ADHD

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ADHD Etiology

ADHD is a heterogenous behavioral disorder with multiple possible etiologies:

- Neuroanatomic/ Neurochemical
- CNS insults
- Genetic origins
- Environmental factors

Incidence and epidemiology:

- Most common mental health disorder of childhood
- Prevalence rates range from 2-9%
- Affects ~ 4.4 million American school children
- Impairments in functioning extend to school, home,
- Other problems often coexist with ADHD
- Increasing evidence that this disorder and related impairments persist into the adult years

"The Science of ADHD in Adults"

Russell Barkley, Ph.D.

- 85-95% of young adults still have impairments due to ADHD
- Only 35-40% still met DSM criteria
- Significantly impairments:
  1) Educational 2) Occupational 3) MVA
  4) Relationships 5) Antisocial
- "Adults look like they outgrow ADHD but what they outgrow is the DSM criteria"

DSM- IV Symptoms of Inattention

- Careless
- Difficulty sustaining attention in activities
- Does not listen
- Does not follow through
- Can not organize
- Avoids or dislikes tasks requiring sustained effort
- Often loses things
- Easily distracted
- Forgetful in daily activities

Must have to

How much impairment.

DSM- IV Symptoms of Hyperactivity/ Impulsive

- Fidgets and squirms in seat
- Can't stay seated or restless
- Often runs about or climbs excessively
- Can't play/ work quietly
- "On the go" or "driven by a motor"
- Talks excessively
- Blurts out answers
- Can't await turn
- g Interrupts or intrudes on others

Other diagnostic criteria:

- Impairment present before 7 years age
- Impairment present in two or more settings
- Evidence of impairment in social, academic or occupational functioning (greater than 6 months)
- Symptoms are not accounted for by another mental disorder

Neurotransmitters

- Dopamine
  - -Enhanced signal
  - -Improved attention
    (focus, vigilance, on-task behavior and cognition)
- Norepinephrine
  - -Enhances Executive function
  - -Decreases noise
  - -Increases inhibition

ADHD Medications

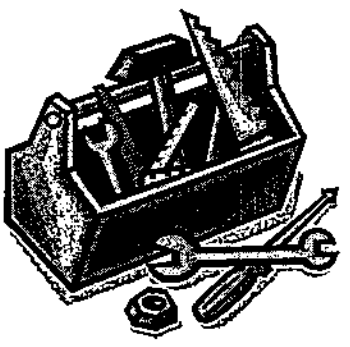
1937- Benzedrine
1952- Dexedrine
1955- Ritalin
1982- Ritalin SR
1996- Adderall
1997- DextroStat
1999- Metadate ER
2000- Concerta
Methylin ER
2001- Adderall XR
Metadate CD
Focalin
2003- *Strattera
Ritalin LA
2005- Focalin XR
2006- Daytrana
2007- Vyvanse
2009- *Intuniv

Keys to Successful Treatment

- ADHD is a **chronic condition** that is managed, not cured
- Any management plan is a **step-by-step** approach- one step at a time.
- **Start with one or two** specific, measurable and achievable goals
- **Collaboration is the key to success**

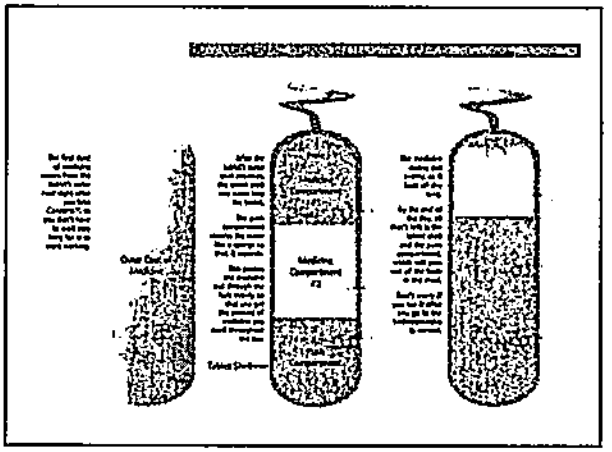
Selecting the right medication

- Acceptance
  (past experience, FH, risks)
- Control of target symptoms
- Promote multimodal treatment
- Coverage of the day, activities etc.
- Watch for coexisting problems
- Titrate to most effective dose
- Develop an ADHD Management Plan

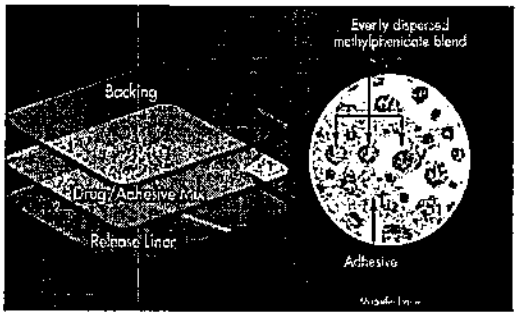


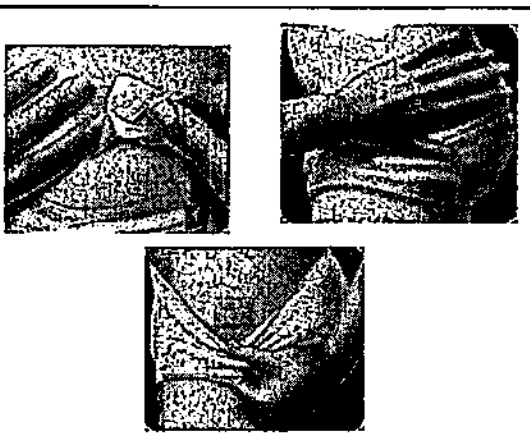
Medications: Stimulants

- Methylphenidate Regular and SR:
  5, 10, 20, 20mg. tablets/ 20mg. SR tablets
  Ritalin, Metadate ER, Methylin
  Ritalin LA 10, 20, 30, 40mg. capsules
  Metadate CD 10, 20, 30, 40, 50, 60 mg capsules
  Concerta 18, 27, 36, 54, 72mg. tablets
- *d- Methylphenidate (Focalin): 2.5, 5, 10mg. Tablets*
  Focalin XR 5, 10, 20, 30 mg. Caspules
- *Methylphenidate transdermal system*
  Daytrana 10, 15, 20, 30mg patches



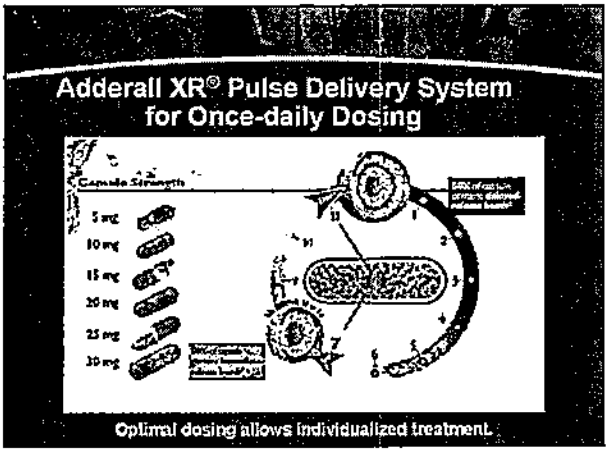
Methylphenidate Patch



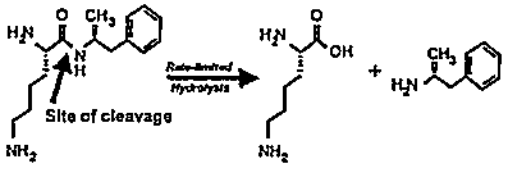


Medications: Stimulants

- Amphetamine mixture:
  - *Adderall 5, 7.5, 10, 12.5,15, 20, 30mg tablets*
  - Adderall XR 5, 10, 15, 20, 25, 30mg capsules
- Dextroamphetamine:
  - *Dexedrine, Dextrostat*
    - *5, 10, 20mg tablets*
    - *5, 10, 15mg spansules*
- Lisdexamfetamine
  - *Vyvanse 30, 50, 70 mg capsules*



Lisdexamfetamine



Adverse Effects of Stimulants

- Headaches/ Stomachaches
- Appetite Suppression
- Sleep Problems?
- Rebound
- Apathy or Personality changes
- Tics

Medications: Nonstimulant

- Atomoxetine (Strattera)
- Central-Acting a-Adrenergic Agonists:
  - Clonidine
  - Guanfacine
  - Intuniv (extended release guanfacine)
- Bupropion (Wellbutrin SR and XL)
- Tricyclic antidepressants

Mechanism of Action

Centrally acting alpha 2-adrenergic agonists

- Stimulates alpha 2-adrenergic receptors in the brain
- Recent studies show that these meds enhance functions in the prefrontal cortex by inhibiting cAMP signaling closing potassium channels and strengthening physiologic connections
- May also improve working memory and regulation of emotion
- Reduces sympathetic outflow from the CNS resulting in decreased peripheral resistant, renal vascular resistant, heart rate, and blood pressure.

Studies by Arnsten AF, Dept of Neurobiology at Yale Medical School

Intuniv

- Non- stimulant medication
- Selective alpha-2A adrenoceptor agonist
- Engaged alpha-2A receptors close ion channels and strengthen network firing
- Improves working memory, reduces distractibility, improves attention regulation, enhances impulse control and improves behavioral inhibition

Kapvay

Extended Release Clonidine

- Centrally acting alpha-adrenergic agonist approved for treatment of ADHD as monotherapy or as adjunctive therapy to stimulant medications
- Dosage forms and strengths- 0.1 mg and 0.2 mg tablets
- Dosage rage- 0.1- 0.4 mg per day given BID
- Possible adverse effects are hypotension/bradycardia, somnolence/sedation and allergic reactions

Cause tiredness + sluggishness

Conditions that commonly co-exist with ADHD

- Oppositional defiant disorder 54-84%
- Depression disorders 5- 40%
- Learning or language disorders 25-35%
- Bipolar disorder 0-16%
- Substance abuse or smoking 15-19%
- Others- anxiety, tics

Pliszka S. ADHD Practice Parameter. JAACAP 2007

Problems that coexist with ADHD

- Medical Problems/ Syndromes
- Developmental Problems/ Delays
- Cognitive Problems (Mental Retardation)
- Speech/ Language Disorders
- Fine Motor Problems
- Gross Motor/ Coordination Problems
- Sensory Problems
- Sleep Problems
- Substance Abuse Disorders
- Environmental Stressors

Treatment of ADHD and comorbidities

- Deal with most impairing symptoms first
- Other forms of treatment are often necessary (multi-modal therapy)
- Combination of medication may be needed for different symptoms/ disorders

References and Websites:

- Developmental and Behavioral Pediatrics- www.dbpeds.org
- University of Massachusetts- www.schoolpsychiatry.com
- Children and Adults with Attention-Deficit Hyperactivity Disorder, www.chadd.org
- Bright Futures in Practice: Mental Health- www.brightfutures.org
- Understanding ADHD and the ADHD Toolkit, American Academy of Pediatrics- www.aap.org
- Great Schools- www.schwablearning.org
- www.ADDinschools.org
- www.successinmind.org

Stimulants and Drug Abuse Fact Sheet: Methylphenidate and Amphetamines[1]

How do prescription stimulants affect the brain?

- All stimulant increase dopamine levels in the brain.
- Therapeutic effects are achieved by slow and steady increases of dopamine, similar to natural dopamine production.
- When taken in doses and routes other than those prescribed, stimulants can increase brain dopamine in a rapid and disruptive manner, producing euphoria and increasing the risk of addiction.

What is the role of stimulants in the treatment of ADHD?

- Stimulants can improve the core symptoms of ADHD, as well as self-esteem, cognitive efficiency, and social/family interactions.
- The most commonly prescribed stimulants are amphetamines (e.g., Adderall) and methylphenidate (e.g., Ritalin, Concerta).
- Research suggests that individuals with ADHD do NOT become addicted to their stimulant medications when taken as prescribed.
- In addition, stimulant medication treatment in childhood does not appear to increase the risk for drug and alcohol abuse disorders in adulthood.

Why and how are prescription stimulants abused?

- Stimulants have been abused for "performance enhancement" (e.g., increase wakefulness, facilitate weight loss, increase focus) as well as for recreational purposes ("getting high").
- Euphoric effects of stimulants usually occur when crushed and then snorted or injected; complications can occur because insoluble fillers in the tablets can block small blood vessels.

What adverse effects does prescription stimulant abuse have on health?

- Stimulants can increase heart rate, blood pressure, and body temperature, and decrease sleep and appetite. High doses can lead to cardiovascular complications, including stroke.
- Repeated use in excess of prescribed dosages can lead to hostility and paranoia, as well as withdrawal symptoms (fatigue, depression, disturbed sleep) can emerge when the stimulants are discontinued after chronic abusive use.

How widespread is prescription stimulant abuse?

- Data from 2008 suggest that non-medical use of Ritalin over the past year occurred in 1.6% of 8th graders, 2.9% of 10th graders, and 3.4% of 12th graders.
- Amphetamines are the third most common drug used for illicit purposes among 12th graders.

When should I suspect stimulant abuse or diversion?

- Stimulant prescriptions are frequently "lost" or refill requests occur more frequently than expected.
- Parents or patients report fewer beneficial effects despite steadily increasing doses.
- Observers (such as teachers) report that the child appears not to be on medication despite an otherwise adequate dose.

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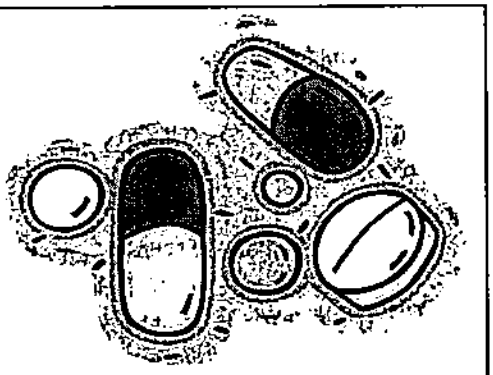
[1] Adapted from NIDA InfoFacts June 2009, www.drugabuse.gov

Basic Facts

What Every Parent Should Know before Starting their child on Medication



General information:

Studies have shown that treatment for ADHD with medication is effective in treating the symptoms of ADHD either alone or in combination with behavioral interventions. There are several types of medications and they are grouped into two major categories: stimulants and non stimulant medications. Most children are initially treated with stimulants, although there are reasons why your doctor may choose to treat your child with a non-stimulant. Deciding which medication is right for your child may take time. Your doctor may try several different doses or switch to different medications to find the best choice. Discuss any family history of heart disease, high blood pressure or substance abuse with your doctor.

Stimulant medications usually work within 30 to 90 minutes, depending on dose and formulation. Stimulant medications come in short acting preparations which need to be given 2 or 3 times per day, and long acting preparations that are given only once a day. Although the medications are similar, each child may experience different benefits and side effects with different medications. Stimulant medications should be given at the same time of the day and you should never double up to make up for a missed dose. Non stimulant medications may take up to 2 or 3 weeks before a beneficial effect is seen.

Side effects:

There are several side effects which can be associated with stimulant medications. These include stomachache, headache, decreased appetite, sleep problems and increased symptoms as medication wears off. Usually these effects are mild and often decrease after the first 1 to 2 weeks. Your doctor will adjust meds or discuss other strategies at follow up visits if these side effects continue. It is helpful to observe the time of day when side effects occur. Serious side effects are rare, but you should contact your doctor's office if your child experiences dizziness, fainting, severe irritability, tics, or serious behavioral changes.

Follow up:

Currently there is no way to know which medication will be best for any particular child. To make sure that your child is receiving the dose which gives the best effect with the least side effects your doctor will need to start at a low dose and increase dose until a good effect or side effects are seen. In order to judge whether the medication is helping, your doctor will obtain rating sheets from you and your child's teachers at baseline (without medicine), and at different medication doses. If there is no beneficial effect at the maximum recommended dose, your doctor will usually try another stimulant medication. Approximately 80 to 90 % of children will respond to one of the stimulants.

Setting a follow up plan:

Your child will need to be seen frequently during the initial treatment phase. After a satisfactory dose has been found, your child will be scheduled for a follow up visit at regular intervals usually every 2 to 3 months
At follow up visits your doctor will review rating scales from you and your child's teacher, and will check weight, blood pressure, and emotional status and review any medication side effects.

Parent's follow up responsibilities:

- Discuss your child's treatment program with appropriate school personnel.
- **Bring copies of Vanderbilt forms parent and teacher forms to all follow up visits.**
  School may be willing to Fax Vanderbilt forms to your doctor's office.
- Inform doctor before the next scheduled visit if your child is experiencing serious medication side effects.
- Ask the child how he feels on the medication.
- Schedule follow up visits.

Follow up visit schedule:

- Initial visit:
- First follow up visit: Usually within 2 weeks of initiating medication.
- Second follow up visit: Usually within 4 weeks of initiating medication.
- Usually monthly visits until satisfactory dose found.
- Regularly scheduled visits annually with full review, and at least every 2 to 6 months with review of Vanderbilt forms and side effects.

National Resource Center on AD|HD
A program of CHADD

ADHD and Coexisting Disorders (Overview)

About the series: These five information sheets provide an overview of attention-deficit/hyperactivity disorder (ADHD) and some of the more common conditions that coexist with ADHD. Extended versions of each may be found at www.help4adhd.org.

Any disorder can coexist with ADHD (Attention-Deficit/Hyperactivity Disorder), but certain disorders seem to co-occur more often. In fact, up to two thirds of children with ADHD may also have another disorder. Just as untreated ADHD can have long-term effects, so too can other untreated disorders.

As part of the diagnostic process for ADHD, the health professional must determine if there are any other psychiatric or neurological disorders affecting the child. The symptoms of ADHD may often overlap with those of other conditions. The challenge for the clinician is to determine whether a symptom belongs to ADHD, to a different disorder, or to both disorders at the same time. For some individuals, the overlap of symptoms among the various disorders makes multiple diagnoses possible. By conducting a complete evaluation, a trained health professional familiar with ADHD and these other disorders will be able to make the correct diagnosis(es). Interviews and questionnaires are often used to obtain information from the patient, the patient's family and his or her teachers to screen for these other disorders.

Disorders that commonly co-occur with ADHD Include:

DISRUPTIVE BEHAVIOR DISORDERS

- **Oppositional Defiant Disorder:** Oppositional Defiant Disorder (ODD), involves a pattern of frequently arguing with adults, frequently getting angry and refusing to follow rules, blaming others and being resentful, spiteful, and vindictive.
- **Conduct Disorder:** Children with Conduct Disorder (CD) frequently break rules. They can be violent with people or animals, destroy property, lie or steal things and skip school. CD is often described as delinquency and children who have ADHD and conduct disorder may have especially difficult lives.

Treatment: Children with ADHD and ODD or CD are treated with therapies aimed at changing their behavior so as to discourage damaging behaviors and encourage positive ones. This means providing strong, clear structure and incentives and rewards for positive behaviors as part of an overall management plan. Medication can also help.

MOOD DISORDERS

- **Depression:** Children with ADHD often feel left out of social activities. Their poor social skills may mean they have difficulty making friends, are not invited to play at other children's homes or are not chosen for sports teams or other groups. This can harm a child's self-esteem and contribute to depression. Children with ADHD can become discouraged and abnormally sad. They may keep to themselves, stop doing things they once enjoyed, lose their appetite, criticize themselves excessively, or even talk about dying.

Treatment: Treatment for a child with ADHD and depression involves making the child's liife as stress-free as possible. Parents and teachers can arrange play in small groups and children can be closely watched at school. Antidepressant medications can also be used, sometimes alone or along with medications for ADHD.

- **Mania/Bipolar disorder:** Bipolar disorder involves periods of elevated mood (excessively happy or irritable) that is outside of the norm, as well as periods of depression. Children who are manic may have moods that change very rapidly, seemingly for no reason. They may be irritable a lot of the time or be aggressive for no apparent reason. The combination of ADHD and mania often leads to severe difficulty functioning at home and at school.

Treatment: When a child has bipolar disorder and ADHD at the same time, it usually means that the child's mood should be stabilized with medication before ADHD medications can work. Treatment from a trained child and adolescent psychiatrist is essential.

ANXIETY DISORDERS

- These disorders include phobias, Panic Disorder, Obsessive-Compulsive Disorder (OCD) and Generalized Anxiety Disorder (GAD). A person with an anxiety disorder usually worries too much about a lot of things. He or she may also feel "on edge," stressed out, tired, tense and have trouble sleeping. Children with ADHD and an anxiety disorder usually have more school, family, and social problems than children who have ADHD alone.

Treatment: Children with anxiety disorders are taught how to pay attention to events and things that may bring about anxiety and fear. By becoming more aware, they are encouraged to address their thoughts or feelings. Relaxation techniques for stressful situations can also help. Those with ADHD and anxiety usually don't respond as well as others with ADHD to conventional ADHD medication, so other medications, such as antidepressants or anti-anxiety medications, may be used.

TICS AND TOURETTE SYNDROME

- Tics are sudden, rapid, repetitive, involuntary movements or sounds. Movements such as excessive eye blinking or throat clearing often occur between the ages of 10-12 years and appear worse when a child is nervous or tired. Temporary tics usually go away over one-to-two years. Tourette Syndrome is a less common, but more serious tic disorder, where children may make noises (e.g., barking a word or sound) and movements (e.g., repetitive eye blinking) almost every day for years.

Treatment: Tics can also become more noticeable when patients are treated with stimulants. Sometimes, lowering the dose or using a non-stimulant ADHD medication can help.

LEARNING DISABILITIES

- Learning at school can be hard for children with ADHD. Depending on how these conditions are defined, up to 50 percent of children with ADHD also have a learning disability. Some have trouble reading or doing math calculations, but this doesn't mean they are less intelligent than other children.

Treatment: Learning disabilities and ADHD should be treated taking into account the student's individual needs and strengths. A student may need special education services. Medications do not specifically improve learning disorders.

SUBSTANCE ABUSE:

- Substance abuse is more common in youth with ADHD than in youth without the disorder. It can also run in families.

Treatment: Early intervention to prevent behavior problems often associated with substance abuse is crucial. Certain forms of therapy such as Cognitive Behavior Therapy and family therapy may help.

For more information on ADHD and Coexisting Disorders, please see *What We Know #5: ADHD and Coexisting Disorders* on our website at: www.help4adhd.org/en/treatment/coexisting/WWK5.

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For further information about ADHD or CHADD, please contact:
National Resource Center on ADHD: A Program of CHADD
8181 Professional Place, Suite 150, Landover, MD 20785
1-800-233-4050 / www.help4adhd.org

MENTAL HEALTH, *NATURALLY*

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- Tips on becoming an advocate for mental health in your family and community

About the Author

Kathi J. Kemper, MD, MPH, FAAP, is recognized internationally as the leading authority on holistic, integrative, and complementary therapies for children. Her expertise is frequently sought out by media outlets such as *USA Today, Parenting* magazine, and ABC News. She is the Caryl J. Guth chair for holistic and integrative medicine at the Wake Forest University School of Medicine and the 2008 recipient of the Inaugural Leadership Award from the Integrative Pediatrics Council. Dr Kemper lives in Winston-Salem, NC.

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