Nicotine and Stimulant Use in Adolescents

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Disclosures

• No financial relationships to disclose.

The contents of this activity may include discussion of off label or investigative drug uses. The faculty is aware that it is their responsibility to disclose this information.
Target Audience

• The overarching goal of PCSS-MAT is to make available the most effective medication-assisted treatments to serve patients in a variety of settings, including primary care, psychiatric care, and pain management settings.
Educational Objectives

At the conclusion of this activity participants should be able to:

• Discuss recent trends in nicotine and stimulant use among adolescents
• Describe the health risks of nicotine and stimulant drugs
• Apply evidence-based treatment for youth with tobacco/nicotine use and stimulant misuse
Outline

1. Definitions and trends in nicotine products
2. Neurobiology and health impacts of nicotine use
3. Nicotine prevention and cessation in adolescents
4. Illicit stimulants: Trends, risks and treatment
5. Prescription stimulants: Trends, risks and treatment
6. Caffeine: Trends and health risks
7. Conclusion/take home points
Nicotine and Tobacco Products

- E-cigarettes
- Cigars and cigarillos
- Cigarettes
- Chewable Dissolvable
- Hookah and waterpipe
- NRT
Smoked Tobacco Products

Cigars and cigarillos

Kretek

Bidi

Hookah

Photo credits: Wikimedia Commons
## Smoked Tobacco Products

<table>
<thead>
<tr>
<th>Products</th>
<th>Alternate Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigar</td>
<td>Cigarillo, figurado</td>
<td>Large, tightly rolled bundle of tobacco wrapped in leaf tobacco</td>
</tr>
<tr>
<td>Hookah</td>
<td>Pipes, waterpipe, hubble, bubble, narghile, shisha</td>
<td>Lit tobacco bubbles through water, inhaled through shared mouthpiece</td>
</tr>
<tr>
<td>Bidi</td>
<td></td>
<td>Hand-rolled leaf-wrapped cigarette, often with flavors</td>
</tr>
<tr>
<td>Kretek</td>
<td>Clove cigarette</td>
<td>Rolled mixture of tobacco, cloves and additives</td>
</tr>
</tbody>
</table>

Smokeless Tobacco Products

Chewing Tobacco\(^1\)

Dissolvable tobacco\(^2\)

Moist snuff

Dry snuff

Snus\(^3\)

# Alternate Tobacco Products: Smokeless

<table>
<thead>
<tr>
<th>Products</th>
<th>Alternate Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chewing tobacco</td>
<td>Chew, spit tobacco</td>
<td>Consumed by holding between gum and cheek (loose-leaf, “plug” or “rolls”)</td>
</tr>
<tr>
<td>Snuff</td>
<td>Pinch, dip</td>
<td>Finely ground tobacco (dry or moist) inhaled or held in mouth</td>
</tr>
<tr>
<td>Snus</td>
<td></td>
<td>Form of moist snuff dispensed in packets, held in mouth, no spitting</td>
</tr>
<tr>
<td>Dissolvable tobacco</td>
<td></td>
<td>3 forms: strips, sticks or pellets/orbs</td>
</tr>
</tbody>
</table>

E-pipes, E-cigars and E-cigarettes

Vaping products¹

E-liquids²

Photo credits: (1) Minnesota Department of Health
(2) Wikimedia Commons
Influences and Beliefs

- 2 of the **strongest factors** associated with smoking initiation in children and adolescents are:
  - Parental smoking
  - Parental nicotine dependence

- **Other factors**
  - Age
  - Low level of parental monitoring
  - Socioeconomic status
  - Peer and family influence/support
  - Misperceptions about social/health consequences

Past 30 Day Use of Tobacco Products and E-cigarettes Among Middle and High School Students (US)

Centers for Disease Control and Prevention (2016)
Cigarettes vs E-cigarettes

TEENS MORE LIKELY TO USE E-CIGARETTES THAN CIGARETTES

Past-month use

- 8th Grade: 2.6%
- 10th Grade: 4.9%
- 12th Grade: 6.2%
- Cigarettes: 11.0%
- E-cigarettes: 12.5%

What did 12th graders think was in the mist they inhaled from an e-cigarette? Despite the belief that the liquid used in e-cigs contains only flavoring, it also might contain nicotine.

- Flavoring: 24.9%
- Nicotine: 6.8%
- Marijuana or hash oil: 5.6%
- Don’t know: 62.8%

Cigarettes vs Marijuana

TEENS MORE LIKELY TO USE MARIJUANA THAN CIGARETTES

Daily use among 12th graders

- 1992: Cigarettes 1.9%
- 1997: Cigarettes 24.6%
- 1992: Marijuana 1.9%
- 2017: Marijuana 5.9%
- 2017: Cigarettes 4.2%

Percentage of Smokers Aged 15-19 Seriously Considering Quitting in the Next 6 months/30 days

Risk Perception: Tobacco vs Marijuana

12TH-GRADE STUDENTS REPORTING PAST-MONTH CIGARETTE USE AND PERCEPTION OF HARM, 1975 TO 2013

Perceived Risk of Harm

1/2 a pack+/day

Year

12TH-GRADE STUDENTS REPORTING PAST-MONTH MARIJUANA USE AND PERCEPTION OF HARM, 1975 TO 2013

Perceived Risk of Harm

Past-Year Use

Year

Neurobiology and Health Impacts of Nicotine Use

Photo credit: Wikimedia Commons
Nicotine Addiction

• Nicotine is a *highly addictive substance*, possibly more so than cannabis, alcohol and cocaine\(^1\)

• Cravings can emerge only 3-4 months after the first cigarette/e-cigarette, sometimes less

• 18 months after the first cigarette, 25% of young smokers lose confidence in their ability to quit

• Youth: *less severe withdrawal symptoms*, but can appear after only a few cigarettes
  ▪ Obstacle for early cessation

Nicotine and the Teen Brain

- **Persistent changes** in the development of neuronal connectivity (dendritic formation)

- **Specific brain areas** affected:
  - Nucleus accumbens (reward center)
  - Medial prefrontal cortex (executive functioning)
  - Amygdala (emotional regulation)

Nicotine and the Teen Brain

- Epigenetic changes: increased sensitivity to other drugs

- **Long term** effects (animal studies):
  - Increased impulsivity
  - Decreased attention performance

Nicotine and the Teen Brain

Public Health Association of South Africa:
https://www.phasa.org.za/understanding-nicotine-dependence/
Cigarettes and Alternate Tobacco Products

• **All forms** of tobacco and nicotine products **carry important health risks for youth**

• Even if the health risks might seem smaller for some tobacco products when compared with others, all tobacco and almost all vaping products contain **nicotine**, which can lead to **increased use and addiction**.

• Tobacco/vaping **is not safe** in any amount or form

Smoking/Vaping Prevention and Cessation
The 5 As

Ask about tobacco use/vaping

Advise to quit

Assess readiness to quit

Assist in quit attempt

Arrange follow-up

**Screening to Brief Intervention (S2BI)**

S2BI

In the past year, how many times have you used:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Once or twice</td>
</tr>
<tr>
<td></td>
<td>Never</td>
</tr>
<tr>
<td>Alcohol</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Once or twice</td>
</tr>
<tr>
<td></td>
<td>Never</td>
</tr>
<tr>
<td>Marijuana</td>
<td>Weekly</td>
</tr>
<tr>
<td></td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Once or twice</td>
</tr>
<tr>
<td></td>
<td>Never</td>
</tr>
</tbody>
</table>

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Use validated screening tool to identify risk level and appropriate intervention

- Abstinence
  - Positive Reinforcement
- Substance use without a disorder
  - Brief Health Advice
- Mild/moderate substance use disorder
  - Brief Intervention
- Severe substance use disorder
  - Referral to Treatment

Note: Evidence is mixed\(^2\) for the effectiveness of SBIRT for individuals with substance use disorders

Brief Counseling

• Tobacco/vaping counseling by health providers can reduce smoking initiation in children and adolescents\(^1\)
  ▪ RR 0.81 [95% CI, 0.70 to 0.93]

• Different counseling modalities:
  ▪ **Face-to-face** encounters (i.e. motivational interviewing, CBT)
  ▪ **Phone** interactions
  ▪ Provision of **print material**
  ▪ Directing patients towards **online sources of information**

• Guidance to parents and families
  ▪ Important to make content **age and context-specific**
  ▪ Adolescents need more **short-term/concrete elements** vs long-term consequences

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### Most compelling information

**Effects of second-hand smoke on household members:**

- Higher rates of asthma, colds, pneumonia, and ear infections, even if parents do not smoke in the house
- Increased rates of heart disease in the long term
- Children more likely to become smokers if parents smoke

**Personal risks:**

- Increased rates of heart disease, lung cancers and diseases, other cancers
- Infertility, prematurity and stillbirth, effects on fetal brain development

Adapted from: Sockrider, M et al. (2013). Prevention of smoking initiation in children and adolescents, UptoDate, last accessed January 28, 2018
Age-Specific Counseling:
School Age (5-11 years old)

<table>
<thead>
<tr>
<th>Most compelling information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immediate effects of smoking:</strong></td>
</tr>
<tr>
<td>➢ Bad breath and smell, yellow teeth</td>
</tr>
<tr>
<td>➢ Harder to keep up in sports</td>
</tr>
<tr>
<td>➢ Even trying smoking just a few times can get you hooked</td>
</tr>
<tr>
<td><strong>Long-term consequences:</strong></td>
</tr>
<tr>
<td>➢ Cigarettes are expensive: could use money for more fun things</td>
</tr>
<tr>
<td>➢ Tobacco companies use ads to try to trick you into thinking that smoking is cool and safe</td>
</tr>
<tr>
<td>➢ Long-term effects on health, including cancer, heart attacks</td>
</tr>
<tr>
<td>➢ It is illegal to buy cigarettes when you are under-age</td>
</tr>
</tbody>
</table>

Adapted from: Sockrider, M et al. (2013). Prevention of smoking initiation in children and adolescents, UptoDate, last accessed January 28, 2018
# Age-Specific Counseling: Adolescents

<table>
<thead>
<tr>
<th>Most compelling information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immediate effects of smoking</strong></td>
</tr>
<tr>
<td>➢ Cosmetic effects (smell, breath, yellow teeth, early wrinkles)</td>
</tr>
<tr>
<td>➢ Endurance and athletic performance</td>
</tr>
<tr>
<td>➢ Hacking coughs, more colds and pneumonias</td>
</tr>
<tr>
<td>➢ Potential for addiction after smoking as few as 100 cigarettes</td>
</tr>
<tr>
<td>➢ Cigarette smoking is expensive (between $1500-$3500/year)</td>
</tr>
<tr>
<td><strong>Long-term health consequences:</strong></td>
</tr>
<tr>
<td>➢ Selected long-term health risks (as mentioned in “Parents”)</td>
</tr>
<tr>
<td>➢ Alternate forms (snuff, e-cigarettes) no safer than cigarettes</td>
</tr>
<tr>
<td>➢ Smoking exposes friends and family to health risks from second hand smoke</td>
</tr>
</tbody>
</table>

Adapted from: Sockrider, M et al. (2013). Prevention of smoking initiation in children and adolescents, UptoDate, last accessed January 28, 2018
Factors Impacting Teen Smoking Cessation

- **Age/sex** (male sex and older teens more likely to quit)
- **Education/cultural context**
- **Psychological conditions**, drug and alcohol consumption
- **Excess weight/weight preoccupation** (less likely to quit)
- **Physical health** conditions and chronic illness
- **CYP2A6 slow nicotine metabolizer** (more likely to quit)
- **Peer and family** tobacco use and support for cessation
- **Access** to tobacco products
- **Time** availability
- **Knowledge**, attitudes, and beliefs about tobacco
- **Behavioral skills**
- **Pregnancy** and parenthood

Factors Impacting Teen Smoking Cessation

- Important considerations:
  - The need to experiment
  - Dealing with anxiety and stress
  - Fear of gaining weight
  - Fear of peer-rejection
  - The need for control/independence
  - The need for privacy
  - LGBTQ: Smoking rates 2-3 times higher
A. Nicotine Replacement Therapy

- Recent guidelines encourage single or dual NRT in regular smokers ages 12 and above
  - Acceptable safety profiles
- Potential side effects:
  - Mouth and skin irritation, ↑ HR/BP
- Most recommended:
  - Gums, lozenges and transdermal patches
  - Nicotine inhalers: not recommended
- Contraindications: post-surgery, arrhythmia
Teen Smoking Cessation: Medications

- **B. Bupropion**
  - Small number of trials, non significant effects
  - **Recommended in some cases** mostly based on expert opinion

- **C. Varenicline**
  - Small number of trials, non significant effects
  - **Recommended in some cases** mostly based on expert opinion

- **D. Others:**
  - Data about **Tricyclics, clonidine and cytisine** (partial nicotine agonist) is insufficient to recommend use

E-cigarettes for Smoking Cessation?

• **There is conclusive evidence** that:
   Nicotine exposure and emissions of other potentially toxic emissions from e-cigarettes are **highly variable**
   Completely substituting cigarettes for e-cigarettes **reduces exposure** to a number of toxicants and carcinogens

• **There is substantial evidence** that:
   E-cigarettes **increase the risk** of using tobacco cigarettes in youth/young adults

• E-cigarettes should **NOT** be used for smoking cessation in adolescents

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Stimulants

Photo credit: Wikimedia Commons
# Stimulants: Epidemiology

## Top Drugs among 8th and 12th Graders, Past Year Use

### 8th Graders

<table>
<thead>
<tr>
<th>Drug</th>
<th>Illicit drugs</th>
<th>Pharmaceutical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marijuana/Hashish</td>
<td>11.7%</td>
<td></td>
</tr>
<tr>
<td>Inhalants</td>
<td>5.3%</td>
<td></td>
</tr>
<tr>
<td>Synthetic Marijuana</td>
<td>3.3%</td>
<td></td>
</tr>
<tr>
<td>Cough Medicine</td>
<td>2.0%</td>
<td></td>
</tr>
<tr>
<td>Tranquilizers</td>
<td>1.7%</td>
<td></td>
</tr>
<tr>
<td>Adderall</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>Hallucinogens</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>OxyContin</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>Vicodin</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>Cocaine (any form)</td>
<td>1.0%</td>
<td></td>
</tr>
<tr>
<td>MDMA (Ecstasy)</td>
<td>0.9%</td>
<td></td>
</tr>
<tr>
<td>Ritalin</td>
<td>0.9%</td>
<td></td>
</tr>
</tbody>
</table>

### 12th Graders

<table>
<thead>
<tr>
<th>Drug</th>
<th>Illicit drugs</th>
<th>Pharmaceutical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marijuana/Hashish</td>
<td></td>
<td>6.8%</td>
</tr>
<tr>
<td>Adderall</td>
<td></td>
<td>5.8%</td>
</tr>
<tr>
<td>Synthetic Marijuana</td>
<td></td>
<td>5.8%</td>
</tr>
<tr>
<td>Vicodin</td>
<td></td>
<td>4.8%</td>
</tr>
<tr>
<td>Tranquilizers</td>
<td></td>
<td>4.7%</td>
</tr>
<tr>
<td>Cough Medicine</td>
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<td>4.1%</td>
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<tr>
<td>Sedatives</td>
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<tr>
<td>Hallucinogens</td>
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<td>4.0%</td>
</tr>
<tr>
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<td></td>
<td>3.6%</td>
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<td>2.6%</td>
</tr>
<tr>
<td>Inhalants</td>
<td></td>
<td>1.9%</td>
</tr>
<tr>
<td>Salvia</td>
<td></td>
<td>1.8%</td>
</tr>
<tr>
<td>Ritalin</td>
<td></td>
<td>1.8%</td>
</tr>
</tbody>
</table>

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# Illicit Stimulants

<table>
<thead>
<tr>
<th>Street Names</th>
<th>Commercial Names</th>
<th>Common Forms</th>
<th>Common Ways Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cocaine:</strong> Blow, Bump, C, Candy, Charlie, Coke, Crack, Flake, Rock, Snow, Toot</td>
<td>Cocaine hydrochloride topical solution (anesthetic, rarely used)</td>
<td>White powder, whitish rock crystal</td>
<td>Snorted, smoked, injected</td>
</tr>
<tr>
<td><strong>Ecstasy/MDMA:</strong> Molly, Adam, Clarity, Eve, Lover's Speed, Peace, Uppers</td>
<td>No commercial uses</td>
<td>Colorful tablets with imprinted logos, capsules, powder, liquid</td>
<td>Swallowed, snorted</td>
</tr>
<tr>
<td><strong>Methamphetamine:</strong> Crank, Chalk, Crystal, Fire, Glass, Go Fast, Ice, Meth, Speed</td>
<td>Desoxyn®</td>
<td>White powder or pill; crystal meth looks like pieces of glass or shiny blue-white “rocks” of different sizes</td>
<td>Swallowed, snorted, smoked, injected</td>
</tr>
</tbody>
</table>

Adapted from: National Institute on Drug Use (Last Revised January 2018), Commonly Abused Drugs Charts. Accessed January 28, 2018
Cocaine

• Use and accessibility have been steadily decreasing in adolescents since 1999 and are now at a historic low

• Acute effects:
  ▪ Psychological: Euphoria, increased energy, restlessness, anxiety, paranoia, psychosis
  ▪ Physiological: vasoconstriction; mydriasis; hyperthermia, tachycardia, hypertension, nausea
  ▪ Acute hazards: arrhythmia, stroke, seizures, coma

• Long term effects: Anosmia, nosebleeds, nasal damage and trouble swallowing from snorting, bowel ischemia, poor nutrition and weight loss.
MDMA/Ecstasy

- Recent **increase in popularity** among young adults (not in adolescents)
- Both a stimulant and a hallucinogen
- Frequently laced with other substances including opioids (i.e. fentanyl), risk of overdose with one single pill
- **Short term effects:**
  - Psychological: ↓ inhibition, ↑ sensory perception
  - Physiological: Tachycardia, hypertension, hyperthermia, muscle tension, nausea, faintness
  - Hyperthermia/dehydration can lead to kidney failure
- **Long-term effects:** Long-lasting confusion, depression, problems with attention, memory, and sleep, increased anxiety, impulsiveness, decreased libido
Methamphetamine

- Use had been decreasing in both adolescents and young adults since the turn of the century (although increase in 2017)
  - Very high risk perception
- Methamphetamine is structurally similar to amphetamines, produces similar effects, but has important differences:
  - Onset is quicker, effects can be stronger
  - Users will often use repeatedly and go on “binges”
- **Short term effects:** Increased wakefulness and physical activity; decreased appetite; tachycardia, hypertension, hyperthermia, arrhythmia
- **Long term effects:** Anxiety, confusion, insomnia, mood problems, violent behavior, paranoia, hallucinations, delusions, weight loss, severe dental problems (“meth mouth”), intense itching leading to skin sores from scratching
Illicit Stimulants: Treatment

• **No FDA-approved medications** to treat stimulant addiction
  - Experimental trials for cocaine: baclofen, tiagabine, topiramate, antipsychotics, modafinil, disulfiram (inconclusive)
  - Experimental trials for methamphetamine: naltrexone, bupropion, mirtazapine (limited evidence)

• **Behavioral therapies:**
  - Cognitive-behavioral therapy (CBT)
  - Contingency management/motivational incentives, including vouchers/gift cards

• **Community-based recovery groups:**
  - 12 Step programs

• Prescription apps (Approved by the FDA for alcohol, cannabis and cocaine disorders)

Harm Reduction

- Using **with others**, never alone
- **Pre-testing** dose (starting with a small dose)
- **Naloxone** rescue kits for use on self or others (as stimulants often laced with opioids)
- **If injecting**: clean needles, no sharing, no reusing
- **Test strips** for Fentanyl and derivatives:
  - High sensitivity and specificity if proper technique
  - Need to dissolve in water
    (if tablets, need to crush)

Photo credit: DanceSafe.org
Prescription Stimulants

Photo credit: Wikimedia Commons
# Prescription Stimulants

<table>
<thead>
<tr>
<th>Street Names</th>
<th>Commercial Names</th>
<th>Common Forms</th>
<th>Common Ways Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bennies, Black Beauties, Crosses, Hearts, LA Turnaround, Speed, Truck Drivers, Uppers</td>
<td><strong>Amphetamine (Adderall®)</strong></td>
<td>Tablet, capsule</td>
<td>Swallowed, snorted, smoked, injected</td>
</tr>
<tr>
<td>JIF, MPH, R-ball, Skippy, The Smart Drug, Vitamin R</td>
<td><strong>Methylphenidate (Concerta®, Ritalin®)</strong></td>
<td>Liquid, tablet, chewable tablet, capsule</td>
<td>Swallowed, snorted, smoked, injected, chewed</td>
</tr>
</tbody>
</table>

Adapted from: National Institute on Drug Use (Last Revised January 2018), Commonly Abused Drugs Charts. Accessed January 28, 2018
Prescription Stimulants

2016 Monitoring the Future College Students and Young Adults Survey Results

**RITALIN**
- Past-Year Use
- College: 2.4%
- Non-College: 1.6%

**ADDERALL**
- Past-Year Use
- College: 9.9%
- Non-College: 6.2%

# Prescription Stimulants

<table>
<thead>
<tr>
<th>Drug</th>
<th>Time Period</th>
<th>8th Graders (%)</th>
<th>10th Graders (%)</th>
<th>12th Graders (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamine</td>
<td>Lifetime</td>
<td>5.70</td>
<td>8.20</td>
<td>9.20</td>
</tr>
<tr>
<td></td>
<td>Past Year</td>
<td>3.50</td>
<td>5.60</td>
<td>5.90</td>
</tr>
<tr>
<td></td>
<td>Past Month</td>
<td>1.70</td>
<td>2.50</td>
<td>2.60</td>
</tr>
<tr>
<td>Adderall</td>
<td>Past Year</td>
<td>1.30</td>
<td>4.00</td>
<td>5.50</td>
</tr>
<tr>
<td>Ritalin</td>
<td>Past Year</td>
<td>0.40</td>
<td>0.80</td>
<td>1.30</td>
</tr>
</tbody>
</table>

Prescription Stimulants

• Use in adolescents has been decreasing in the past 5 years but remains high among young adults

• Short-term effects:
  ▪ Psychological effects: Increased alertness, attention, energy
  ▪ Physiological effects: Hypertension, tachycardia, vasoconstriction, hyperglycemia
  ▪ High doses: Hyperthermia, arrhythmia, seizures

• Long-term effects: QT prolongation (risk for arrhythmia), anger, psychosis, paranoia
## Source of prescription stimulants for non-medical use in US population 12 and above

<table>
<thead>
<tr>
<th>Sources</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Friends/relatives source</strong></td>
<td></td>
</tr>
<tr>
<td>Got for free</td>
<td>75</td>
</tr>
<tr>
<td>Bought from friend/relative</td>
<td>52</td>
</tr>
<tr>
<td>Took without asking</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td><strong>Physician source</strong></td>
<td></td>
</tr>
<tr>
<td>Got one or more prescriptions from 1 doctor</td>
<td>11</td>
</tr>
<tr>
<td>Got prescriptions from more than 1 doctor</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Illegal source</strong></td>
<td></td>
</tr>
<tr>
<td>Fake prescriptions</td>
<td>10</td>
</tr>
<tr>
<td>Stole from clinic, hospital or pharmacy</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Bought from drug dealer</td>
<td>7</td>
</tr>
<tr>
<td>Bought over the Internet</td>
<td>2</td>
</tr>
<tr>
<td><strong>Other source</strong></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from: Chen LY, Strain EC, Crum RM, Storr CL, Mojtabai R (2015). Sources of nonmedically used prescription stimulants: Differences in onset, recency and severity of misuse in a population-based study, Drug and Alcohol Depend, 156(1):106-112
Substance Use and ADHD

- Children/youth with ADHD are 2.5 times more likely than their peers to develop substance use disorders.
- ADHD also associated with an earlier onset of substance use and higher likelihood of using multiple substances.
- Treatment with stimulants may reduce the risk of substance use disorders, although evidence is mixed.
- Suggested screening questions (not yet validated):
  - Have you ever shared or sold your medication?
  - Have you ever taken a larger dose than prescribed?
  - Have you ever taken your medication more often than prescribed?

Harstad L, Levy S (2014). Attention-Deficit/Hyperactivity Disorder and Substance Abuse, Pediatrics, 134(1)
Zulauf CA et al (2014). The Complicated Relationship Between Attention Deficit/Hyperactivity Disorder and Substance Use Disorders, Curr Psychiatry Rep, 16(3): 436
Substance Use and ADHD

Strategies to reduce the risk of stimulant misuse:

• Optimize behavioral (non-pharmacological) management of ADHD
• Safe prescription and documentation practices:
  ▪ Regular follow-up (i.e. every 1-6 months)
  ▪ Single prescriber
  ▪ Avoid early refills
• Use formulations with lower abuse potential:
  ▪ Longer acting vs shorter acting
  ▪ Non-stimulant medications (although often less effective)
• Direct observation treatment, keep medication locked

Harstad L, Levy S (2014). Attention-Deficit/Hyperactivity Disorder and Substance Abuse, Pediatrics, 134(1)
Prescription Stimulants: Approach

- **Need to confirm or rule-out ADHD**
  - Detailed history and work-up: clarify nature and onset of symptoms (if present)
  - Previous diagnoses (i.e. ADHD, learning disability)
  - Consider referral for neuro-psychological testing

- **No FDA-approved** medications to treat stimulant use disorder
  - Behavioral therapies used for illicit stimulants may be useful (CBT, contingency management)
  - Mobile medical application

- **Treat/address comorbidities:**
  - Other substance use disorders
  - Mental health comorbidities (i.e. anxiety, depression)
Caffeine
Caffeine

- Caffeine is the most widely-used psychoactive substance in the world

- Use of caffeine in adolescents in the US has more than doubled since 1980:
  - ≈ 75% of adolescents consume caffeine each day

- Caffeine has different effects on males and females after puberty:
  - Stronger cardiovascular, reinforcing and subjective responses in boys vs girls

Caffeine: Health Risks

- Caffeine use produces **greater tolerance** in teens vs adults
  - Animal studies: caffeine use during adolescence is associated with a greater sensitivity to **cocaine and other illicit drugs** in adulthood
  - Effects not seen if caffeine exposure starts in adulthood

Caffeine: Health Risks

• Caffeine consumption is associated with increased risk-taking, impulsivity, and sensation seeking in teens
  ▪ Association is stronger in boys, who also consume greater quantities of caffeine than girls
  ▪ Unclear if caffeine is a cause or if youth who are more prone to risk-taking are also more prone to caffeine use

• The American Academy of Pediatrics recommends a maximum of 100mg of caffeine per day for adolescents under 18 (but preferably no caffeinated beverages at all)
  ▪ The FDA recommends < 400mg per day in adults

Approximate caffeine content of common beverages

Caffeine content, mg

- Large coffee, coffee shop
- Coffee, drip (made at home)
- Red Bull
- Mountain Dew
- Diet coke
- Instant coffee
- Espresso
- Black tea
- Green tea
- Dark chocolate bar
- Chocolate bar
- Chocolate milk

Adapted from: Food Sources of Caffeine - Dietitians of Canada
Energy Drinks

- Contain approximately 50-80 mg of caffeine per 8oz (a cup of coffee usually contains ≈ 100-125mg)
- College students who regularly consume energy drinks are at a greater risk for future **alcohol use disorder**, **cocaine use** and misuse of **prescription stimulants**
  - Association (not a causal study)
- Death of a 16-year old teenager in 2017:
  - Caffeine-induced cardiac arrhythmia
  - Ingestion of a latte coffee, a large Mountain Dew and an energy drink
  - Caution is advised

Caffeine Powder

- **Caffeine powder** is an emerging health hazard for youth: available online, often marketed for weight loss
- A teaspoon of pure caffeine powder is equivalent to approximately 25 cups of coffee (2700mg of caffeine)
  - This is a lethal dose for an adolescents (or adult)
  - Other acute effects: Tachycardia, palpitations, arrhythmia, seizures, diarrhea, vomiting, disorientation
- Death of an Ohio high school student in 2014 prompted a FDA safety advisory about caffeine powders
  - April 2018: FDA statement providing recommendations for industry about highly concentrated caffeine in dietary supplements (non-binding)
Conclusion
Take Home Messages: Nicotine

• Nicotine has important **deleterious effects** on the developing teen
• Cigarettes and e-cigarettes are **never safe** for children and adolescents
  ▪ E-cigarettes are associated with increased use of tobacco products and other substances
• **Screening and brief intervention** by health providers can delay the onset of smoking/vaping and should be included in all teenage health encounters
• **Nicotine replacement** therapy should be considered in adolescents who are daily users
Take Home Messages: Stimulants

- Rates of stimulant use (prescription and non-prescription) are **decreasing** in adolescents.
- Untreated ADHD is a **risk factor** for substance use; caution is needed when treating youth with stimulants which have a potential for misuse and diversion.
- There is **no approved** pharmacological treatment for stimulant abuse.
- **Behavioral interventions** including CBT and contingency management should be considered first line of treatment.
- Caffeinated beverages and caffeine powder can be **dangerous** and even lethal if misused.
References

- Harstad L, Levy S (2014). Attention-Deficit/Hyperactivity Disorder and Substance Abuse, Pediatrics, 134(1)
References

• National Institute on Drug Use (Last Revised January 2018), Commonly Abused Drugs Charts. Accessed Jan 28, 2018
• Sockrider, M et al. (2013). Prevention of smoking initiation in children and adolescents, UptoDate, last accessed January 28, 2018
PCSS Mentor Program

- PCSS Mentor Program is designed to offer general information to clinicians about evidence-based clinical practices in prescribing medications for opioid addiction.

- PCSS mentors are a national network of providers with expertise in addictions, pain, evidence-based treatment including medication-assisted treatment.

- 3-tiered approach allows every mentor/mentee relationship to be unique and catered to the specific needs of the mentee.

- No cost.

For more information visit: pcssNOW.org/clinical-coaching
Have a clinical question?

Ask a Colleague

A simple and direct way to receive an answer related to medication-assisted treatment. Designed to provide a prompt response to simple practice-related questions.

Ask Now
PCSS-MAT is a collaborative effort led by the American Academy of Addiction Psychiatry (AAAP) in partnership with the: Addiction Technology Transfer Center (ATTC); American Academy of Family Physicians (AAFP); American Academy of Neurology (AAN); American Academy of Pain Medicine (AAPM); American Academy of Pediatrics (AAP); American College of Emergency Physicians (ACEP); American College of Physicians (ACP); American Dental Association (ADA); American Medical Association (AMA); American Osteopathic Academy of Addiction Medicine (AOAAM); American Psychiatric Association (APA); American Psychiatric Nurses Association (APNA); American Society of Addiction Medicine (ASAM); American Society for Pain Management Nursing (ASPMN); Association for Medical Education and Research in Substance Abuse (AMERSA); International Nurses Society on Addictions (IntNSA); National Association of Community Health Centers (NACHC); National Association of Drug Court Professionals (NADCP), and the Southeast Consortium for Substance Abuse Training (SECSAT).

For more information: [www.pcssNOW.org](http://www.pcssNOW.org)

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