on child psychiatry for ADHD
    - Medication is a supportive tool for success in daily life and facilitates learning self-regulation and compensatory life skills in children who could not otherwise participate fully
    - Not a substitute for other interventions in the home and classroom

OPENING DISCUSSION

Your Experiences Working with the Medical Community:
Referring children, Parent interactions, Student Outcomes, Worries about overmedication

KEY LEARNING POINTS

- Not every child with behavior challenges has ADHD; other disorders may present similarly
- Children with ADHD may have other diagnoses also
- Which children need medical help?
  - At what point do you refer parents to a developmental pediatrician/child and adolescent psychiatric/pediatric neuropsychologist? How does the care team work together?
  - Why is it so crucial that children receive help, if and when they need it?
- Medications are not a cure-all!
  - Social and executive skills training, parental training, lifestyle management (physical exercise, healthy diet, sleep) are very important
OVERVIEW OF PRESENTATION

1. ADHD as a severe form of attentional challenge. How is ADHD diagnosed?
   - [Exercise #1: Adult self-report and discussion]
2. Who gets ADHD? Epidemiology
3. Natural History of ADHD; ADHD as a Spectrum
4. What causes ADHD?
5. What else could it be? Differential diagnosis and comorbidity
   - [Exercise #2: Case study discussion]
6. Why treat? Consequences of not treating
7. Medication for ADHD in a child or adolescent; pros & cons
   - [Exercise #3: Teacher Vanderbilt rating scale and discussion]
8. Parenting, Classroom, and other Behavioral Interventions
   - Useful resources for teachers
   - [Exercise #4: Post-test and discussion]
9. Further Questions?
10. Acknowledgements
11. References

QUESTION 1

Which of the listed disorders is the most common comorbidity with ADHD in children?
- A-Learning disorders in Math
- B-Learning disorders in expressive language
- C-Oppositional defiant disorder
- D-Separation anxiety disorder
- E-Gender Identity Disorder of Childhood

QUESTION 2

A diagnosis of ADHD in adults must include?
- A- Retrospective history of ADHD symptoms before the age of 12 years
- B- History of school failure
- C- History of motor vehicle accidents
- D- History of failed multiple marriages
- E- History of substance abuse

QUESTION 3

Which of the following psychiatric disorders has the greatest genetic contribution?
- A- Schizophrenia
- B- Bipolar affective disorder
- C- Major depressive disorder
- D- ADHD
- E- Generalized Anxiety Disorder

QUESTION 4

Which statement is false regarding the development of ADHD across the lifetime?
- A- 2/3 of children with ADHD will no longer meet criteria for the disorder in adulthood
- B- Inattentiveness is the most commonly retained feature in adulthood
- C- ADHD is most commonly identified in elementary school
- D- ADHD symptoms are first noticeable after age 7
- E- Girls are more likely than boys to present with primarily inattentive features
QUESTION 5

What two neurotransmitters when deficient are felt to be fundamental in the pathology ADHD?

- A. Serotonin and Norepinephrine
- B. Dopamine and Serotonin
- C. Glutamate and GABA
- D. Dopamine and Norepinephrine
- E. GABA and Acetylcholine

WHICH ONE IS TRUE ABOUT PHARMACOKINETICS IN YOUNGER CHILDREN?

A) Psychotropics tend to have longer half-lives in younger children
B) GFR is less efficient than in adults
C) More fatty tissue in younger children allows meds to be stored somewhat longer in the body
D) Half-lives may be shortened due to altered kinetics, compared to teens

WHICH IS TRUE REGARDING NEUROTRANSMITTER DEVELOPMENT?

- A) 5-HT receptor density increases with age
- B) DA receptor density stays constant throughout life
- C) NE receptor density increases with age
- D) Attending Psychiatrists tend to get denser with age

ALL OF THE FOLLOWING ARE TRUE IN PEDIATRICS, EXCEPT?

- A) Stimulants have the most studies to justify their use
- B) Both free and bound portions of medication are psychoactive
- C) Children and teens may require higher doses of medication
- D) There are now at least 3 SSRIs with FDA indications in pediatric patients

1. ATTENTION

What is it and what does it mean to have an attention deficit disorder?
ADHD:

- Clinical characteristics:
  - Some combination of severe inattention, hyperactivity, and impulsivity that begins in childhood, and often persists into adult yrs.
  - Must cause functional impairment across settings, and must be developmentally relevant
  - Some symptoms should be present before age 12 (previously 7 in DSM-IV)

ADHD-INATTENTIVE TYPE

- Difficulty organizing tasks and activities
- Avoidance of tasks that require sustained mental effort
- Losing things necessary for tasks (toys, assignments, books)
- Easily distracted by external stimuli
- Often forgetful in daily activities

ADHD-HYPERACTIVE/IMPULSIVE TYPE

- Fidgets with hands/feet, or squirms in seat
- Leaves seat in classroom or other situations where sitting is expected
- Runs or climbs excessively in inappropriate situations
- Difficulty playing or engaging in leisure activities quietly
- Often “on the go” “driven by a motor”
- Talks excessively

ADHD-INATTENTIVE TYPE

- Failure to pay close attention to details / frequent careless mistakes
- Difficulty sustaining attention in tasks or play
- Not listening when spoken to
- Not following through on instructions, and failure to finish tasks (schoolwork, chores). Not due to oppositionality or failure to understand

ADHD-HYPERACTIVE/IMPULSIVE TYPE

- Impulsivity
  - Blurs out answers before questions have been completed
  - Difficulty waiting turn
  - Interrupts or intrudes on others (conversations, games)
**DSM-5 CRITERIA FOR ADHD**

- **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).
  - Often has trouble organizing tasks and activities.
  - Often avoids, dislikes, or is reluctant to do tasks that require mental effort over a long period of time (such as schoolwork or homework).
  - Often loses things necessary for tasks and activities (e.g., school materials, pencils, books, tools, wallets, keys, paperwork, eyeglasses, mobile telephones).
  - Is often easily distracted
  - Is often forgetful in daily activities.

- **Hyperactivity-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).
  - 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).

**Other Criteria**

- Some impairing symptoms were present before age 12
- Some impairment **across settings** (home, school)
- **Clinically significant** impairment in social, academic or work functioning
- Other conditions must be considered as source of symptoms

**Practice Guidelines**

- **Summary**
  - Use explicit criteria for diagnosis
  - Obtain history from more than 1 setting
  - Symptoms must be severe enough to cause functional impairment
  - Screen for co-existing conditions
- **May need 2-3 visits for full work-up**
- **Parent and teacher questionnaires**
  - (may be fixed for efficiency)
  - Connor’s scales, Vanderbilt scales, Child Behavioral Check List (CBCL), other ADHD rating scales
2. WHO GETS ADHD?

Risk factors

- Temperamental
- Environmental
- Genetic and physiological
- Course modifiers

RISK AND PROGNOSTIC FACTORS

GENETICS OF ADHD

- Whole Genome Sequencing - what have we learned?
  - For ADHD, Bipolar Affective Disorder, Schizophrenia:
    Hundreds of genes each contributing a small amount
  - No "big players" found
  - Explains the complex overlap between certain diagnoses and
    some gene combinations are risk factors for multiple
    disorders (ADHD and Substance Use Disorder)

- How do we tell how much of a complexly inherited
  disorder is due to genetics?
  - Identical twin studies, raised apart

INHERITANCE OF SEVERE MENTAL ILLNESS

- How much of a complexly inherited disorder is due to genetics?
  - Twin studies: Identical twins, raised apart to control for environmental
    factors
  - Other studies on first-degree family members show that subtle traits may
    be present throughout the family based on lesser genetic loader
    - Schizophrenia, autism, ADHD
    - Supports spectrum model

Example: This is Linda. She is 32. Her identical twin sister Anne has
schizophrenia. She is worried about the chances she will develop
schizophrenia too. What is her genetic risk?

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40%
This is Mike. He is 14. Mike has ADHD. What is the likelihood that his identical twin George has ADHD as well?

This is George. He has not been tested for ADHD. George would like to know his genetic risk!

75%

GENETICS OF SEVERE MENTAL ILLNESS: HOW DOES ADHD COMPARE?

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ADHD IN CHILDHOOD:

- **Epidemiology**
  - ADHD is **FAMILIAL**
  - First degree relatives of a child with ADHD have a 5-9x greater risk of having ADHD than the general population
  - 3-7% of school-age children
  - Boys 2-9x greater than girls depending on study
- **Gender-Related Diagnostic Issues**
  - Males: females in the general population
  - 2:1 for ADHD in children
  - 1.6:1 ADHD in adults
  - Females are more likely than males to present primarily with inattentive features.

ENVIRONMENTAL RISK FOR ADHD

- Low birth weight
- Prematurity
- In-utero exposure to maternal stress
- In-utero exposure to cigarette smoking
- In-utero exposure to alcohol to certain prescription drugs (paracetamol)
- In-utero exposure to illicit substances
- Environmental toxins at young age or in utero
- Lead, organophosphate pesticides
- Nutritional deficiencies
- Zinc, magnesium, polyunsaturated fatty acids
- Nutritional surpluses
- Sugar, artificial food coloring
- Extreme very early life social deprivation

CULTURAL RELATED DIAGNOSTIC ISSUES

- Cultural variation exists in attitudes toward or interpretations of children’s behaviors.
- Clinical identification rates in the United States for African American and Latino populations tend to be lower than for Caucasian populations.

RARE GENETIC SYNDROMES WITH ADHD

- Screening considered in presence of Intellectual Disability with ADHD:
  - Fragile X Syndrome
  - Tuberous Sclerosis
  - 22q11 microdeletion
  - Williams Syndrome
- These conditions also have high risk for ADHD, ADHD-like features, Autism, as well as schizophrenia
  - Genetic overlap between mental illnesses even in genetically “straightforward” (a few known genes involved) syndromes is impressive

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ADHD IN CHILDHOOD

- Excessive motor activity when the child is a toddler, but symptoms are difficult to distinguish from highly variable normative behaviors before age 4 years.
- In preschool, the main manifestation is hyperactivity.
- In Kindergarten, children with weaker inhibition and working memory capacities are more likely to exhibit high levels of disruptive behaviors and ADHD symptoms.
- Disruptive behaviors at these young ages may be more related to impaired executive function than oppositionality.
- ADHD is most often identified during elementary school years, and inattention becomes more prominent and impairing.

ADHD IN CHILDHOOD

- ADHD: a chronic neuropsychiatric syndrome affecting 3% to 5% of children. Population surveys suggest that ADHD occurs in most cultures in about 5% of children and about 2.5% of adults
- Approximately two thirds of children with ADHD have symptoms which persist into adulthood.

TEMPERAMENT, CHARACTER AND PERSONALITY DEVELOPMENT IN ADHD

- Cloninger’s biopsychosocial model of personality
- ADHD adults report high novelty seeking and high harm avoidance
- ASD adults report low novelty seeking, low reward dependence, and high harm avoidance.
- Cooperativeness overall low, reflecting high prevalence of personality disorders in both groups
  - ADHD more likely to have a cluster B personality disorder
  - ASD more likely to have cluster A or C
  - Anckarsater H. et al 2006

ADHD SUB-TYPES VS. A SPECTRUM

- Controversial Topic
- Sub-clinical traits of ADHD seen in “unaffected” family members
- Children may switch from one sub-type to another, as symptoms may change over the lifespan
- Sub-types are based on observation of groups of children having similar sets of symptoms
  - Assigned one of the 3 subtypes according to clinical observation based on somewhat arbitrary DSM-V criteria
  - In order to be biologically valid distinction, must demonstrate different responses to treatment, different etiology, different prognosis
  - Non of these conclusively proven for the sub-types yet but research is ongoing
  - Schizophrenia is an example of how subtypes may be elucidated in complex mental illness (Washington University in St. Louis, 2014)
ADHD IN ADULTHOOD
- ADHD meeting diagnostic criteria persists into adulthood for approximately 1/3 of childhood ADHD diagnoses
- Most will still have subclinical symptoms
  - Inattentiveness the most common
- ~60% will have an additional psychiatric diagnosis

ADHD IS A HETEROGENEOUS CONDITION: MANY CAUSES
- Final common pathway to ADHD phenotype
  - Factors along the pathway include:
    - family / genetic factors
    - brain structure / functional abnormalities
    - prenatal / perinatal factors
      - Maternal smoking and alcohol use
    - neurotoxins
    - psychosocial stressors and combined factors

NEUROLOGY OF ADHD
- ADHD is mediated by an intrinsic deficiency of neurotransmitters Dopamine and Norepinephrine
  - causes dysregulation of cortical activities primarily in the frontal lobe regions
- Widespread structural brain alterations seen on MRI
  - Reduced total grey matter and altered basal ganglia volumes correlated with higher familial ADHD risk.
  - Some evidence medication normalizes brain structure and function, other evidence that the grey and white matter abnormalities persist into adulthood
- Area for future research!

CURRENT RESEARCH: GENE TO BRAIN TO FUNCTION IN ADHD
- Dopamine transporter gene variant (10 repeat bases)
  - Doesn’t function as well
  - Studies indicate possible roles in brain structure and function in children with ADHD, including response to stimulants
  - Studied influence of this variant on prefrontal cortex thickness in children with ADHD
  - Having two copies of the variant led to thinner cortex in the right lateral prefrontal cortex
  - involved in executive processing and dopamine function
  - this genotype in a general population sample was linked to impaired executive function and increased ADHD symptoms

4. PATHOPHYSIOLOGY OF ADHD?
   Etiology, Genetics, Neuro-anatomy, Neurophysiology, Limits of Knowledge
**METABOLIC CHANGES IN ADHD**

- Meta-analysis has shown decreased omega-3 fatty acids
- Supplementation first reported to help as much as medications
- Later found not to be proven more effective than placebo by Cochrane Review

**HOW DOES COMORBIDITY OCCUR?**

- True comorbidity can result from:
  - Overlapping symptomatology
  - One disorder manifesting itself as an earlier form of the other
  - Shared Risk Factors
    - Research supports this mechanism for ADHD and SUD

**ADHD & Co.**

- Co-existing conditions must also be evaluated for
- 30-50% of ADHD may be co-morbid with other diagnoses
  - Oppositional Defiant Disorder (ODD): Pervasive pattern of negativistic, defiant, disobedient, and hostile behaviors toward authority figures
  - Conduct Disorder (CD): Repetitive pattern of violating the basic rights of others/major age-appropriate social norms or rules are violated
  - Mood disorders (depression/bipolar disorder)- check family history!
    - Poor outcome in co-morbid teens (higher risk for suicide)
  - Anxiety Disorders- 25% or more
  - Learning Disorders- up to 60% in non-PCP settings
    - Especially Reading Disorder

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**ADHD COMORBIDITY**

- Oppositional defiant disorder: 30-45%
- Conduct disorder: 20%
- Disruptive mood dysregulation disorder
- Specific learning disorder: up to 60%
- Anxiety disorders: 25% +
- Major depressive disorder: 10-20%
- Intermittent explosive disorder
- Substance use disorders
- Antisocial and other personality disorders
- Obsessive-compulsive disorder
- Tic disorders
- Autism spectrum disorder
ADHD DIFFERENTIAL DIAGNOSIS
- Oppositional defiant disorder
- Intermittent explosive disorder
- Other neurodevelopmental disorders
- Specific learning disorder
- Intellectual disability (intellectual developmental disorder)
- Autism spectrum disorder
- Reactive attachment disorder
- Anxiety disorders
- Depressive disorders
- Bipolar disorder
- Disruptive mood dysregulation disorder
- Substance use disorders
- Personality disorders
- Psychotic disorders
- Neurocognitive disorders

HEALTH RELATED QUALITY OF LIFE
- ADHD lowers multiple domains including:
  - Parent reported problems of emotional-behavioral role function, behavior, mental health, and self-esteem
  - Parent’s own emotional health, parent’s time to meet their own needs
  - Interference with family cohesion and activities
  - Kløsen et al. 2004

RISK BEHAVIORS
- ADHD is an independent predictor of:
  - Greater overall number of driving offenses
  - Higher frequency of driving without a seatbelt
  - Greater likelihood of having driven without a valid license
  - More at-fault accidents
  - Disqualified driver’s license
    - (Kaye et al. 2014)

SUICIDE RISK
- Increased risk of attempted and completed suicide
  - Over 51,000 Swedish patients with ADHD
  - Even after adjusted for comorbid psychiatric disorders, OR for attempted suicide 3.62 [95% CI >3], completed suicide 5.91 [95% CI 2.45-14.27]

  - Increased familial risk among first degree relatives
    - OR 2.42 [95% CI 2.36-2.49] among parents for suicide attempts
    - Lower in more genetically distant family
      - Ljung et al. 2014
**LEGAL CONSEQUENCES**

- 25% of female prison inmates in German prison have ADHD
  - Female prisoners younger at age of first incarceration, longer incarceration periods (Roesler et al. 2008)
  - ADHD rates in female prisoners exceed general population
- Boys with ADHD:
  - 2.5X more likely to have community correction records or incarceration records
- Girls with ADHD:
  - 3X more likely to have community correction records
  - 7X more likely to have an incarceration record
  - Silva et al. 2014

**SUBSTANCE ABUSE**

- Optimal treatment (not just medication!) of the symptoms of ADHD is the most effective way to reduce the incidence of substance use disorder
- ADHD symptom severity is associated with risk for cocaine use

**FUNCTIONAL CONSEQUENCES OF ADHD**

- Reduced school performance and academic attainment, social rejection
- As adults, poorer occupational performance, attainment, attendance, and higher probability of unemployment, elevated interpersonal conflict. Traffic accidents and violations, obesity.
- Children with ADHD are more likely develop conduct disorder in adolescence and antisocial personality disorder in adulthood, substance use disorders and incarceration

**TREATMENT**

- Stimulants
- Non-stimulants
- Non-pharmacological interventions
HISTORY OF PEDIATRIC PSYCHOPHARMACOLOGY
- Realm of pediatricians
- Child Psychiatry itself has developed over the past 100 years
  - In parallel with the psychological study of normal child development

PSYCHOLOGICAL ISSUES IN PHARMACOLOGIC MANAGEMENT
- Prescriber Issues
  - Dual Working Alliance crucial for successful outcomes
  - Child/teen may be easier to work with than parent
  - Potential for conflict of interest when conducting clinical trials
  - Many adult relationships need to be cultivated to promote best working alliance, maximum adherence, and best clinical outcomes
    - Parent
    - Teacher
    - Primary Therapist
    - Primary Care Provider / Other referring specialist

GENERAL APPROACH
- Children are not small adults (usually)
- Establish a diagnosis, or diagnostic category
- Parents and teachers are essential collaborators
- All physician’s actions have meaning to patients, and families
  - (especially to teens)

CHILDREN ARE NOT SMALL ADULTS (USUALLY)
- Liver metabolism, GFR are more efficient in children
  - GFR reaches adult rates by about 12 mos.
- Neurotransmitter development
  - 5-HT levels stay relatively constant throughout life
  - NE levels increase with age
    - differential response in child vs. adult to TCA
    - does not explain response in ADHD

CHILDREN ARE NOT SMALL ADULTS (USUALLY)
- Young children may not be able to describe their internal states
- Developmentally relevant vocabulary must be developed for working with children and families
- Physiologically different
  - start low, go slow, but higher doses may be tolerated and required, on a mg/kg basis
  - gender differences across development affecting medication half-life and distribution
  - shorter psychotropic medication half-lives in children may require more frequent dosing than adults

CHILDREN ARE NOT SMALL ADULTS (USUALLY)
- Neurotransmitter development, cont’d
  - DA: decrease in receptor density beginning @ age 3
- Lack of long-term safety data for most drugs
  - in fact, prolonged use may be harmful in very young children (Valproic Acid, Phenobarbitone in preschoolers)
- Most long-term data are extrapolated from animal studies
CHILDREN ARE NOT SMALL ADULTS (USUALLY)

- Pharmacokinetics:
  - the disposition of the drug to determine drug concentration at the effector site
- Pharmacodynamics:
  - the drug’s action at the effector site and the end response

CHILDREN ARE NOT SMALL ADULTS (USUALLY)

- Pharmacodynamic and pharmacokinetic differences, cont’d.
  - Young adolescent males may be at particular risk for acute dystonic reactions, compared to adults
  - Some drugs induce their own metabolism, and this may result in lower levels than expected

CHILDREN ARE NOT SMALL ADULTS (USUALLY)

- Pharmacodynamic and pharmacokinetic differences, cont’d.
  - Because Vd (the volume into which the drug distributes into the body, when the body is at equilibrium) is linearly related to body wt, less drug may be available for delivery than expected. (mg/kg dosing attempts to correct for this)

CHILDREN ARE NOT SMALL ADULTS (USUALLY)

- Plasma protein binding
  - Remember, most meds are reversibly bound to albumin, and only the free unbound portion is active and available for tissue distribution.
  - Different sites for acidic drugs (globulin) and basic drugs (a-1 glycoprotein)
  - Because a-1 glycoprotein is an acute phase reactant, its increased presence during infection and physical stress may result in decreased free medication.

- Cytochrome P450: As important in children as in adults.

PSYCHOLOGICAL ISSUES IN PHARMACOLOGIC MANAGEMENT

- How many prescriptions are not filled or are taken improperly?
  - About 50%, on average, across pediatric specialties
  - Depends on frequency of dosing and length of time meds are needed, ease of use, taste, cost, and understanding of necessity, among other reasons
- Why is psychological management important?
- Parent issues:
  - Ambivalence regarding need for medication, guilt about having “caused” the condition
  - Feelings of “inadequate” parenting
  - Feeling responsible for “poor” gene contribution
  - Inadequate parental surveillance of adherence
PSYCHOLOGICAL ISSUES IN PHARMACOLOGIC MANAGEMENT

More Parent Issues:
- Misunderstanding of doses, serum levels, and onset of effects
- Internet information and misinformation
- General public perception (see Psychiatr Serv 58:613-618, May 2007)
- All of our actions have meaning to the patient and family
  - What language do we use to explain the theoretical nature of their child’s illness?

Meanings, cont’d
- Many patients (especially teens) attach meaning to the medication itself.
  - Once taken, the “pill” is psychologically incorporated into the patient’s view of himself/herself, and can change their sense of identity
  - The meaning and significance of a drug can affect the way patients view the drug, the prescriber, and themselves (Lieberman & Tasman, 2000)

Prescriber Issues
- Triple Working Alliance crucial for successful outcomes
  - Child/teen may be easier to work with than parent
  - Teacher’s input essential for functional assessment
- Many adult relationships need to be cultivated to promote best working alliance, maximum adherence, and best clinical outcomes
  - Parent
  - Teacher
  - Primary Therapist
  - Primary Care Provider / Other referring specialist

BRAIN WITH ADHD IS FUNDAMENTALLY DIFFERENT

- Different genetics produce different neurochemistry with unique responses to stimulants
  - Caffeine, adrenaline, amphetamines will often have a paradoxical calming effect compared to other children
    - i.e. adolescent who drinks Espresso before bed “It helps me relax!”
STIMULANTS

- “stimulate” certain areas of the brain to focus better
  - FDA classifies a substance as “psychostimulant” if nucleus accumbens (NA) is activated
    - NA, aggregate of neurons with common functions
    - Located within the basal ganglia’s ventral striatum
    - Motivation, aversion, pleasure, reward, reinforcement learning
    - Also emotional response to music, rhythmicity, cuteness of babies
  - Modulated by dopamine signaling from Ventral Tegmental Area and by norepinephrine
    - Rich with dopamine receptors (D1, D2)
- in use for “behavioral disorders” in children since 1930’s
- many studies to document safety and efficacy
- 70-85% response rate
  - do not use this to confirm diagnosis!
  - Ex: abuse of stimulants in high school and college settings

Benefits:
- improved focus, concentration, attention span; reduced hyperactivity, impulsivity, and fidgeting
- Side effects: irritability, stomachache, headache, dysphoria, zoned-out effect, appetite suppression, sleep problems, height velocity slow-down (<10%)
  - Amphetamine formulations may produce more sleep/appetite problems, especially at higher doses

MATCH THE FORMULATION WITH THE NEEDS OF THE PATIENT AND FAMILY

- Have to know when youth “needs” the psychostimulant (e.g., early in AM for school only, or including homework, peer activities, week-ends)
  - Teacher input essential
- Parent and teen sometimes have definite preferences for one or another, and so do HMOs
- Train parents and teachers to observe efficacy and side effects through the day (teachers) and into the evening (parents)

THE ART OF FINE TUNING

- Must have accurate info about child/teen’s performance “over the day”; use scales and listen to teachers; titrate as needed
- Can combine short and long-acting preparations
THE ART OF FINE-TUNING -II

- If only partial efficacy with stimulants, can “mix and match” with other anti-ADHD drugs (e.g., clonidine / guanfacine, bupropion, atomoxetine TCAs)
- Inform family, and be vigilant about checking for additive sympathomimetic side effects

NON-STIMULANT MEDICATIONS

- Atomoxetine (Strattera)
- Bupropion (Wellbutrin)
- Guanfacine

COMMON ERRORS IN DOSING PSYCHOSTIMULANTS

- Failure to increase dosing slowly to maximum if no side effects (MTA study showed lower dosing in community sample)
- Beginning with a dose that is too high
  - “Start low and go especially slow” with patients who are developmentally delayed - more prone to side effects
- Not assessing the duration of action; (may need to “bunch up” dosing with IR formulations)
- Failure to use another psychostimulant if the first or second trial fails
- Failure to use input from school

CMAP-ADHD

- 4 algorithms: ADHD, with tics, with MDD and with IED
- Tactic Tables: Dosing schedules for Stimulants, TCAs, Bupropion, Alpha Agonists and SSRIs

TICS AND ADHD (ADAPTED FROM REVIEW BY PLIZSKA, 2006)

- Mild or moderate tics occur in a significant number of patients with or without ADHD pharmacotherapy
  - 5-18% of schoolchildren will experience a simple or complex tic in their lifetime
- Tics during ADHD treatment may improve even while psychostimulants are used; discontinue only if serious
- Lipkin et al. in a review of 122 children treated with stimulant medication found 9% developed transient tics and <1% developed chronic tics

GUIDELINES FOR CLINICIANS

- Medication response is frequently unpredictable - use a “start low, go slow” approach.
- Rebound symptoms may be experienced if abruptly discontinued or doses missed.
- Increase dosing frequency with smaller dose if this occurs.
- Absence of response within 2 weeks may signify treatment failure.
- Contraindicated: acute mania, history of psychosis
- Non-hyperactive subtypes (ADD) improve on smaller doses of stimulants but also have higher failure rates.
ADVERSE REACTIONS/ SIDE EFFECTS
- Insomnia, anxiety, appetite loss, weight loss, dysphoria and headache.
- Adverse reaction to a specific stimulant does not contraindicate the use of other stimulants.
- High doses: impair performance, memory, sequence coordination and thought clarity.
- "Cognitive constriction" = adventitious movements, paranoia, and disruptive outbursts are signs of drug toxicity.

SERIOUS SIDE EFFECTS OF PSYCHOSTIMULANTS
- Sudden cardiac death
  - Anecdotal, but not irrelevant
  - Cases thus far have been primarily in patients with pre-existing cardiac conduction defects
  - Ask about history of sudden tachycardia, fainting, and family history of sudden cardiac death prior to initiating
- 30+ cases of psychosis or formal hallucinations: discontinue the medication
- Growth Suppression (MTA 2004, 2009) effects are likely to be made up in late teens or by drug holidays; especially at risk, those with nausea and vomiting
  - Plot heights every 3 months to ensure proper growth velocity

INTERVENTIONS
Labeling a problem won’t solve the problem unless it leads to a plan for change.

INTERVENTION: GUIDELINES
1. Identify and prioritize treatment targets. Include current level of functioning.
2. Create specific, measurable, meaningful treatment goals.
3. Develop individualized strategies to reach these goals.
4. Track progress. Regularly review and revise targets, goals, and strategies.

STRATEGIES FOR INTERVENTION
- Medical
- Behavioral
- Cognitive and cognitive-behavioral
- Psychosocial
- Academic

8. BEHAVIORAL INTERVENTIONS
STRATEGIES FOR INTERVENTION (CONT.)

- Behavioral therapies
  - Target a specific behavior
  - Specific interventions
  - Modify environment
  - Goal is to change the behavior

- Cognitive and cognitive-behavioral
  - Addresses how people think about things or perceive things

- Psychosocial
  - Involves how people interact with others

- Academic
  - Modified general instruction
  - Small-group or individual instruction
  - Specialized instruction techniques
  - Specific skill instruction

STRATEGIES FOR INTERVENTION (CONT.)

- Who can implement these strategies?
  - School staff (teachers, aides, assistants, therapists, coaches, bus monitors)
  - Parent(s) or other family member(s)
  - Community member(s)
  - Student

- Where can these strategies be used?
  - School setting
  - Home setting
  - Community setting
INTERVENTION: SUMMARY

- Think about context/setting.
- Be specific in your goals. Prioritize.
- Increase external structure and support.
- Reinforce appropriate behaviors.
- Respond immediately.
- Think about how this skill fits into life, and make appropriate recommendations.

POSITIVE BEHAVIORAL INTERVENTION

- Identify the need for positive behavioral interventions,
- Establish baselines for the behaviors,
- Suggest targets for intervention plans,
- Monitor progress in behaviors, and
- Support decisions to discontinue or increase positive behavioral supports.

TEACHING POINTS

- ADHD is a clinical diagnosis in both youth and adults
- There are several subtypes that have different presentations
- The drugs of choice are psychostimulants and atomoxetine, but there are several other medications that can be effective

QUESTION 1

- Which of the listed disorders is the most common co-morbidity with ADHD in children?
  - A-Learning disorders in Math
  - B-Learning disorders in expressive language
  - C-Oppositional defiant disorder
  - D-Separation anxiety disorder
  - E-Gender Identity Disorder of Childhood
QUESTION 2
- A diagnosis of ADHD in adults must include:
  - A. Retrospective history of ADHD symptoms before the age of 12 years
  - B. History of school failure
  - C. History of motor vehicle accidents
  - D. History of failed multiple marriages
  - E. History of substance abuse

QUESTION 3
- Which of the following psychiatric disorders has the greatest genetic contribution?
  - A. Schizophrenia
  - B. Bipolar affective disorder
  - C. Major depressive disorder
  - D. ADHD
  - E. Generalized Anxiety Disorder

QUESTION 4
- Which statement is false regarding the development of ADHD across the lifetime?
  - A. 2/3 of children with ADHD will no longer meet criteria for the disorder in adulthood
  - B. Inattentiveness is the most commonly retained feature in adulthood
  - C. ADHD is most commonly identified in elementary school
  - D. ADHD symptoms are first noticeable after age 7
  - E. Girls are more likely than boys to present with primarily inattentive features

QUESTION 5
- What two neurotransmitters when deficient are felt to be fundamental in the pathology ADHD?
  - A. Serotonin and Norepinephrine
  - B. Dopamine and Serotonin
  - C. Glutamate and GABA
  - D. Dopamine and Norepinephrine
  - E. GABA and Acetylcholine

KEY LEARNING POINTS
- Not every child with behavior challenges has ADHD; other disorders may present similarly
- Children with ADHD may have other diagnoses also
- Which children need medical help?
  - At what point do you refer parents to a developmental pediatrician/child and adolescent psychiatric/pediatric neuropsychologist? How does the care team work together?
- Why is it so crucial that children receive help, if and when they need it?
- Medications are not a cure-all!
  - Social and executive skills training, parental training, lifestyle management (physical exercise, healthy diet, sleep) are very important
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- Shashank V. Joshi, MD, FAAP
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RESOURCES:

- Classroom strategies and modifications
  - www.schoolpsychiatry.org
- Parent Education and Empowerment
  - www.parentshelpingparents.com
  - www.schwablearning.org / www.greatschools.net
  - www.chadd.org
  - www.aacap.org (Amer Acad of Child & Adolesc Psychiatry: Facts for Families)
  - *www.parentsmedguide.org* (antidepressants)
  - www.add.org
  - NAMI (www.nami.org)

RESOURCES:

  - "excellent guide for both medical and non-medical providers, about the cost and size of the Harriet Lane Handbook"
- Wilens, Timothy: Straight Talk about Psychiatric Medications for Kids, revised edition, Guilford Press, 2004
  - "well-written and recently revised, among the best medication resources for parents, teachers, nurses, and therapists"
  - *The standard textbook of pediatric psychopharmacology, well-written and updated in 2010*

RESOURCES

- Connors (CPRS, CTRS, CAAARS) rating scales may be obtained through Multi-Health Systems (along with instructions for scoring): 908 Niagara Falls Blvd., North Tonawanda, NY 14120-2060, (800) 444-3961.
- Vanderbilt Scales for rating ADHD are available for "free" through http://www.brightfutures.org/mentalhealth/pdf/tools.html
- Barkley RA: Attention Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment, 2nd ed, 2005; Guilford
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