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ADHD in Children, Youth and Adults: Information for Psychiatry Residents

Summary: Attention deficit hyperactivity disorder (ADHD) is characterized by extreme problems with inattention, distractibility and/or hyperactivity and impulsivity. Advantages of this type of attentional difference are that such individuals may do well with exciting, stimulating, hands-on and/or creative tasks, e.g. emergency medicine and surgery. On the other hand, in other settings, it can cause impairment with daily function, e.g. lab medicine. Fortunately, there are many interventions that can help, including modifications and accommodations to better fit the person's abilities to their home, school and workplace. Should those be insufficient, there are also various interventions including medications such as stimulant medications and non-stimulant medications.

Abbreviations

ADHD, attention-deficit hyperactivity disorder ; AMPH, amphetamine; ATX, atomoxetine; MPH, methylphenidate; SUD, substance use disorder.

Case, Part 1

Identifying data:

- Josh is a 10 year old male who presents with difficulty sitting still and distractibility.

Chief complaints

- Mother: "The school thinks he needs to be on medication!"

HPI

- Mother: "It's true -- he's an active kid. He's the star goalie on his hockey team, and when he's not playing hockey, he just wants to be outside all the time. But at school, the teacher thinks he has ADHD and she said he needs medication."
- Josh: "School is boring!"

What are you going to do?

Introduction

Attention appears to run along a continuum...

No problems at all with attention -- Easily able to focus for long periods. No problems with hyperactivity.	Mild problems with attention and hyperactivity, but not causing significant problems.	Significant problems with inattention, hyperactivity causing significant problems.
Able to focus, even on boring tasks		Need tasks to be highly stimulating in order to focus

When the distractibility and need to move are so severe that it causes problems, it may be ADHD.

Epidemiology

Prevalence of ADHD

- Age
  - School age children: 6-9% (Wolraich et al., 1998; CDC, 2010; Ontario Child Health Study, 1989)
  - Adult : 4.4% (NCS-R, 2006)
- Gender:
  - 9.0% in males (4-16 yrs old)
  - 3.3% in males (OCHS, 1989)

ADHD accounts for 30-50% of mental health referrals (MTA Cooperative Group, 1999)

Neurobiology of ADHD

ADHD is a polygenic condition (many genes involved) that leads to:

- Delayed cortical maturation.
- Dysfunction in cortico-striatal-thalamic-cortical (CSTC) loops
- Catecholamine dysfunction (norepinephrine and dopamine)

Etiology

Predisposing factors for ADHD

- Genetics
  - Genetics accounts for ~0.76 of the variance in ADHD
  - Higher parental age at birth
  - Lower parental IQ
  - Parental ADHD
  - Parental conduct disorder (CD)
- Environmental / non-genetic factors
  - Cigarette exposure, i.e. from mother smoking during pregnancy
  - Alcohol / drug exposure, i.e. from mother drinking alcohol or using drugs during pregnancy
  - Low birth weight
  - Prematurity
- Psychosocial Adversity
  - Low socioeconomic status (SES)
- Parenting
  - Parenting does not cause ADHD, however unhealthy parenting does not help, and healthy parenting can have a positive outcome on ADHD.

Hunter Hypothesis

Why do some people have ADHD? One bio evolutionary theory is that ADHD traits helped early hunter gatherers survive (Williams, 2006; Jensen, 1997). A good hunter would need to be:

- Aware of everything in their surroundings
- Able to act or respond quickly;
- High energy in order to move for hunting.

It is thanks to people with these traits that humans survived. We were able to settle in one place to farm and establish towns and cities. While the way we live has changed, many people still carry these 'hunter' traits. Modern life doesn't always suit the hunters among us. When you ask a 'hunter' to sit still for long periods, it is then that they start fidgeting, and appear to be hyperactive. When you ask a 'hunter' to focus on low stimulating activities (e.g. a teacher talking for long periods), then the hunter gets bored and appears distractible.

Classic hunter traits are the following:

High energy, active and "hands on":	People with ADHD often excel in situations where a lot is going on at once. They learn to pay attention to many things at the same time and good at 'mulit-tasking'. Their "hyperactivity" allows for them to meet the high energy requirements of: • Sports; • Outdoor jobs; • Trades; • Construction; • Computer sciences.
Excitement seeking	People with ADHD hate being bored, so they often seek out work that stimulates them. They have a great sense of fun and adventure, and are often very social. They are often attracted to careers like: • Policing; • Firefighting; • Working in the emergency department; • Being a paramedic; • Armed forces; • Teaching.
Energized by change	People with ADHD often find change exciting, and will seek out new and interesting experiences. This also helps them to adapt and thrive in many different situations. When faced with change, they often respond by showing they can be: • Persistent; • Resourceful; • Outgoing; • Ready for action; • Good at improvising; • Good in crisis situations.
Creative	People with ADHD can be very innovative and full of ideas. This may be helpful in: • Design; • The arts; • The entertainment industry; • Technology and innovation.

Clinical Presentation

Clinical Presentation in Children/Youth

- Children/youth are typically brought due to problems at:
  - School
    - Teachers may report that the child "has potential" and is "smart", yet due to inattention in the classroom, and/or hyperactivity, the child is "unable to reach his/her potential".

- Home
  - The child's inattention may make it difficult for the child to meet normal home expectations and/or follow daily routines.
  - Impulsivity may present as behaviour problems, including anger/defiance.

Clinical Presentation in Adults

Adults may present with symptoms such as:

- Putting off tasks requiring mental effort
  - Impairment:
    - Self/Home: Mail left unopened, paying bills late.
    - School/Work: Staying up, late to prepare work for the next day.
    - Relationships: Lack of preparation for shared activities upsets others.

- Talking excessively
  - Impairment:
    - Self/Home:. Talking too much creates inefficient communication with service providers like doctors.
    - School/Work: Lose other's interest in meetings.
    - Relationships: Talking more than other people limits depth of relationships.
- Troubles sustaining attention on long term projects such as
  - Relationships, e.g. they may have had multiple relationships versus their non-ADHD contemporaries who will have settled down in a stable relationship
  - Career, e.g. they may have multiple changes in jobs, careers, or education versus their non-ADHD peers who have been able to focus on a career.

- Using compensatory strategies which may make it harder to spot symptoms such as:
  - Defer or avoid challenging activities, thus they may deny distress or impairment from classic ADHD symptoms;
  - May be less efficient as they require more time to do work or tasks.
  - May feel exhausted from having to pay attention, or control behaviour
  - May rely on complex organizational and reminder systems
  - May rely on others for keeping them on task or structured -- if fortunate enough, an adult with ADHD will be able to find a partner to compensate for their disorganization.

Assessment and History

Here are examples of questions:

	Questions for Parent or Child/Youth / Comments	Questions for Adult / Comments
Goals	What are your best hopes from this visit? Parents classically report they want "better behaviours", "better focus", "less hyper".	What are your best hopes from this visit? Adults with insight will hopefully want improvement of ADHD symptoms; they may also have comorbid anxiety/depression.
HPI	Tell me about the problems with ____ (e.g. troubles focusing, behaviours, etc.)?	Tell me about the problems with ____ (e.g. troubles focusing, behaviours, etc.)?
Stressors	What are the main stressors currently?	
ADHD-focused questions		

Inattention	Do you have to repeat instructions to your child? Do you find that you can only give 1-2 short instructions, rather than multiple instructions? Does your child get easily distracted? Affected by little distractions (telephone, noise)? Does your child day dream?	Do you get distracted easily?
Hyperactivity	Difficulty sitting still? Energy level?	Were you hyperactive as a child? How is that nowadays? Hyperactivity tends to improve with age, thus adults with ADHD may not report current hyperactivity, though may be impatient, and have troubles waiting.
Impulsivity	Acts before thinking, daredevil?	Any problems with being impulsive, i.e. acting before thinking through the consequence?
Executive skills	Troubles with organization for school? Missing schoolwork or tests?	Troubles with organization for work? Missing work deadlines?
High need for stimulation and novelty	Tend to be thrill seeking, e.g. climbing or even risky situations	Do you enjoy high adrenaline activities? Adults with ADHD may seek out stimulation through sports or high stimulation occupations, or creative arts.
Functional impairment	Any problems at home (e.g. mealtimes, routines, homework), school, community activities?	Any troubles finishing school? Getting and keeping jobs? Have you had troubles with long-term relationships? Adults with ADHD tend to have troubles achieving life stages that other non-aDHD adults might, e.g. completing education, having stable relationships, stable employment. They may report multiple past jobs, multiple relationships.
Psychiatric Review of Symptoms	Any troubles with anxiety? Depression? Seeing or hearing things that others don't?	Same as with children
Substance Use History	Are you concerned about your child using alcohol or drugs? Marijuana?	Any use of alcohol? Drugs? Marijuana? A classic history is self-medicating with marijuana to improve focus.
Medical History	Any cardiac issues?	Same
Family Medical History	Any family history of cardiac problems? Relatives who died unexpectedly young, i.e. below age 55 from cardiac issues?	Same
Family History	Have your parents, siblings, or other family members been diagnosed with ADHD or shown symptoms of inattention, hyperactivity or impulsivity?	Same

Collateral History

- For patients who are children/youth: Ask for parental permission to contact the school in order to obtain collateral history from teachers and other sources.
- For patients who are adults: See if you can obtain collateral history from the patient's spouse or other family members.

Rating Scales

Various rating scales can be used to provide supplemental information to support your clinical impression of ADHD symptoms. They need to be combined with good clinical judgment, and are not to be used in isolation.
Examples

- Conners Rating Scale-Revised (Parent/Teacher)
- SNAP-IV Teacher/Parent Rating Scale\

Available at www.caddra.ca

Diagnosis of ADHD

ADHD Diagnostic Criteria (DSM-5)

- Inattentive symptoms (≥6/9), AND/OR hyperactive-impulsive symptoms (≥6/9) (for age 17 and older at least 5 symptoms are required)
- Several symptoms must have been present <12 y.o.
- Several symptoms must be present ≥2 settings (home, school, work, friends, other activities)
- Clear interference in functioning (school, social, family, work)
- Symptoms not better explained by another mental health disorder or medical condition

- Specify whether:
  - Combined presentation (both inattention and hyperactivity-impulsivity criteria are met for the past 6 months)
  - Predominantly inattentive presentation
  - Predominantly hyperactive/impulsive presentation

ADHD presentation in children: (Polanczyk et al., 2007)

- Combined (50-75%)
- Inattentive (20-40%)
- Hyperactive-impulsive (<5-15%)

Differences from DSM-IV-TR

- Examples added to criterion items to facilitate application across the life span
  - Is often forgetful in daily activities (e.g., doing chores, running errands; for older adolescents and adults, returning calls, paying bills, keeping appointments)

- Onset criterion has been changed from < 7 y.o. to < 12 y.o.
- Comorbid diagnosis with Autism Spectrum Disorder is allowed
- Symptom threshold requires ≥5 symptoms in persons ≥17 y.o.
- Now listed as a neurodevelopmental disorder to reflect correlation between ADHD and brain development

- “Subtypes” have been replaced with presentation “specifiers”

Special Populations: Diagnosis in Adults

- Diagnosing ADHD is more challenging in adults compared to children/adolescents, with studies estimating that less than 20% of adults with ADHD are identified and treated, versus > 50% of children/adolescents with ADHD.
- By definition, diagnosis requires presence of ADHD symptoms in childhood (before age 12).

Differential Diagnosis: Medical

There are numerous medical conditions that can lead to inattention, including the following:

Condition	History/Screening Questions	Further Assessment / Management
Hearing		
• Hearing impairment	Any problems with hearing?	Audiology
• Auditory processing problems	Any problems hearing when there is background noise?	Audiology assessment for auditory processing problems
Visual problems		
• Visual processing problems	Are you overwhelmed or stressed out by lots of things in the environment? Lots of 'clutter'?	Behavioural optometrist
• Visual impairment	Where do you sit in the classroom? Troubles seeing the board?	Optometrist
• Convergence insufficiency	Do you see double?	Optometrist
Genetic conditions (e.g. Fragile X, fetal alcohol spectrum disorder)	Any dysmorphic facies? Any signs of intellectual disability?	Genetics
Neurological conditions		
• Traumatic brain injury	Any head injuries? Concussions?	Neurology
• Tics / Tourette's	Any involuntary motor movements?	Neurology
• Seizure Disorder	Screening questions (Ottman, 2010) for seizures: Any seizures, convulsions, fits or spells? Any uncontrolled movements of your body, e.g. twitching, jerking, shaking or going limp? Any periods of "spacing out"? Any unusual body movements if exposed to strobe lights, video games, flickering lights, bright glare?	Neurology
Sleep disorder		
• Restless legs	Any problems sleeping due restless legs? Are sensations worse at night? Are sensations relieved by movement?	Sleep Lab
• Periodic limb movement disorder	Do spouses or others notice that the patient moves during the night? Problems staying asleep? Problems with excessive daytime sleepiness?	Sleep Lab
Metabolic/Endocrine		
• Thyroid problems	Any problems with fatigue, weight changes, problems tolerating heat or cold?	Thyroid indices
• Anemia such as iron deficiency anemia	Any problems with low energy?	CBC to rule out anemia B12 / folate Iron

• Toxins (e.g. lead)	Does the patient live in an old home? Anyone in the family involved in occupations with lead exposure?	Serum lead (or other heavy metals) if concerns about lead or other heavy metal toxicity
Medication-induced	Any medications that may cause inattention?	Discontinue unnecessary medications ; reduce dosages if possible

Differential Diagnosis: Psychiatric

Various psychiatric conditions may lead a child to appear inattentive; many of these may also be comorbid as well:

Condition	History/Screening Questions	Further Assessment / Management
Learning disorder	Does the school-aged child have much lower grades in a specific subject, compared to others? E.g. Passing most subjects, but is failing math (i.e. math disorder)	Psychoeducational assessment
Gifted child	Is the child bored? I.e. is the child not paying attention due to being understimulated academically?	Psychoeducational assessment for giftedness
Intellectual disability	Young child: Problems in various developmental domains such as speech/language? Older child: Is the patient behind that of peers in all areas?	Developmental paediatrics consult Psychoeducational assessment for school-aged children
Oppositional defiant disorder	Is the child oppositional with rules? To an extreme that causes problems?	
Conduct disorder	Is there breaking rules, to the point where it violates other's rights? E.g. Aggression towards others? Animals? Theft?	
Mood disorder (e.g. depression)	Irritable and/or depressed mood? Problems with sleep, appetite, concentration, energy, loss of interests?	
Anxiety	Significant problems with anxiety causing impairment?	
Autism Spectrum Disorder	Narrow interests and activities? Problems with reciprocal social interactions? Problems with seeing other's perspectives?	
Substance use	Any use of recreational drugs? Alcohol use? Cannabis? Any impairment?	

ADHD vs. Mania / Bipolar

Is it ADHD or mania? It can sometimes be challenging to distinguish between ADHD and mania -- both are conditions where patients can have high energy, as well as be inattentive. The following questions may help to

differentiate these conditions:

	ADHD	Mania
Course of symptoms	Constant	Episodic
Predominant symptoms	Less mood symptoms	Pervasive mood symptoms
Presence of psychosis	Does not typically have psychosis	May have psychosis
Sexuality		May be hypersexual
Sleep	Trouble settling at night since often still 'revved up'	May have decreased need for sleep, yet despite this, has high energy the next day
Mood		Irritable, or elevated /expansive Mood
Low frustration tolerance	Low frustration tolerance	Low frustration tolerance
Hyperactivity	"Always on the go" hyperactivity	Goal directed activity
Typical presentation	"Class clown, silly"	
Distractibility	Easy distracted	Easy distracted
Self-concept	Often brags, "positive illusory bias"	Inflated self esteem; Grandiosity
Thought form	Off topic/poor pragmatics	Flight of ideas
Impulsivity		Engages in high risk activities

Comorbidity

Most of the time, ADHD does not occur on its own; patients will have other comorbid conditions such as the following:

ADHD only (i.e. "simple ADHD")	32%
ADHD and oppositional defiant disorder	40%
ADHD and anxiety/mood disorder	38%
ADHD and conduct disorder	14%
ADHD and tics	11%

Reference: MTA study, Jensen P., 1999

Comorbidity: Adults with ADHD

Any mood disorder	38%
Major depressive disorder	19%
Any anxiety disorder	47%

• Social phobia	29%
• Generalized anxiety disorder	8%
Any substance use disorder	15%

Physical Exam /Medical Evaluation

The physical exam in ADHD should be normal, other than the fact that the patient may be active and have troubles sitting still.

Baseline Vitals (BP, HR, RR)	In the event medications are started, baseline measures are important
General	Any dysmorphic features that might suggest fetal alcohol, or genetic syndromes? (which may lead to ADHD symptoms) Does patient appear excessively pale, which might suggest anemia?
Head/Neck	Any problems with: • Hearing? • Vision?
Skin	Dry skin, eczema, brittle nails, may indicate possible omega 3 fatty deficiency, which may lead to ADHD symptoms
Thyroid	Any signs of hyper or hypothyroid? (which may imitate symptoms of ADHD)
Cardiovascular exam	For baseline, and to exclude cardiovascular conditions that might contraindicate potential stimulant medication treatment
Neurological exam	ADHD is due to functional changes (rather than structural) and thus the neurologic exam should not should any signs of structural issues

Investigations

There are no investigations that are diagnostic for ADHD, however investigations may play a role in helping rule out contributing or comorbid conditions.

General laboratory screening may include

- CBC to rule out anemia
- Lytes
- Bun/Cr
- Ferritin to rule out iron deficiency
- Thyroid indices to rule out thyroid problems
- Liver enzymes

If suspected

- Serum lead if lead toxicity is suspected.
- Note:
    - In the province of Ontario, Canada, a report by Global News, Toronto Star, and Concordia and Ryerson University showed that over 2,400 Ontario schools and daycares have been found with a lead levels exceeding those of federal guidelines (Robinson, 2019).

Other tests

- Psychoeducational Testing for all children/youth with ADHD (recommended by CADDRA)
- Audiology assessment to rule out hearing problems
- Optometry assessment to rule out visual problems

Management

MTA Study

Multimodal Treatment Study of Children With ADHD (MTA Group, Arch Gen Psychiatry, 1999):

Conclusions:

- Medication, with or without behavioural treatment, is the most effective treatment for core ADHD symptoms
- On the other hand, parents prefer behavioural treatment, with or without medication, to medication treatment alone.
- The combination of medication and behavioural treatment is the most effective approach for problems associated with ADHD.

Management: Non-Medication Interventions in Children/Youth

The American Academy of Pediatrics recommends the following (AAP, 2011)
Is the child a pre-schooler aged aged 4-5 years or younger?

- Do not start with medications
- 1st line
    - Evidence-based parent and/or teacher-administered behavior (i.e. non medication) strategies
    - Examples include parent education, parent management training such as Triple P, Incredible Years

Psychoeducation

- Explain the rationale for the diagnosis
- Explain that ADHD is mainly a genetically and neurobiological based disorder
- Review the natural course of ADHD
- Provide a sense of hope since ADHD is one of the most treatable psychiatric conditions

Behavioural Parent Management Training

- improved compliance with parental commands; improved parental understanding of behavioral principles; high levels of parental satisfaction with treatment)

Behavioural School and Academic Intervention

- Improved compliance with classroom rules; decreased disruptive behavior; improved work productivity)

Parenting Skills Training for Parenting the Child with ADHD

Evidence-based parenting approaches generally include features such as:

- Explain to parents that parenting a child with ADHD requires an approach that takes into account the child's ADHD
- Spending regular positive 1:1 time with your child with ADHD, which may mean more physically active activities
- Using positive feedback (e.g. praise or gratitude) to encourage positive behaviours

    - Always give more positive feedback than criticism
- When talking to your child with ADHD, keep things brief and to the point
    - When making requests to a child with ADHD
    - One or two simple, clear instructions should be given at a time (as opposed to simply telling multiple instructions to your child).
    - The child should repeat the instructions back to ensure comprehension.
    - Consider using visual reinforcement, e.g. writing down your request
- Structured home environment
    - Consistent daily routines (e.g. the same wakeup, mealtime and bedtime routines)
    - Provide consistent schedules and routines with forewarning of any upcoming changes.
    - Clear expectations
    - Consistent responding
    - Positive attention for appropriate behaviors
- Family rules
    - Clear, concise rules should be provided for the behavior of all family members, with consistent followthrough of appropriate consequences and rewards.
- Discipline
    - Decrease inappropriate behavior by allowing:
        - natural consequences to the child's actions,
        - logical consequences linked to the offending behavior
    - When giving consequences, do so in a calm, business like manner, without showing anger.
    - Ensure appropriate consequences for maladaptive behaviors; with ADHD, short-term, immediate consequences are better than long-term consequences
    - E.g. If the ADHD child has positive behaviours, acknowledge or reward them as soon as possible, as opposed to waiting too long
    - Showing anger may stop behaviours in the short run, but it damages the parent-child relationship in the long-run
    - In the long run, having a strong parent-child relationship is the best motivator for positive behaviour.
- Sleep
    - Create consistent sleep habits and a restful sleep environment.
    - Distraction-free zones
    - Have a special quiet spot with few distracting influences for doing homework or working on projects.
- Collaborative problem-solving
    - When possible, rather than simply telling the child what to do, give the child some choices within set limits so that the child has a sense of some control
        - E.g. Parent: "Everyone has to contribute by helping out at dinner. What would you like to help out with?"
        - E.g. Parent: "When you have done your homework, then we can do something fun together. For example, we can go to the park together, go swimming, or do something else... What do you want to do after your homework is done?"
    - Externalize the problem
        - Make sure the child knows his or her behavior is the issue or problem, not the child himself or herself.
        - Parent: "I love you, and it hurts me to see this behavour."
    - For negative behaviours
        - Utilize differential social attention to decrease ADHD behaviors that are not aggressive or dangerous to self, others or property. You can do this by ignoring behaviors like interrupting others, wherein you provide no attention (e.g., eye contact, verbal, smiling at them, etc.) to the problem behavior (e.g., "Thanks for being quiet while I finished talking to my friend"). This strategy is often taught in parent training programs.
- Incorporate prevention strategies such as visuals (e.g., timers, posted hour rules, etc.) to promote on-task and adaptive behaviors.
- Be a role model for your children

    - Remember that your children absorb whatever they observe in others, such as their parents
    - Ensure that you are similarly showing appropriate coping methods in front of children so they can learn positive methods to channel their frustrations
    - For example
        - Talk about your feelings, e.g. "I feel... "
- Ensure that you have social support
    - Keep up your connections with close family members and friends for support

Treatment by Ages: Under Age 4

Sometimes parents present with young children below aged 6, which is the age at which ADHD medications have FDA-approval.
In general, one would treat with non-medication interventions.
Rare exceptions might include:

- Child is almost aged 6
- Symptoms of ADHD so severe that it causes severe hardship on the family, e.g. child is suspended from school/daycare, which means parents have to take time off work, etc.

- If so, one might consider low dose ADHD medications.

Non-Medication Strategies

- Limit recreational screen time
    - Given the link with excessive screen time and inattention, it is reasonable to limit recreational screen time, as per standard Canadian Pediatric Society (CPS) media use guidelines, which are max 1 hrs/daily for aged 6-12, and max 1-2 hrs/daily for aged 12-18.
    - Some would argue that if a child/youth is having symptoms of ADHD, it may be helpful to have a screen detox to see if this reduces symptoms of ADHD (Dunckley, 2014)
    - Many parents have historically limited screen time such as TV during school days, only allowing it on Friday/Saturday, for example.

- “Mindful parenting”, that parents him in a low stimulation environment, without giving too much “easy dopamine” or sensory overload
    - Instead of electronic screens which give “easy dopamine”, give him opportunities to create his own dopamine/adrenaline, through non-electronic activities such as
        - Nature time for spontaneous outdoor play

- Consider occupational therapy (OT) to help with self-regulation. Usual OT recommendations for ADHD (at school) include:
    - Movement:
        - Increase opportunities for movement, e.g. allow standing rather than sitting at the desk; mobility seating such as Wedge cushions, ball chairs, etc.
    - Limit auditory distractions

Alternative and Complementary Treatments

Evidence-based alternative therapies recommended by the NIH National Center for Complementary and Integrative Health https://nccih.nih.gov/health/providers/digest/adhd-science

- Omega 3 fatty acids – Moderate effects

- Short-term aerobic exercise
    - Aerobic exercise such as yoga, has shown beneficial effects on core symptoms of ADHD such as attention, hyperactivity, and impulsivity.

    - If possible, ensure he is walking or biking to school in the morning.

- Diet interventions
    - Studies for mood/depression show that limiting processed foods, limiting simple sugars, and ensuring a Mediterranean diet with whole grains, vegetables and fruits may be helpful for brain health.

- Promising treatments however needing replication studies:
    - Saffron
        - One RCT showing effectiveness (Baziar, 2019)
        - Dosage was 20-30 mg daily in in 54 kids aged 6-17
        - Saffron also recommend by Canadian Network for Mood and Anxiety Treatments (CANMAT) for mood disorders -- evidence (meta-analysis and 3 systematic reviews) that supports “its use as a monotherapy with comparable efficacy to antidepressants in mild to moderate major depressive disorder.” (Ravindran, 2016)
        - By extension, this suggests that Saffron may be helpful for other brain conditions, i.e. ADHD.
        - Nonetheless, it more replication from international trials is recommended.

- 5-HTP plus tyrosine
    - Hinz treated patients with ADHD with monoamine precursors (i.e. 5-HTP and tyrosine) (Hinz, 2011).

Management: Non-Medication Interventions in Adults

Psychoeducation

- Provide teaching about ADHD

Behavioural Intervention and Goal Setting

- Link here

Assistive and Organizational Technologies

- Link here

Workplace or academic accommodations

- Link here to eMH workplace letters

Psychotherapy for ADHD in Adults

- CBT in combination with medication (Safren SA et al., 2005; Stevenson CS et al., 2002; Safren SA et al., 2010)
- Meta-cognitive therapy (Solanto M et al., 2010)
    - A group-administered, cognitive-behavioral principles and training in executive self-management skills.
- Other psychotherapies
    - Individual psychotherapy
    - Marital therapy

Management: Substance Abuse Disorders (SUD)

Does the patient have a substance use disorder (SUD)?

- Refer for concurrent SUD treatment.

- Note however that individuals with ADHD do less well in SUD treatment

- ADHD meds have not proven beneficial in reducing substance use.
- Treat the ADHD
- ADHD medications do not increase the risk of drug use.
- Stimulants remain the most effective ADHD meds even with ongoing SUD.
- Is there a significant risk of the patient diverting the ADHD stimulant medication, perhaps to sell?
    - Use extended release stimulants or non-stimulants

Management: Stimulant Medications

What are the benefits of medications?

- Numerous studies show sustained improvement with ongoing medication, e.g. .one study showed sustained improvement in academic performance with ongoing treatment over 5 years.
- However much of the benefit of stimulant medication disappears after medication is stopped.

For preschool-aged children aged 4-5 years

- Medications are FDA-approved for aged 6 and above, and thus are generally not recommended for children younger than age 6.
- Exceptions
    - Have non-medication interventions been tried without success?
    - Is there severe impairment causing undue hardship on parents? E.g. the child is suspended from school, and the parent has to take time off work to look after the child.
    - If so, then consider low dose methylphenidate

For children/youth (age 6-18)

- 1st line
    - ADHD medications alone are more effective than behavior treatment alone (MTA Study)
    - Many parents prefer to start with non-medication interventions prior to initiating medication, thus:
        - Consider offering non-medication intervention first (e.g. school accommodations)
        - Ask parents if they would agree to reconsider medications at a later visit if ADHD symptoms persist

Prior to starting medications:

- Are there any possible contraindications to medications (such as structural cardiac abnormalities)?
    - If so, then refer to cardiology.

Pharmacological Algorithms for ADHD

2014 CADDRA Guidelines for Medical Treatment of ADHD (children/adolescent/adult)

1st line

1. Long acting stimulant
    1. Methylphenidate or
    2. Dextroamphetamine
2. Atomoxetine or Guanfacine XR
3. Bupropion
4. Tricyclic antidepressants, modafinil, other medications and medication combinations

2nd line

- Second Line – Long Acting Non- Stimulant for ADHD

    - E.g. Atomoxetine
- Second Line – Short Acting Stimulant Treatment for ADHD
    - E.g. Methylphenidate regular
    - E.g. Dextroamphetamine regular

What if there is ADHD plus a comorbid condition?

- Most individuals with ADHD have co-occurring conditions which often complicate the clinical pictures of ADHD had have to be dealt with
- Treat the “primary” disorder first, i.e. the more severe, early onset and pervasive disorder.
    - E.g. if anxiety came first, treat anxiety.
    - E.g. if ADHD came first, treat ADHD.

ADHD Medication Table

Name	Availability	Starting dose	Titration schedule per week (CADDRA)	Maximum dose/daily (CADDRA)
First Line Long Acting				
Amphetamine mixed salts (Adderall XR)	5, 10, 15, 20, 25, 30 mg cap	Children/adults: 5-10 mg q morning	5 mg /week	Child: 30 mg Adults 30 mg
Lisdexamfetamine (Vyvanse)	20, 30, 40, 50, 60 mg cap	20-30 mg mornings	10 mg / week	Child: 60 mg Youth/Adults: 70 mg
Methylphenidate (Biphentin)	10, 15, 20, 30, 40, 50, 60, 80 mg cap	10-20 mg mornings	10 mg /week	Child: 60 mg Youth/Adults 80 mg daily
Methylphenidate OROS (Concerta)	18, 27, 36, 54 mg tab	18 mg mornings	9-18 mg/week	Child: 72 mg Youth: 90 mg Adults 80 mg

Second Line Agents

Name	Availability	Starting dose	Titration schedule per week (CADDRA)	Maximum dose/daily (CADDRA)
Intermediate Acting Stimulants				
Ritalin SR (Methylphenidate)	20 mg tab	20 mg morning	20 mg / week	100 mg daily
Dexedrine spansules	10,15 mg spansule	10 mg daily	10 mg daily	Child/Youth: 20-30 mg Adults: 50 mg
Methylphenidate short acting (Ritalin)	10-20 mg	5 mg bid-tid Adult: up to qid	5-10 mg weekly	Child/Youth 60 mg Adults: 100 mg
Dexedrine	5 mg	2.5-5 mg bid	5 mg weekly	Child: 40 mg daily Adult: 50 mg daily

Third line

- Consider adjunctive use or monotherapy with the following:

Strattera (Atomoxetine)	10, 18, 25, 40, 60, 80, 100 mg cap	Child: 0.5 mg/kg/day x at least 3-days Adult: Start 40 mg daily	Child: Usual target dosage is 1.2 mg/kg/day Adult: Usual target 80 mg daily	Child: Max 1.4 mg/kg/day Youth/Adults: 100 mg
Guanfacine (Intuniv XR)	1, 2, 3, 4 mg tab	1 mg	1 mg every 7-14 days	Child: 4 mg Youth/Adults 7 mg

What is the Short-term Efficacy of Medications?

- 70% of children and adults will respond to any given stimulant, compared with 4-30% who respond to placebo (Spenser et al., 1996)
- About 90% will respond to either MPH or AMPH (Arnold, 2000)
- AMPH has also been found to have “moderately” greater effect size than MPH (Faraone & Buitelaar, 2009 [meta-analysis]):
    - – AMPH effect size=1.0-1.2 (NNT=2.0)
    - – MPH effect size=0.7-0.9 (NNT=2.6)
- While about 25% of patients respond preferentially to AMPH, about 20% respond preferentially to MPH (Arnold, 2000)
- For ODD/CD symptoms and aggression associated with ADHD, stimulants have an overall effect size of about 0.7-0.8 (“medium” to “large”) (Connor et al., 2002; Pringsheim et al., 2015)

Cardiac Effects

Analysis of patient-year exposure data for children on ADHD medications suggests that the rate of sudden death is similar to the general population. Possible under-reporting, a report of increased odds of stimulant use in patients with sudden death compared with motor vehicle deaths, and rare deaths with the initiation of medication remain reasons for continued research in this area (class IIa, level C).

Patients with ADHD, like all pediatric patients, should undergo a careful history and physical examination that includes personal and family history details that may identify those at risk of sudden cardiac death. This should be performed by their primary care physician (class IIa, level C).

1. Routine ECG assessment of ADHD patients before starting medication is not supported by evidence and is not recommended (class IIa, level C).
2. For ADHD patients with suspected heart disease or identified risk factors for sudden death, assessment by a cardiologist is recommended. This would also be the case for a non-ADHD patient (class IIa, level C).
3. The above points are based on the consensus of a combined group of practitioners from across Canada with expertise in sudden death, general pediatric cardiology, and the care of children and youth with ADHD. Further research is necessary before recommendations satisfying higher levels of evidence criteria can be made (class IIa, level C).

Current Recommendations

- Before initiating a stimulant
    - Any history of cardiac symptoms including syncope, palpitations, chest pain, shortness of breath or seizures during exercise?
    - Any history of cardiac disease including a clinically significant murmur (not functional)
    - Any family history of
        - Premature (sudden/unexpected) death in family members <40 years old
        - Cardiac family history including hypertrophic cardiomyopathy, clinically important arrhythmias including long QT syndrome (LQTS), Marfan syndrome
- Assessment of heart rate and blood pressure per gender/age/height norms.
- Are the above screening negative?
    - If so, then no additional screening is required (i.e. no EEG required)

- Are there abnormal findings?
    - If abnormal findings in above screen, then consider
        - ECG and
        - Consultation with primary care physician or cardiologist
- During treatment with a stimulant
    - Monitor change in personal cardiac history (including subjective complaints) or change in family cardiac history
    - Regular assessment of heart rate and blood pressure per gender/age/height norms
    - Clinical screening is standard of care and should be documented

Reference: Cardiac risk assessment before the use of stimulantmedications in children and youth: A joint position statement by the Canadian Paediatric Society, theCanadian Cardiovascular Society, and the Canadian Academy of Child and Adolescent Psychiatry (2009)

Side Effects and Management Strategies

Insomnia	• Consider switching to Atomoxetine since less insomnia • Avoid giving stimulants in the evening • Sleep Hygiene • Melatonin 3-6mg given 1-2 hrs before bed
Rebound Hyperactivity	• Use long acting stimulant or more frequent dosing of short acting agent; • Switch to non-stimulant
Appetite Suppression	• Take medication after breakfast • Switch to higher calorie foods and drinks, e.g. homogenized milk, Boost ™, high fat yoghurt, etc. • Instead of insisting on rigid meal and snack times, allow child to eat when hungry and graze throughout the day on nutritious snacks • If significant weight loss (e.g. over 10% body weight), switch to alternate stimulant or non-stimulant
Growth Suppression	• Monitor height / weight • It is felt that ADHD medications may possibly lead to a very minor suppression of growth, i.e. potentially a 1” deficit overall • Benefits of treatment generally outweigh the risk. • Practice of drug holidays has largely fallen out of favour, on the basis that most patients benefit not just during the school year, but during the whole year
Tics	Tics are common and usually transient in children, and they wax and wane on their own. Stimulants do not bring out or exacerbate tics, nonetheless some individuals may have an increase in tics with stimulants (Roessner et al., 2006; Tourette Syndrome Study Group, 2002; Bloch et al., 2009). Are there tics with a stimulant medication? Consider: • Lower the stimulant dose; , • Switch to a different stimulant formulation,, • Add guanfacine,, • Switch to a non-stimulant (i.e. atomoxetine) • Hold stimulant until tics disappear, and then restart stimulant to see if tics return ◦ If tics return, ■ Add tic medication such as atypical antipsychotics (eg. Risperidone) or clonidine. ■ Consider switch to atomoxetine or imipramine.
Headaches	Are there headaches with stimulant medication? Consider: • Watchful waiting as headaches usually disappear once on a stable dose for a few weeks. • Mild analgesics such as acetaminophen, ibuprufen.

Psychosis	Typically visual or tactile hallucinations of snakes, insects, or worms. Rate of psychosis or mania on stimulant is 1 in 400 children (Ross, 2006). People with psychosis triggered by stimulant likely have an underlying vulnerability or predisposition to psychosis. Are there psychosis symptoms with stimulant medication? Consider: • Stop the stimulant -- If there is no prior history of psychosis prior to starting the stimulant, then psychotic symptoms usually stop after the stimulant is discontinued. Do symptoms of psychosis persist after stopping the antipsychotic? • If so, the patient might have had an underlying tendency to psychosis and may need an antipsychotic medication.

Contraindications to Stimulants

- Advanced arteriosclerosis
- Moderate to severe hypertension
- Untreated hyperthyroidism
- Glaucoma
- Hypersensitivity to the drug
- During treatment with MAO inhibitors, and for up to 14 days after discontinuation (hypertensive crises may result)
- Pregnancy
- Stimulants are not contraindicated in individuals with seizure disorders, autism spectrum disorders, or Tourette syndrome, but their use should be cautious in these populations
- Psychosis

Monitoring While On Stimulants

Monitor the following:

- Height and weight on growth charts
- HR and BP at baseline, with dose changes and periodically thereafter
- Use parent and teacher rating scales to monitor response and side effects at different doses.

Course and Prognosis

ADHD tends to persist from childhood to adolescence to adulthood.
After being diagnosed in childhood

- Most children (60-85%) continue to meet ADHD criteria in adolescence (Barkley et al., 1990; Biederman et al., 1996; Claude and Firestone, 1995)
- As adults
    - 40% of adults continue to meet full criteria for ADHD in adulthood;
    - 90% had at least 5 symptoms of ADHD (Biederman et al., 2000).

It is important to treat ADHD in adults because adults with untreated ADHD show the following:

- 2x more likely to have been arrested
- 2x more likely to have been divorced
- 4x more likely to have contracted a sexually transmitted disease2
- 3x more likely to be currently unemployed.

Case, Part 2

Identifying data:

- Josh is a 10 year old male who presents with difficulty sitting still and distractibility.

Chief complaint

- “The school thinks he needs to be on medication!”

HPI

- Mother: “It’s true -- he’s an active kid. He’s the star goalie on his hockey team, and when he’s not playing hockey, he just wants to be outside all the time. But at school, the teacher thinks he has ADHD and she said he needs medication.”

You do a comprehensive assessment, which confirms that he meets criteria for ADHD, combined type. On a scale between 0 and 10, where 0 is no focus, and 10 is the best, Josh and mother feel his focus is 2/10. He does not have any contributory medical issues (e.g. lead toxicity) or other psychiatric comorbidities (e.g. learning disorders, sensory processing issues, etc.)

When you explore the school situation, it turns out that one trigger this year was that the family changed schools, and he moved from a school with 10 other students to one with 20 other students.

You work with the school, and recommend that they start with accommodations and modifications for his attentional difference.

He is still struggling however, and so it is decided to start medications for ADHD

Online ADHD Resources

Teach ADHD
This site is designed specifically for teachers, but the information and down-loadable materials are also of interest for parents and clinicians. This website is developed and maintain by The Hospital for Sick Children, Toronto.
www.teachadhd.ca

Centre for ADHD Awareness Canada
National, umbrella organization providing leadership in education and advocacy for ADHD organizations and individuals across Canada.
www.caddac.ca

Learning Disabilities Association of Canada
www.ldac-acta.ca

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