



# **Clinical Approach to Evaluating and Treating Attention-Deficit/Hyperactivity Disorder (ADHD)**

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# Disclosures



NO FINANCIAL  
DISCLOSURES



USE OF BRAND NAMES  
FOR MEDICINES

# Objectives

- ▶ Review diagnostic criteria for ADHD
- ▶ Discuss prognosis and co-morbid conditions
- ▶ Discuss screening and assessment tools
- ▶ Compare and contrast treatment options
- ▶ Discuss reasons to refer

# ADHD Defined

# “The Story of Fidgety Philip”

Heinrich Hoffmann (1845)

- ▶ “... Thus Papa bade Phil behave;
  - ▶ And Mamma looked very grave.
  - ▶ But fidgety Phil.
  - ▶ He won't sit still;
  - ▶ He wriggles,
  - ▶ And giggles...
  - ▶ ...How Mamma did fret and frown...
  - ▶ ...And Papa made such a face!
- Philip is in sad disgrace.”



# DSM-5 Criteria

- ▶ ≤ 16 years: ≥ 6 symptoms of inattention and/or hyperactivity-impulsivity
- ▶ 17+ years: ≥ 5 symptoms of inattention and/or hyperactivity-impulsivity
- ▶ Duration: 6 month minimum
- ▶ Inappropriate for developmental level

# Additional Criteria

- ▶ Symptoms present before age 12 years
- ▶ Symptoms present in 2+ settings (e.g., home, school or work; other activities)
- ▶ Symptoms interfere with / reduce the quality of social, school, or work functioning
- ▶ Symptoms are not better explained by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder, a personality disorder)

# Sub-Types

Predominantly  
Inattentive

Predominantly  
Hyperactive/Impulsive

Combined

# Inattention

- ▶ Poor detail attention or makes careless mistakes
- ▶ Gets off task
- ▶ Does not listen when spoken to
- ▶ Does not follow instructions or finish tasks
- ▶ Poor organization
- ▶ Avoids, dislikes, or reluctant to do tasks that require mental effort over a long period of time
- ▶ Loses critical items
- ▶ Easily distracted
- ▶ Forgetful with daily activities

# Hyperactivity / Impulsivity

- ▶ Fidgets, taps, or squirms
- ▶ Leaves seat
- ▶ Runs about or climbs when not appropriate or feeling restless
- ▶ Cannot play quietly
- ▶ “On the go” / “driven by a motor”
- ▶ Talks excessively
- ▶ Blurts out
- ▶ Trouble waiting their turn
- ▶ Often interrupts or intrudes on others
- ▶ Hyperactivity ≠ energy

# Epidemiology & Prognosis

# Epidemiology / Prognosis

- ▶ Worldwide prevalence: 7.2% in children
- ▶ US children: 9.4%
- ▶ Most common neurobehavioral disorder of childhood
- ▶ 2/3 children / adolescents on medication
- ▶ Half received behavioral therapy
- ▶ 1/4 never treated
- ▶ Avg age diagnosis: 7yo
  - ▶ More than half by PCP / Pediatrician

# Prognosis

- ▶ Adolescence:
  - ▶ Hyperactive / Impulsive symptoms decline
  - ▶ Inattentive symptoms persist
- ▶ Majority with comorbid psychiatric diagnosis
- ▶ Persistence into adulthood
  - ▶ ~15% (full)
  - ▶ 40-60% (partial)
  - ▶ Males more likely to remit

# Case Scenario #1

6 year old male in first grade struggling to meet milestones, mostly math. In preschool, concerns for excessive tantrums and screaming which have improved. At home patient is “wild,” does not listen, screams often. Behavior is good at school. Parents feel like he is smart but just does not want to do the work.

What is the next step in management?

# Audience Question

- ▶ A) Reassurance that this is normal for 6 year olds
- ▶ B) Prescribe trial of stimulant
- ▶ C) Referral to psychiatry for behavior disorder evaluation
- ▶ D) Recommend learning disorder evaluation and school interventions

# Co-morbid Conditions

- ▶ Anxiety
- ▶ Depression
- ▶ Oppositional Defiant Disorder (ODD)
- ▶ Tic Disorder
- ▶ Narcolepsy
- ▶ Obsessive-Compulsive Disorder
- ▶ Eating disorders
- ▶ Insomnia
- ▶ Specific learning disorders

# Case Scenario #2

- ▶ 8 year old female presents with parental concerns of being “slow.” She takes hours to complete homework. She struggles to learn basic tasks like tying shoelaces and telling time. She loses items often. She frequently daydreams. Parents are concerned she is developmentally delayed.
- ▶ What is the next step in management?

# Audience Question

- ▶ A) Discuss potential for ADHD and offer screening recommendations for both parents and teachers
- ▶ B) Refer for extensive developmental work up
- ▶ C) Reassurance that this is normal for 6 year old girls
- ▶ D) Get labs for metabolic disorder

# Sex Differences

## Boys (XY)

- ▶ 2x more likely
- ▶ 2.5 – 4 : 1 ratio in childhood
- ▶ Hyperactivity more frequent
  - ▶ Observable
  - ▶ Disruptive
- ▶ External conditions
  - ▶ Oppositional Defiance
  - ▶ Conduct Disorder
  - ▶ Tics
  - ▶ Autism

## Girls (XX)

- ▶ Internalizing conditions
  - ▶ Anxiety
  - ▶ Depression
  - ▶ Emotional dysregulation
  - ▶ Eating disorders
- ▶ Greater impairment
  - ▶ Low self-esteem
  - ▶ Experience more negative burden
- ▶ Underdiagnosed in school-age

# Evaluation

# Screening vs Assessment Tools

## Screening

- ▶ Evaluates the possible presence of a specific problem
- ▶ Can be simple yes/no
- ▶ Determines if additional evaluation is warranted
- ▶ Takes only few minutes

## Assessment

- ▶ Defines the nature of the problem
- ▶ Contributes to diagnosis
- ▶ Helps guide treatment regimen
- ▶ Many require special training to administer and interpret

# Case Scenario #3

17 year old female presents with parents who have concerns about worsening attention, declining grades, forgetfulness, and not turning in assignments. Patient always worked harder in school but mostly passed. Patient has received 2 speeding tickets since getting license 4 months ago. Denies alcohol, smoking/vaping, illegal drug use. Teacher Vanderbilt forms x4 do not suggest ADHD, suggest average student with average grades. No comments. Powerschool grades all failing.

What is the next step in management?

# Audience Response

- A) Begin transition of care to adult provider as the patient will be an adult soon.
- B) Reassurance. Teacher forms do not support ADHD.
- C) Refer to specialist given inconsistent information from school and caretakers.
- D) Order urine drug screening and pregnancy testing.

# Screening Tools: Rating Scales

- ▶ Conners
  - ▶ Full length or short versions
  - ▶ Ages 6-18
  - ▶ Validated
- ▶ Vanderbilt
  - ▶ Ages 6-12
  - ▶ Symptom and performance evaluation
  - ▶ Follow-up scales for monitoring
- ▶ ADHD Rating Scale for Children and Adolescents (ADHD-RS-V)
  - ▶ Child (5-10) or adolescent (11-17) forms
  - ▶ Male or female forms
  - ▶ No co-morbid conditions
- ▶ Swanson, Nolan and Pelham (SNAP) scale
  - ▶ Longer
  - ▶ Screens for more co-morbid conditions

# Rating Scale Comparison

Scale	Free	Ages	Screens for Co-morbid Conditions	Validated	# Items
Vanderbilt	Yes	6-12	Yes	No	26-55
Conners	No	6-17	Yes	Yes	59-87 37 (short)
ADHD-RS-V	No	5-17	No	No	18
SNAP	Yes	6-18	Yes	No	90 26 (short)

# Assessment: Neuropsychiatric Testing

## Continuous Performance Test (CPT)

- ▶ IVA-2
  - ▶ Ages 6+
  - ▶ Visual and auditory attention and response
- ▶ TOVA
  - ▶ Ages 4+
  - ▶ Visual and auditory
- ▶ Connors 3
  - ▶ Ages 8+
  - ▶ Visual only
- ▶ Connors Continuous Auditory Test of Attention (Connors CATA)
  - ▶ Auditory only

## Virtual Reality Continuous Performance Test (VR-CPT)

- ▶ Qb Test / Qb Check
  - ▶ Ages 6+
  - ▶ Attention and movement
  - ▶ FDA approved
- ▶ Nesplora Aula
  - ▶ Ages 6-16
  - ▶ Visual, auditory, and movement

# Treatment

# Treatment Considerations

- ▶ Age
- ▶ Degree of impairment
- ▶ Family willingness
- ▶ Patient willingness
- ▶ Medical history
- ▶ Compliance

**\*Management of ADHD should be the same manner as with other special health care needs using the chronic care model\***

# Treatment Options

- ▶ Parent Training in Behavioral Management
  - ▶ Recommended 1<sup>st</sup> line in pre-school age
- ▶ Behavioral classroom interventions
- ▶ School accommodations
  - ▶ 504 accommodations
  - ▶ Individualized Educational Plan (IEP)
- ▶ Stimulants
- ▶ Non-Stimulants

# Stimulants

- ▶ 2 FDA approved classes: methylphenidates (MPH) and amphetamines (AMP)
- ▶ Enhance noradrenergic and dopaminergic neurotransmission
- ▶ No proven difference in racemic mixtures (D- vs DL-)
- ▶ American Academy of Pediatrics (AAP) and American Academy of Child and Adolescent Psychiatry (AACAP) recommend treatment initiation with either class
  - ▶ Clinical practice suggests MPH class preferred over AMP

# Stimulant Comparison

## MPH

- ▶ Onset 30-45min
  - ▶ Jornay PM, delayed 10 hours
- ▶ IR duration: 3-5 hours
- ▶ XR duration: 7-12 hours
- ▶ ↑ dose → ↑ focus
- ▶ More than 70% of children are MPH responders

## AMP

- ▶ Onset 30-60min
- ▶ IR duration: 4-8 hours
- ▶ XR duration: 6-12 hours
  - ▶ Mydayis 16 hours
- ▶ ↑ dose → ↑ focus → ↑ motivation, ↑ euphoria, ↑ aggression
- ▶ Reduces cocaine cravings
- ▶ Affected by foods
  - ▶ Acidic → ↓ absorption / levels
  - ▶ Alkaline → ↑ absorption / levels

# Stimulant Monitoring

- ▶ **BLACK BOX WARNING:** concerns about abuse / dependence
  - ▶ Data suggest that children treated with stimulants are NOT more likely than those who did not receive stimulants to develop substance misuse later in life
  - ▶ Substance misuse is more prevalent in ADHD (~15% vs 5-6%)
  - ▶ Divergence: selling medication
- ▶ Increase blood pressure (1-4 mm Hg) and heart rate (1-2 BPM)
- ▶ Serious cardiac event (RARE)
- ▶ Psychiatric events
- ▶ Longterm growth suppression
  - ▶ MPH 7 days/week x 3 years → 2 cm less ht and 2.7 kg less wt
- ▶ Seizures (low)
  - ▶ Risk highest during initiation
- ▶ Motor / vocal tics
- ▶ Priapism

# Methylphenidate Formulations

Delivery	Duration (hrs)	Name
Methylphenidate (MPH) IR (tablet, chewable, liquid)	3-5	MPH Ritalin Focalin IR
Pulse (IR + ER) (capsule)	7-8	Ritalin SR Metadate ER Methylin ER Aptensio XR Adhansia XR (d/c)
Pearls (capsule)	8-10	Metadate CD Ritalin LA Focalin XR
Delayed release	8-12 (delayed onset)	Jornay PM
Pump / Osmotic (pill)	8-12	Concerta

# Other MPH

- ▶ Azstarys
  - ▶ IR Focalin + pro-drug Focalin
  - ▶ Powder inside
- ▶ Cotelpla: oral disintegrating
- ▶ Quillichew: chewable
- ▶ Quillivant: liquid
- ▶ Daytrana: patch

# Amphetamine Formulations

Delivery	Form	Duration (hrs)	Name
IR	D-tablet D-liquid	4-8	Zenzedi Procentra
IR	DL-tablet	4-8	Adderall IR Evekeo
Pulse (2 beads)	D-capsule	6-9	Dexedrine
Pulse (3 beads)	D-capsule	<16	Mydayis
Pearl	DL-capsule	8-12	Adderall XR
Pro-drug	D-capsule D-chewable	8-12	Vyvanse
Oral disintegrating	D-tablet ODT	8-12	Adzenys
Patch	D-patch	Variable	Zelstryl
Other	D-liquid DL-chewable	8-12 12+	Dyanavel XR Dyanavel XR

# Special Considerations

## ▶ Adderall

- ▶ Only FDA approved stimulant for <6 years
- ▶ Absorption pH dependent

## ▶ Mydayis

- ▶ Longer duration
- ▶ 13 years and older

## ▶ Zelstrum

- ▶ Effect diminishes once removed

## ▶ Vyvanse

- ▶ Amount of d-AMP not disclosed
  - ▶ Now generic
  - ▶ Cannot convert to other stimulants
- ▶ Onset longer (30-60 min)
- ▶ Less “drug liking”

# Case Scenario #4

4yo male brought to clinic by parents in a panic because he has been kicked out of his 3<sup>rd</sup> daycare for eloping, being disruptive, not listening, and worsening impulsivity. Patient is in 3K going on 4K. Developmental milestones on track. Academically, patient can recognize letters and numbers, count to 100, read several sight words. Socially, kiddo has friends but sometimes plays wildly on playground. Parents are really frustrated. In clinic, child is running around room, crawling under table, playing with computer.

What is the next step in management?

# Audience Response

- ▶ A) Refer for Autism evaluation
- ▶ B) Start a stimulant. It is obvious he has ADHD, combined.
- ▶ C) Refer to psych for behavior concerns
- ▶ D) Recommend non-stimulant for suspected ADHD

# Non-stimulants

- ▶ Effect size: Stimulants (1.0) > Non-stimulants (0.7)
- ▶ Alpha-adrenergic agonists
  - ▶ Intuniv (guanfacine)
  - ▶ Kapvay (clonidine)
- ▶ Serotonin norepinephrine reuptake inhibitors (SNRIs)
  - ▶ Strattera (atomoxetine)
  - ▶ Qelbree (viloxazine)
- ▶ Others
  - ▶ Norepinephrine and dopamine reuptake inhibitors (NDRIs) (i.e. Wellbutrin / bupropion)
  - ▶ Nutritional (e.g., dyes, sugars, omega 3s, Mg and Zn)

# Alpha-agonist: Intuniv (guanfacine)

- ▶ Alpha 2a specific
- ▶ IR 4-8 hours, for hypertension
- ▶ ER (Intuniv)  $\leq$  24 hours, for ADHD, fewer side effects than IR
- ▶ 6yrs and older
- ▶ May help with impulse control, emotional regulation, and tics
- ▶ Dose adjustment q-weekly
- ▶ Goal dose is  $\sim$ 0.05 – 0.12 mg/kg (max 4mg/day)
- ▶ Do NOT crush, chew, or break tablets before swallowing
- ▶ Do NOT administer with high fat foods (increased exposure)
- ▶ Do NOT substitute IR for ER on mg-per-mg basis
- ▶ Side Effects: somnolence, hypotension, rebound hypertension

# Alpha-agonist: Clonidine

- ▶ IR & ER tablets, solution, and transdermal patch
- ▶ ER only formulation approved for ADHD
- ▶ Ages 6-17 years
- ▶ Onset 30-60 min
- ▶ Duration 12-24 hours
- ▶ Same “Do NOT” profile as Intuniv
- ▶ Nonspecific: alpha-2a, 2b (baroreceptors) and 2c
- ▶ Clonidine and sleep:
  - ▶ Sedating effect
  - ▶ Can disrupt sleep
- ▶ Side effect potential > Intuniv
  - ▶ Insomnia
  - ▶ Nightmares
  - ▶ Irritability
- ▶ Discontinuation: taper slowly to avoid rebound hypertension

# SNRI: Strattera (atomoxetine)

- ▶ Therapeutic effect comparable to alpha-agonists
- ▶ Initial and full effects longer than stimulants
  - ▶ 1-2 weeks for initial
  - ▶ 4-6 weeks for full effect / peak
- ▶ Initial dose 0.5 mg/kg/day (can divide twice daily)
- ▶ Max 1.4 mg/kg/day or 100 mg/day
- ▶ Black Box Warning: suicidal ideation
  - ▶ Risk greatest during early treatment
  - ▶ ~0.4%
- ▶ May discontinue abruptly, no need to taper

# SNRI: Qelbree (viloxetine)

- ▶ Rapid improvement in symptoms if less optimal response to Strattera
- ▶ Side effect profile and black box warning similar to Strattera
- ▶ Better improvement in combination with stimulant
- ▶ Discontinuation: may do better with taper, no black box

# Selecting Best Treatment

- ▶ Age
- ▶ Degree of impairment
- ▶ Family dynamics
- ▶ Cost
- ▶ Availability
- ▶ Co-morbidities

# Medication Management

- ▶ Medication holidays
  - ▶ May be beneficial in stimulant-induced growth suppression
  - ▶ Summer holidays may allow for growth rebound
  - ▶ Consider impact of no medication on summer activities
  - ▶ Consider lower dose
- ▶ Switching medications
  - ▶ No need to taper
  - ▶ Possible withdrawal effects: insomnia, irritability, anxiety, headache
- ▶ Stimulants are effective in almost all children. If 1<sup>st</sup> one fails, switch to another. Can switch from MPH to AMP without tapering.
- ▶ Dose adjustment
- ▶ Benefit vs adverse effects

# Behavioral Modifications

- ▶ Retention not always beneficial
- ▶ School support
  - ▶ 504 Accommodations vs IEP
  - ▶ Interventional: help student work independently and thrive (e.g., reports, point systems, remediation)
  - ▶ Accommodations: changes (e.g., extended time, reduced work, teacher's notes)
- ▶ Pre-school
  - ▶ Negative coercive cycle: caretaker reacts negatively to inappropriate behavior → child escalates → caretaker gets more upset → more attention / child wins
  - ▶ Positive reinforcement: rewarding child for appropriate behavior, ignoring inappropriate behaviors
  - ▶ Structure / routine
  - ▶ Goal: enhance positive, enjoyable parent child interactions

# Case Scenario #5

10 year old male presents for well-child check up with both parents (divorced, high-conflict). Mom is a physician and has concerns about fidgeting, inattention, forgetfulness, emotional dysregulation and wants to discuss ADHD medication. Dad thinks, "He's just a boy." Teacher evaluations with comments support ADHD diagnosis. Grades have slipped but remain A's. On exam, pt is climbing on table, throwing objects, and chewing on clothes.

What is the next step in management?

# Audience Question

- A) A) Get additional school evaluations to convince dad to treat.
- B) B) Prescribe a stimulant because he meets criteria and that's what mom wants.
- C) C) Reassure the parents that this is normal behavior for a 10 yo.
- D) D) Refer to a specialist for more objective evaluation.

# When to Refer

- ▶ Lack of or inconclusive information from caretakers or school
- ▶ Family disconnect
- ▶ Failure of several medications
- ▶ More complex co-morbidities
- ▶ Accommodations (i.e. standardized testing)

# Summary

- ▶ Bi-directional communication with schools, families, other healthcare providers is critical in diagnosis and management of ADHD
- ▶ Chronic care model is beneficial for parents who may also suffer from ADHD and provides a consistent schedule for management
- ▶ Stimulants are first-line treatment
- ▶ Work best in combination with behavioral therapy
- ▶ Cardiac history critical but no longer need EKG/ECHO
- ▶ Shared decision-making critical to success

# References

Banaschewski T, Coghill D, Zuddas A, Oxford Textbook of Attention deficit hyperactivity disorder (Oxford University Press, Oxford, 2018).

Danielson ML, Bitsko RH, Ghandour RM, Holbrook JR, Kogan MD, Blumberg SJ. Prevalence of parent-reported ADHD diagnosis and associated treatment among U.S. children and adolescents, 2016. *J Clin Child Adolesc Psychol.* 2018; 47(2):199–212

Riddle MA, *Pediatric psychopharmacology for primary care* (American Academy of Pediatrics, Itasca, IL, 2022).

Rowland AS, Skipper BJ, Umbach DM, et al. The prevalence of ADHD in a population-based sample. *J Atten Disord.* 2015;19(9):741–754

Wolraich ML, Hagan JF Jr, Allan C, Chan E, Davison D, Earls M, Evans SW, Flinn SK, Froehlich T, Frost J, Holbrook JR, Lehmann CU, Lessin HR, Okechukwu K, Pierce KL, Winner JD, Zurlhellen W; SUBCOMMITTEE ON CHILDREN AND ADOLESCENTS WITH ATTENTION-DEFICIT/HYPERACTIVE DISORDER. Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of Attention-Deficit/Hyperactivity Disorder in Children and Adolescents. *Pediatrics.* 2019.

Wolraich ML, McKeown RE, Visser SN, et al. The prevalence of ADHD: its diagnosis and treatment in four school districts across two states. *J Atten Disord.* 2014;18(7):563–575