Pediatric ADHD: Focus on Pharmacotherapy
Learning Objectives

• Define the different types of stimulant medications commonly used in children with ADHD

• Discuss the longer-term effects of ADHD treatment

• Identify controversial adverse events related to the treatment of ADHD

• Discuss the spectrum of medications evaluated for the treatment of ADHD in children
ADHD Overview

- Prevalence: 6-8% of children worldwide; 4% of adults
- Considered a chronic disorder; ~50% persistence into adulthood
- Associated with substantial impairment
  - Academic, occupational
  - Social, interpersonal
  - Injuries, motor vehicle accidents, high-risk behaviors
- Multimodal treatment planning
- Pharmacological treatment is fundamental

Heritability of ADHD between 0.9 and 1.0
Willcutt, 2000; Levy, 1997; Gillis, 1992

Heritability of ADHD between 0.8 and 0.9
Coolidge, 2000; Thapar, 2000; Thapar 1995

Heritability of ADHD between 0.7 and 0.8
Rietveld, 2003; Martin, 2002; Sherman, 1997; Gjone, 1996; Stevenson, 1992; Willerman, 1973; Matheny, 1971

Heritability of ADHD between 0.6 and 0.7
Kuntsi, 2001; Hudziak, 2000; Nadder, 1998; Silberg, 1996; Schmitz, 1995; Edelbrock, 1992; Goodman, 1989

Mean heritability of ADHD: 0.75

Suspected Neurochemical Pathophysiology of ADHD

ADHD Assessment

• Life history (with information from parents and teachers or school records, if available for adolescents)
• Self-report for (adolescents) adults
• Mental status exam
• Rating scales: measuring core and broad features
• Medical history review, cardiac and neurological status, blood pressure/pulse
• If medical history is unremarkable, laboratory or neurological testing is not indicated
• Assess for comorbidity (psychiatric, cognitive, psychosocial, medical)

Essential Features of ADHD

Symptoms

• Inattention: 6 (5 in adults) or more developmentally inappropriate
  —and/or—

• Hyperactivity/impulsivity: 6 (5 in adults) or more developmentally inappropriate

Criteria

• Present before age 12 years

• >6 months persistence

• Not better accounted for by another disorder

• Impairment
  – Clear evidence that symptoms interfere with or reduce the quality of functioning
  – Several symptoms in at least 2 settings (eg, school, social, work)

• Subtypes: combined, predominately inattentive or hyperactive/impulsive

Main Changes to ADHD in DSM-5

- Similar symptoms (eg, 9 symptoms of inattention and/or hyperactivity-impulsivity); more prompts added

- Change in symptom requirements
  - <17 years: 6/9 hyperactivity-impulsivity and/or 6/9 inattention
  - >17 years: 5/9 hyperactivity-impulsivity and/or 5/9 inattention

- Change in symptom onset: prior to age 12 years

- Change in "clinically significant impairment" to relative impairment

- Change in exclusion: diagnosis can be made in autism spectrum disorder
Consequences of Not Treating ADHD in Teens

- Academic failure or underachievement
- Low self-esteem
- Increased risk of later antisocial behavior
  - Delinquency
  - Aggression/fighting
  - Legal consequences
- Risk-taking behavior
  - Motor vehicle accidents
  - Substance use
  - Promiscuity
  - Accidental deaths, suicides, suicide attempts
Age-Dependent Decline of ADHD Symptoms

Developing a Treatment Plan

• Educational evaluation and planning is critical

• Parent support and guidance (referral to support groups, CHADD, ADDin)

• Behavior therapy may be recommended initially if:
  – ADHD symptoms are mild to moderate
  – Patient is in preschool
  – Pharmacotherapy is rejected

• Pharmacotherapy is typically considered first line

• Once treatment is established, practitioner’s role:
  – Coordinate with school or college student health services regarding ADHD treatment
  – Prepare patient (and family) for major transitions

Data suggest that enhanced activity improves general attentiveness and executive functioning in children

- ABC program
- Less use of asthma and ADHD medication

Activity throughout the day reduces hyperactivity

Activity improves frontal lobe function (on fMRI)

Preliminary mild improvements shown in ADHD (executive functioning Cronbach's alpha .3)

ABC=activity bursts in the classroom.

Attention-Deficit/Hyperactivity Disorder

Pharmacological Treatment

**Stimulants**
- Methylphenidate
- Dextroamphetamine
- Amphetamine (compounds)

**Atomoxetine**

**Alpha agonists**
- Guanfacine
- Clonidine
- Guan XR or Clon XR + stimulants

**Antidepressants**
- Bupropion
- Tricyclics

**Modafinil**

**Miscellaneous**

FDA-approved
Dan is a 9-year-old with ADHD, prominent executive dysfunction, some moodiness, and a history of tics. What would be the most reasonable initial trial for this patient?

1. Stimulants
2. Stimulants plus antipsychotics
3. Tricyclic antidepressants
4. Psychotherapy only
Representative Studies of Chronic Pharmacotherapy in ADHD

  - Use of immediate-release (IR) MPH
  - Multimodal study of MPH alone (n=50) vs. MPH + multimodal treatment (N=50)
  - Findings at 2 years: excellent response for both groups
  - No additive effect of psychotherapy(ies)
    » Noncomorbid ADHD
    » Comorbid ADHD
  - Relapse with discontinuation
All patients improved over time.

Little difference among initial treatment arms for ADHD outcome at follow-up (initial treatments converge at outcome).

MTA children not functioning as well as local normative comparison children (controls; recruited at 2-year follow-up).

During 14-month trial, best response at 8 years.

Initial weight/height declines were followed by rebound of both variables, but ultimate effects uncertain.

Inconsistent findings on substance abuse.

Essentially naturalistic examination of sample; frequent cross to other treatments (e.g., initial cognitive behavioral therapy (CBT) to medication and vice versa).

Protective Effect of Stimulants on Comorbidity

N = 140 boys with ADHD at entry; 10-year follow-up data
N = 82 subjects receiving stimulants (mean duration: 6 years) and 30 not on stimulants

Massachusetts General Hospital (MGH) Study of Adolescent Girls With ADHD: Stimulant Treatment and Subsequent Substance Use Disorder

N=113
HR=0.27
χ²=10.57
P=0.001

Medication for ADHD Reduces Criminality/Drug Offenses

Swedish national registers (\(N=25\,656\) with ADHD; \(\sim50\%\) on medications). \(\sim40\%\) of convictions related to drug offenses (Tx OR=0.6). No difference in type of ADHD medication (stimulants, nonstimulants) or level of crime.

Stimulant treatment for attention-deficit hyperactivity disorder and risk of developing substance use disorder


Conclusions

Stimulant treatment appears to lower the risk of developing substance use disorders and does not have an impact on the development of nicotine dependence in adolescents with ADHD.

At baseline we assessed ADHD, conduct disorder and oppositional defiant disorder. Substance use disorders, nicotine dependence and stimulant treatment were assessed retrospectively after a mean follow-up of 4.4 years, at a mean age of 16.4 years.

Results

Stimulant treatment of ADHD was linked to a reduced risk for substance use disorders compared with no stimulant treatment, even after controlling for conduct disorder and oppositional defiant disorder (hazard ratio (HR) = 1.91, 95% CI 1.10–3.36), but not to nicotine dependence (HR = 1.12, 95% CI 0.45–2.96). Within the stimulant-treated group, a protective effect of age at first stimulant use on substance use disorder development was found, which diminished with age, and seemed to reverse around the age of 18.

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Prospective study utilizing 2 neuroanatomic magnetic resonance imaging (MRI) scans in 43 youths (age 9-20 years) with ADHD

**Mean baseline and endpoint raw cortical thickness (± standard error of measurement (SEM)) in the left middle/inferior frontal gyrus**

For most participants, cognitive data was not collected at both time points. Increased cortical thinning in the group that stopped taking stimulants was not associated with any difference in clinical outcome. The effects of treatment with nonstimulants cannot be excluded, although the prevalence of nonstimulant use was low.

*Derived from 620 scans of 294 typically developing youths.*

Conclusions: Despite the inherent limitations and heterogeneity of the extant MRI literature, our review suggests that therapeutic oral doses of stimulants decrease alterations in brain structure and function in subjects with ADHD relative to unmedicated subjects and controls. These medication-associated brain effects parallel, and may underlie, the well-established clinical benefits.
Within 2-3 months, the majority of patients with ADHD have stopped taking medication consistently\(^1,2\).

Adherence rates tend to be better for long-acting medications for ADHD\(^3\).

1 study has shown similar adherence for the long-acting agents osmotic-release methylphenidate (OROS MPH), methylphenidate long-acting (MPH LA), mixed amphetamine salts extended-release (MAS XR), and atomoxetine\(^1\).

Patients renewed their monthly prescriptions \(\sim\)2-3 times per year\(^1\).

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Suspected Mechanism of Action of Medications for ADHD


GABA=gamma-aminobutyric acid.
# Methylphenidate (MPH) in ADHD: Optimizing Dosing

<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose</th>
<th>Maximum Dose*</th>
<th>Duration Usual Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ritalin IR</td>
<td>5 mg qd/bid</td>
<td>2 mg/kg/day</td>
<td>3-4 hr/bid-tid</td>
</tr>
<tr>
<td>Focalin</td>
<td>2.5 mg qd/bid</td>
<td>1 mg/kg/day</td>
<td>4-5 hr/bid-tid</td>
</tr>
<tr>
<td>Focalin XR</td>
<td>5 mg qd</td>
<td>1 mg/kg/day</td>
<td>10-12 hr qd</td>
</tr>
<tr>
<td>Daytrana</td>
<td>10 mg</td>
<td></td>
<td>6-16 hr</td>
</tr>
<tr>
<td>Concerta</td>
<td>18 mg qd</td>
<td>2 mg/kg/day</td>
<td>12 hr/once</td>
</tr>
<tr>
<td>Metadate CD</td>
<td>20 mg qd</td>
<td></td>
<td>8 hr/once</td>
</tr>
<tr>
<td>Ritalin LA</td>
<td>20 mg qd</td>
<td></td>
<td>8 hr/once</td>
</tr>
<tr>
<td>Quillivant</td>
<td>&lt;10 mg qd</td>
<td></td>
<td>12 hr/once</td>
</tr>
</tbody>
</table>

*May exceed FDA-approved dose.

## Amphetamine (AMPH) in ADHD: Optimizing Dosing

<table>
<thead>
<tr>
<th>Medication</th>
<th>Starting Dose</th>
<th>Maximum Dose*</th>
<th>Duration Usual Dosing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adderall</td>
<td>2.5-5 mg qd</td>
<td>1.5 mg/kg/day</td>
<td>6 hr/bid</td>
</tr>
<tr>
<td>Adderall XR</td>
<td>2.5-5 mg qd</td>
<td>1.5 mg/kg/day</td>
<td>12 hr/qd</td>
</tr>
<tr>
<td>Vyvanse</td>
<td>30 mg qd</td>
<td></td>
<td>12-14 hr/qd</td>
</tr>
<tr>
<td>Dexedrine tab</td>
<td>2.5-5 mg bid</td>
<td>1.5 mg/kg/day</td>
<td>3-5 hr/bid-qid</td>
</tr>
<tr>
<td>Dexedrine span</td>
<td>5 mg qd</td>
<td></td>
<td>6 hr/qd-bid</td>
</tr>
</tbody>
</table>

*May exceed FDA-approved dose.

Amphetamine Extended-Release (XR) Study in Youth With ADHD: Frequently Reported Adverse Effects

- anorexia
- insomnia
- headache
- abdominal pain
- nervousness
- emotional lability

% of Subjects Reporting

- Placebo
- Add XR 10
- Add XR 20
- Add XR 30
Clinic Sample Receiving High-Dose OROS MPH

MPH Levels
Mean = 27.3 ± 10.0 ng/mL

Preschool ADHD Treatment Study (PATS)

- 165 children aged 3-5.5 years
- Parent training (10 weeks), then open-label safety lead-in (1 week)
- Double-blind crossover titration (5 weeks)
  - Placebo and 4 doses of MPH (1.25, 2.5, 5, 7.5 mg tid)
- Double-blind parallel phase (4 weeks)
  - Random assignment to placebo or best dose from crossover
  - Improved ADHD in dose-dependent fashion (less so than school-aged children)
  - More side effects
- 6-year follow-up
  - 90% of initial sample still with ADHD
  - Medications did not attenuate symptom change (yrs 3-6)

Attention Deficit Disorder, Stimulant Use, and Childhood Body Mass Index Trajectory

CONCLUSIONS: The study provides the first longitudinal evidence that ADHD during childhood not treated with stimulants was associated with higher childhood BMIs. In contrast, ADHD treated with stimulants was associated with slower early BMI growth but a rebound later in adolescence to levels above children without a history of ADHD or stimulant use. The findings have important clinical and neurobiological implications. *Pediatrics* 2014;133:1–9
ADHD Medications Are Not Associated With Adverse Cardiovascular Outcomes in Children

**Figure 1. Adjusted Rates of Serious Cardiovascular Events, According to the Use of ADHD Drugs.**

Rates per 100,000 person-years were adjusted by multiplying the rate in the reference group (nonusers) by the hazard ratios for former and current users. Hazard ratios were estimated with the use of Cox regression models, which were adjusted for the site-specific propensity-score decile, study site, medical conditions (serious cardiovascular disease and serious chronic illness), psychiatric conditions (major psychiatric illness, substance abuse, and antipsychotic use), utilization variables (medical hospitalization and general access to medical care), age, and calendar year. The I bars indicate 95% confidence intervals.

Recommended Cardiovascular Monitoring


- Family history of structural defects (SD) (<30 yrs of age)
  - History of structural/congenital cardiac structural defects
  - Syncope
  - Chest pain
  - Palpitations
  - Check blood pressure (BP)

- Monitor above during treatment

- No need for electrocardiography (ECG), echo, or cardiac biopsy in routine cases

Analyses

- Children similar to adolescents for outcome
- Younger children respond favorably; monitor height and weight (some negative influences)
- Time to response, probability of response after 4 weeks
- Quality of response
Uses

- Uncomplicated ADHD
- Refractory ADHD
- Comorbid ADHD
  - Anxiety or depressive disorders
  - Tic disorders
  - Disruptive disorders
  - Substance use disorders
Atomoxetine Improved Attention in Children and Adolescents With ADHD and Dyslexia in a 16-Week, Acute, Randomized, Double-Blind Trial

Abstract

Objective: The purpose of this study was to evaluate atomoxetine treatment effects in attention-deficit/hyperactivity disorder (ADHD-only), attention-deficit/hyperactivity disorder with comorbid dyslexia (ADHD + D), or dyslexia only on ADHD core symptoms and on sluggish cognitive tempo (SCT), working memory, life performance, and self-concept.

Methods: Children and adolescents (10–16 years of age) with ADHD + D (n = 124), dyslexia-only (n = 58), or ADHD-only (n = 27) received atomoxetine (1.0–1.4 mg/kg/day) or placebo (ADHD-only subjects received atomoxetine) in a 16 week, acute, randomized, double-blind trial with a 16 week, open-label extension phase (atomoxetine treatment only). Changes from baseline were assessed to weeks 16 and 32 in ADHD Rating Scale-IV-Parent-Version:Investigator-Administered and Scored (ADHDRS-IV-Parent:Inv); ADHD Rating Scale-IV-Teacher-Version (ADHDRS-IV-Teacher-Version); Life Participation Scale—Child- or Parent-Rated Version (LPS); Kiddie-Sluggish Cognitive Tempo (K-SCT) Interview; Multidimensional Self Concept Scale (MSCS); and Working Memory Test Battery for Children (WMTB-C).

Results: At week 16, atomoxetine treatment resulted in significant (p < 0.05) improvement from baseline in subjects with ADHD + D versus placebo on ADHDRS-IV-Parent: Inv Total (primary outcome) and subscales, ADHDRS-IV-Teacher-Version Inattentive subscale, K-SCT Interview Parent and Teacher subscales, and WMTB-C Central Executive component scores; in subjects with Dyslexia-only, atomoxetine versus placebo significantly improved K-SCT Youth subscale scores from baseline. At Week 32, atomoxetine-treated ADHD + D subjects significantly improved from baseline on all measures except MSCS Family subscale and WMTB-C Central Executive and Visuo-spatial Sketchpad component scores. The atomoxetine-treated dyslexia-only subjects significantly improved from baseline to week 32 on ADHDRS-IV-Parent: Inv Inattentive subscale, K-SCT Parent and Teacher subscales, and WMTB-C Phonological Loop and Central Executive component scores. The atomoxetine-treated ADHD-only subjects significantly improved from baseline to Week 32 on ADHDRS-Parent: Inv Total and subscales, ADHDRS-IV-Teacher-Version Hyperactive/Impulsive subscale, LPS Self-Control and Total, all K-SCT subscales, and MSCS Academic and Competence subscale scores.

Conclusions: Atomoxetine treatment improved ADHD symptoms in subjects with ADHD + D and ADHD-only, but not in subjects with dyslexia-only without ADHD. This is the first study to report significant effects of any medication on SCT.

Ventromedial PFC is thought to regulate emotion.

Impairment may lead to aggressive and oppositional behavior.

PFC=prefrontal cortex.

Extended-Release Guanfacine Efficacy With AM or PM Administration


6-12 years; dosing 1-4 mg/day; sample size: GXR AM (n=107), GXR PM (n=114), or placebo (n=112)
When to Use Alpha Agonists

- Monotherapy clonidine extended-release (XR) or guanfacine XR
- Stimulant or nonstimulant nonresponders
- Medication partial responders (adjunctive therapy; see later)
- Adverse effects to stimulants or nonstimulants
- Comorbid ADHD plus:
  - Oppositional disorder
  - Tics
  - Emotional dysregulation (needs to be studied)
  - Anxiety (needs to be studied)
- Potentially younger children (needs to be studied)

Bupropion for ADHD

ADHD Treatment

  – N=3 studies (104 subjects)
  – No adolescent studies

  – N=1 open study
  – Four controlled trials
  – Useful in mood labile ADHD (eg, bipolar disorder (BPD) II)
Nortriptyline for Pediatric ADHD

A 17-year-old girl with ADHD is experiencing moodiness and difficulty sleeping. Lisdexamfetamine, mixed amphetamine salts (IR, XR), and methylphenidate preparations were useful but had marked wear-off and caused sleep and appetite problems. Atomoxetine was helpful, but the patient still had sleep issues. Tricyclics were useful for sleep and mood but not for concentration. Bupropion was helpful for mood but not for ADHD or worsened sleep. Of the following options, what might be the most appropriate potential (off-label) solution for this patient?

The use of atomoxetine plus nighttime (qhs) dosing of:

1. Melatonin half to full dose
2. Clonidine 0.1 mg
3. Imipramine 50 mg
4. Mirtazapine 7.5 mg
Alternative Agents for ADHD

• Omega-3/Omega-6 Fatty Acids for ADHD
  - Meta-analysis of 10 studies; N=699 children
    - Indicating *mild to modest improvement* in ADHD overall with good tolerability (effect size (ES)=0.28 monotherapy; 0.18 adjunct)
    - Potential dose response effect of eicosapentaenoic acid (EPA)

• Melatonin (5 mg)
  - N=4-week placebo crossover of 62 youth (aged 6-12); 40% with ADHD receiving stimulants
    - Improved sleep (by questionnaire: RAND General Health Rating Index (RAND-GHRI))
    - Improved sleep onset (57 minutes earlier)

• Follow-up of 44 developmentally disabled youth <3.8 years
  - Age 10 yrs at follow-up
  - Continued effectiveness for sleep (behavior and cognition)
  - No apparent adverse effects or deleterious effects on puberty

Conclusions: Free fatty acid supplementation produced small but significant reductions in ADHD symptoms even with probably blinded assessments, although the clinical significance of these effects remains to be determined. Artificial food color exclusion produced larger effects but often in individuals selected for food sensitivities. Better evidence for efficacy from blinded assessments is required for behavioral interventions, neurofeedback, cognitive training, and restricted elimination diets before they can be supported as treatments for core ADHD symptoms.

Refractory ADHD

Prominent Executive Function Deficits (eg, organization)

• Less response to stimulants (Findling, et al. *J Child Adolesc Psychopharmacol*. 2013)

• Organizational training

• Use of norepinephrine agent: atomoxetine, alpha agonist, tricyclic antidepressant (TCA), bupropion (alone or combined with stimulant, modafinil)

• Investigational
  – Nicotinic/cholinergic agents
    » Indirect: donepezil, galantamine
      • Systematic data negative
      • Case reports positive
    » Direct: nicotinic agents/patch
Studies Show Symptom Reduction Can Improve Functional Impairment

Normalization of ADHD Symptoms Requires Significant Reductions in the ADHD RS-IV

ADHD Diagnosis
At diagnosis patients score up to 54 on the ADHD RS-IV

Standard Reduction
A score reduction of 16-18 points was accompanied by a detectable functional improvement

Achieving Normalization
A score reduction of 20-27 points was accompanied by pronounced functional improvement

Organizational Training for Children With ADHD

- Study of manualized treatment of executive function deficits in children with ADHD
- Ages: 7 to 12 years (3rd to 5th graders)
- N=158 youth randomized to 2 therapies for organization vs. waitlist control
- Organizational skills training performance-based intervention (including parents and teachers)
- **Length**: 20 trainings over 10-12 weeks
- **Findings**: both types of therapies > waitlist control for COSS-Parent and COSS-Teacher and proficiency
- Almost two-thirds of treated children no longer found to have formal organizational impairments compared to 3% of waitlist controls

COSS=Children's Organizational Skills Scale.

OROS MPH Plus Atomoxetine (ATMX): Improvement Characterized by the Behavior Rating Inventory of Executive Function (BRIEF): Initiation

Combination of Clonidine XR Plus Stimulants for ADHD

- Study of clonidine XR coadministration to partial responders on stimulants (≥ADHD RS 26 score)
- Dosing to 0.4 mg daily (0.2 mg twice a day (bid) dosing)
- Duration: 5 weeks (then taper)

**FIGURE 2**
Improvement in ADHD-RS-IV total score from baseline. Improvement was significantly greater in the CLON-XR plus stimulant group versus the placebo plus stimulant group starting at week 2 and continuing through week 7. PBO indicates placebo; STM, stimulant. aP < .05.

Combination of Guanfacine XR Plus Stimulants in the Treatment of ADHD (N=455)

Figure 2. GXR PM dosing plus psychostimulant group: change in ADHD-RS-IV total score from baseline by visit (FAS).

*P<0.05 vs placebo, based on Dunnett’s test.
Effect size at endpoint was 0.447.
Endpoint is the last valid assessment obtained after baseline and before dose taper.

Comorbidity in ADHD

- ADHD
- Conduct / Oppositional Disorder
- Anxiety Disorder
- Mood Disorder
Treating ADHD and Comorbidity

- Understand the overlap symptoms and disorders
- Comorbidity is the rule, not the exception
- Address more severe comorbidity first (e.g., bipolar disorder, substance abuse, depression)
- In the context of comorbidity, ADHD responsivity appears to be less robust with more adverse effects

Autistic Traits in Children With and Without ADHD

**OBJECTIVE:** To assess the implications of autistic traits (ATs) in youth with attention-deficit/hyperactivity disorder (ADHD) without a diagnosis of autism.

**METHODS:** Participants were youth with \((n = 242)\) and without \((n = 227)\) ADHD and controls without ADHD in whom a diagnosis of autism was exclusionary. Assessment included measures of psychiatric, psychosocial, educational, and cognitive functioning. ATs were operationalized by using the withdrawn + social + thought problems T scores from the Child Behavior Checklist.

**RESULTS:** A positive AT profile was significantly overrepresented among ADHD children versus controls \((18\% \text{ vs } 0.87\%; P < .001)\). ADHD children with the AT profile were significantly more impaired than control subjects in psychopathology, interpersonal, school, family, and cognitive domains.

**CONCLUSIONS:** A substantial minority of ADHD children manifests ATs, and those exhibiting ATs have greater severity of illness and dysfunction. *Pediatrics* 2013;132:e612–e622.

ADHD and Substance Abuse

*Treatment Strategies: Overview*

- Assessment

- **Stabilization of substance abuse**
  - Abstinence
  - Stable low-use pattern (harm reduction)

- (Re)assessment: ADHD and comorbidity

- Preferred use of nonstimulants (atomoxetine, bupropion), then extended-release stimulants

Stimulant Misuse and Diversion

• N=21 studies (N >113,000 participants); mostly survey studies in college students (80%)

• 10-20% prevalence of non-medical use of stimulants

• 65-85% of stimulants diverted from "friends"
  – Majority not scamming local docs
  – Not seen as potentially dangerous

• Motivation is typically for concentration and alertness more so than for getting "high"

• Appears to be occurring in substance (ab)users during academic decline

• Immediate-release > > extended-release stimulants

• Recent increase in IR mixed amphetamine salts misuse

ADHD and Tic Disorders

- **Stimulant effects**
  - Prospective data indicating tolerability of MPH in tics (Casetellanos, et al; Gadow, et al)
  - Retrospective data not demonstrating difference in tic course ± stimulants (Spencer, et al. *Arch Gen Psychiatry*. 2001)

- **Clonidine/guanfacine**

- **Atomoxetine**
  - Prospective data indicating lack of tic exacerbation with trends toward reduction in tics

- **Tricyclic antidepressants**

- **Clonidine plus MPH**
Atomoxetine for Youth With ADHD and Anxiety

Dose of ATMX=1.26 mg/kg/day.

Effect of Methylphenidate on ADHD in Stabilized Youth With Bipolar Disorder: Measures at Baseline and After 1 Week of Treatment

N=16; ages 4-17 (mean: 11 yrs)

Euthymic-stable on thymoleptics

1 week Tx

No effect on mania

*ARS-IV: parent-completed ADHD Rating Scale-IV.

Telepsychiatry Effective for ADHD Treatment in Rural Areas

• **Data source**: The results are based on 223 English-speaking children aged 5.5-12 years with ADHD (along with their parents) who were recruited from local primary care practices in 7 rural areas in Washington and Oregon between November 2009 and August 2012.

• **Major finding**: During the 22 weeks of the study, children who received telemental health improved significantly in ADHD inattention and hyperactivity, oppositional defiant disorder, school performance, and adaptive functioning.

• "Our study shows that with modern technology, we have the opportunity to reach out to underserved areas and provide care," said Dr. William P. French of the University of Washington, Seattle. "And the care is good care and can improve the health of the patients at least as well as the local providers."

• ADHD is among the most common neurobehavioral disorders necessitating diagnosis and treatment

• Co-occurring cognitive, emotional, and behavioral disorders are common and often influence treatment

• A thoughtful, comprehensive evaluation is critical

• Nonpharmacological treatments include (cognitive) behavioral therapies and organizational assistance

• Pharmacological treatment includes stimulants, nonstimulants, and their combination

• Longer-term data suggests better outcomes for treated youth with ADHD, particularly adolescents