Adolescent Substance Use and Prevention

23

Peter Jackson, Amy Yule, and Timothy Wilens

Introduction

Adolescence is a period of crucial and relatively rapid physical, intellectual, emotional and social development. Adolescents experience normal developmental drives to seek and experience new stimuli and discover personal identity. During this period, brain regions that process reward develop more quickly than the frontal area of the brain in charge of executive functioning oversight such as emotional regulation and impulse control. This normal biological and psychological development represents a key period of increased risk for substance experimentation and use as well as the development of substance use disorders (SUDs). It is well known that the earlier an individual is first exposed to or begins to heavily use substances, the higher the likelihood of progressing to develop a SUD later in life. Early onset SUD also predicts increased severity and prolonged duration of SUD. Pediatricians and other primary care providers, often an adolescent's only point of contact with the healthcare system, have a key role in preventative guidance, screening and detection, and early intervention for problematic substance use.

M.A. Goldstein (ed.), *The MassGeneral Hospital for Children Adolescent Medicine Handbook*, DOI 10.1007/978-3-319-45778-9_23

Prevalence

According to Monitoring the Future (MTF) 1975–2015, the annual prevalence of 12th grade students using illicit drugs was 38 %. Tenth grade students' prevalence was 28 % and 8th grade students' was 15 %. With respect to the use of licit drugs (alcohol and tobacco), 17 % of 12th grade students, 11 % of 10th graders, and 5 % of 8th grade students reported heavy alcohol drinking ("binge drinking") in the past 2 weeks, defined as five alcoholic drinks in a row. Since a peak in the late 90s, there continues to be a steady decline in current tobacco smoking among high school students. The percent of students who smoked tobacco in the past 30 days was 3.6 % of 8th graders, 6.3 % of 10th graders, and 11.4 % of 12th graders, all of which are the lowest percentages since the beginning of the MTF study.

Though many may not have used regularly, statistics of any lifetime use should be kept in mind. As a general estimate, when all adolescents are combined, about one in six have used an illicit drug in the past 30 days, one in four in the past year and one in three have used an illicit drug in their lifetime. One fourth of teens have used alcohol in the past 30 days and almost half have used alcohol in their lifetime. Data from the National Comorbidity Study-Adolescent Supplement (NCS-A) show that about 11 % of adolescents meet criteria for a substance use disorder, with a steep increase in incidence after age 15 (Fig. 23.1).

Risk

Since SUDs know no social, cultural, economic, or geographic bounds, all adolescents should be screened and counseled about substance use. Awareness of risk and protective factors will assist the pediatrician's care for and counsel of preadolescents and adolescents.

Risk factors for adolescent substance abuse are delineated in Table 23.1. At an individual level, youth with psychopathology such as ADHD, mood or conduct disorders are at approximately twice the risk for developing a SUD—with emerging data suggesting

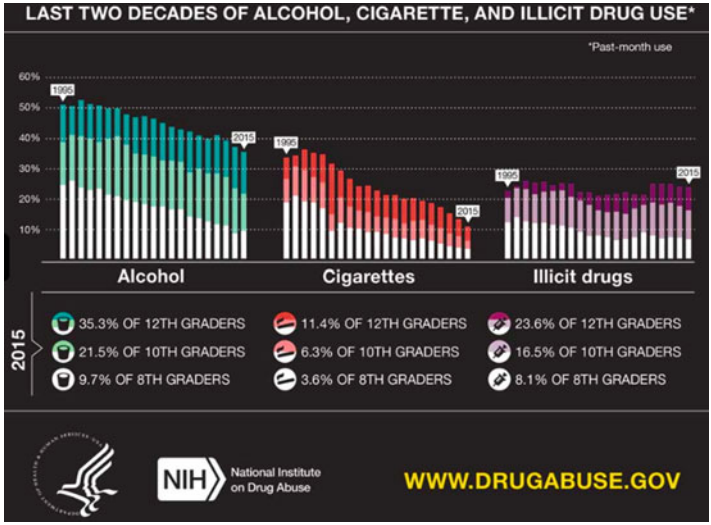

Fig. 23.1 Trends in adolescent alcohol, cigarette, and illicit drug use over the past two decades. (*Source*: National Institute on Drug Abuse, National Institutes of Health, U.S. Department of Health and Human Services. Date from: Monitoring the Future, www.monitoringthefuture.org)

Table 23.1 Risk factors for adolescent substance abuse (Adapted from Hazen et al., 2010)

Domain	Risk factors
Individual	Early aggressive behavior; male gender; untreated psychiatric illness especially ADHD, mood disorders, PTSD, and learning disorder; history of physical or sexual abuse, low self-esteem; academic underachievement; poor social skills; peer rejection
Family	Family history of substance abuse; poor parental or sibling modeling behaviors; chaotic home environment; poor parent–teen communication; high family conflict, or witnessing domestic violence; permissive or neglectful parenting style
Community	High prevalence of substance abuse in the community including availability of substances and tolerance of their use, lack of supportive relationships with other caring adults

ADHD attention deficit, hyperactivity disorder, *PTSD* post-traumatic stress disorder

that continuous treatment of these disorders can reduce the increased risk back to population levels. Children who are from communities with high availability and permissive attitudes towards substance use are also at increased risk for SUD. Counseling these groups as to the enhanced SUD risk and monitoring for cigarette smoking (an early sign of later SUD) or substance use is advised.

Conversely, a number of protective factors exist to reduce SUD risk (Table 23.2). Reminding parents as to the importance of parental modeling and monitoring, pro-social and pro-religious activities, and knowing a youth's peer group all help to mitigate later SUD. Since SUD may start as early as age 10–12 years, it is advised to begin these discussions in fifth grade (prior to middle school).

Risk Factors (Tables 23.1 and 23.2)

Healthcare providers can have an important role in recognizing, asking about, and educating parents and primary caregivers about potential warning signs of substance use. These are outlined in Table 23.3.

Table 23.2 Protective factors against adolescent substance abuse (Adapted from Hazen et al., 2010)

Domain	Factors
Individual	High impulse control and emotion regulation skills
Parents	Positive modeling behaviors; excellent communication skills; high level of emotional support combined with limit setting and consistent enforcement of rules (authoritative model); appropriate supervision
Peers	Non-substance using friends; presence of peers with authoritative parents
Community	Zero-tolerance policies; strong community attachment, low availability of substances
School	Extracurricular activities; sports; positive role modeling in teachers and coaches; educational programming

Table 23.3 Warning signs for the onset of substance use in adolescents

Behavioral	– Academic decline or school truancy
	– Decline in work performance
	– Cessation of extracurricular activities and hobbies
	– Sudden change in peer group
	– Stealing or borrowing more money
	– Sudden changes in appearance, preferred clothing style
	– Violating curfew, sneaking out of the house or other delinquent behavior
Emotional	– Dramatic changes in mood or behavior, including irritability and anger
	– Loss of motivation
	– Increased withdrawal and isolation
	– Periods of unusual hyperactivity
	– Appearing paranoid, anxious or fearful without explanation
Physical	– New onset of lack of attention to hygiene
	– Appearing fatigued or frequent complaining of being tired
	– Sudden changes in appetite or sleep pattern
	– Unexplained injuries/accidents/bruises
	– Bloodshot eyes or frequent nosebleeds
	– Unusual smells on body or clothing, including new heavy use of perfumes or incense

Screening and Brief Intervention

Substance use screening, accompanied by brief interventions, is one of the most essential roles of primary care providers and pediatricians in the prevention/detection of adolescent substance use since they often have a longitudinal relationship with adolescents that is associated with high trust and respect. Recent data show that the juvenile justice system is the most common source of referral to publicly funded substance treatment programs, providing ten times the amount of referrals compared to primary care providers and psychiatrists combined. This suggests a missed opportunity for referrals to be made prior to more severe psychosocial consequences of use.

Multiple nonproprietary tools for screening for substance use have been studied for use with adolescents and were developed to be accurate but quickly administered, given practical demands of a

busy primary care office setting. Among the most commonly used is the CRAFFT, included below. Other validated tools include the two question Alcohol Screening tool developed by the National Institute of Alcohol and Alcoholism (NIAAA), and more recently the Screening to Brief Intervention (S2BI) which includes a single screening question about frequency of past year use for seven different substance categories. It is important to note that all of the above mentioned tools include not only screening questions but recommendations for brief interventions to be done by the pediatric practitioner based on how the screening questions are answered.

The CRAFFT Screening Questions

Part A: During the past 12 months, did the adolescent:

1. Drink any alcohol (more than a few sips)
2. Smoke any marijuana or hashish
3. Use anything else to get high (including illegal drugs, OTC, and prescription drugs) and things that are sniffed or "huffed"

If the adolescent answered NO to ALL three questions, then ask B1 and then stop. If the teen answered yes to any of the three questions, ask B1 through B6.

Part B: During the past 12 months, did the adolescent:

1. Ride in a car driven by someone, including the adolescent who was "high" or had been using alcohol or drugs
2. Did the adolescent ever use alcohol or drugs to relax, feel better, or fit in
3. Did the adolescent ever use alcohol or drugs when alone
4. Did the adolescent ever forget things while using alcohol or drugs
5. Did the adolescent's family or friends ever tell him or her to cut down on drinking or drug use
6. Did the adolescent ever get into trouble while using alcohol or drugs

CRAFFT Interventions:

If the adolescent answers No to A1–3 and No to B1, then praise the teen.

If the adolescent answers No to A1–3 and Yes to B1, ask the teen to avoid riding with a driver using alcohol or drugs.

If the adolescent answers YES to one or more of A1–3, then B1–6 needs to be administered with each Yes answer to B1–6 receiving one point.
If there is a Yes only to B1, then ask the adolescent to avoid riding in a car with a driver who has used drugs or alcohol.
If the CRAFFT score is 0 or 1 using questions B2–B6, then counsel the teen to stop using substances and review how substance use may lead to undesirable outcomes in the social, academic, and health domains; follow up at the next visit.
If the CRAFFT score is 2 or more using questions B2–B6, then further assessment is indicated, including a brief assessment of substance use, follow up in primary care or referral to a treatment program.

Further assessment for substance use may include asking for more history about whether use has caused any problems for the teen, peer use, availability, screening for any other substances used, and if the adolescent has tried to quit and why. Based on the additional information, the pediatrician may decide that further evaluation by another professional is needed. If there appear to be no major problems and the adolescent believes that he/she can change, then arrange a follow-up visit to ascertain if the adolescent has stopped the use of substances.

Physical Exam and Review of Systems

Pediatricians, particularly those working in emergency settings, may be the first point of contact for a teen who is intoxicated. Table 23.4 includes a system-based list of possible signs and symptoms of acute substance ingestion/use.

Laboratory Testing

If an adolescent endorses substance use, objective toxicology testing can be helpful in the assessment for problematic substance use. Even when an adolescent acknowledges substance use, they may be reluctant to disclose the full extent of their substance use

Table 23.4 Symptoms and signs of adolescent substance abuse (adapted from Table 19.3, previous edition)

System	Symptom/sign	Substance
Vital signs	Hypertension	Cocaine, amphetamine, anabolic steroids, LSD, phencyclidine, Ecstasy, ketamine, bath salts
	Hypotension	Opiates, barbiturates
	Tachycardia	Marijuana, cocaine, LSD, amphetamine, ecstasy, ketamine, bath salts
	Hyperthermia	Cocaine, amphetamine, LSD, ecstasy
	Hypothermia	Heroin
Skin	Track marks, abscesses	Intravenous drugs
	Acne, stretch marks	Anabolic steroids
	Itchiness	Opiates
Eyes/nose	Injected conjunctivae	Marijuana
	Dilated pupils	Marijuana, cocaine, amphetamine, LSD, ketamine
	Constricted pupils	Heroin/opiates
	Nystagmus	Benzodiazepines, barbiturates
	Lacrimation	LSD
	Nasal irritation, mucosal erosion	Cocaine, glue sniffing
Heart	Arrhythmia	Heroin, cocaine, amphetamines
		Inhalants, PCP
GI	Constipation	Opiates
	Increased appetite	Marijuana
Neurologic	Hyperreflexia & hyporeflexia	Marijuana, cocaine, amphetamines, bath salts
	Ataxia	Amphetamines, alcohol, psilocybin, ketamine, inhalants
	Seizure	Cocaine, PCP
Mental status	Decreased libido	Anabolic steroids
	Rapid speech	Amphetamines, cocaine, bath salts
	Slurred speech	Alcohol, benzodiazepines, inhalants
	Drowsiness	Marijuana, benzodiazepines
	Hallucinations	LSD, psilocybin, amphetamines, ketamine, inhalants, synthetic marijuana
	Agitation	PCP, amphetamines
	Trance-like state	Salvia divinorum
	Paranoia	Amphetamines
	Rage	Ketamine, PCP
	Flashbacks	PCP, LSD
		Anabolic steroids, cocaine, psilocybin, ketamine

and toxicology testing can be helpful for detection of other substances of misuse or substances that may have been included in the substance that the teen was using that they were unaware of (e.g., laced).

Urine or oral fluid (saliva) samples are generally used for drug testing given a longer window for detection of substance use. Serum toxicology testing can be helpful for detection of substance use when an adolescent presents with an unclear mental status or is acutely intoxicated although it is a more invasive type of testing and is not useful for certain drugs such as cannabis use which is the most common illicit substance used. With all toxicology testing it is important to be aware of what substances are being tested for as well as the test's sensitivity and specificity for each substance tested. For example, unless specified many urine toxicology tests that test for opioids are unable to detect synthetic opioids such as oxycodone or fentanyl. Furthermore adolescents who are reluctant to change their substance use may attempt to adulterate urine toxicology samples through dilution and it is important to assess a urine toxicology sample for validity with a measure of the sample's concentration since an overly dilute sample may be invalid. If there is concern for adulteration or false positive or negative screening tests, it can be helpful to have a sample tested further with more expensive but more specific confirmatory testing through gas chromatography or mass spectrometry. Since oral fluid (saliva) testing obviates the adulteration of urine testing and tends to be more accepted by patients, it may be a more useful tool for toxicology testing in adolescents. Toxicology testing may also be useful for monitoring progress in treatment, such as with quantitative urine toxicology tests for marijuana (cannabis levels).

Determining Severity and Referral to Treatment

The American Academy of Pediatrics (AAP) has identified several stages of use. A pediatrician should be knowledgeable about the spectrum of substance use and appropriate forms of intervention for all stages.

Abstinence: No substance use. This is the period before an adolescent has ever used drugs or had more than a few sips of alcohol. Even in abstinence the pediatrician has an important role in applauding youth for their wise choices and educating parents and teens about risks involved with substance use. There should be clear and consistent reinforcement of a nonuse message.

Experimentation: The first couple of times a teen uses, often prompted by a desire to know how intoxication feels. In this case, pediatricians should promote patient strengths and encourage abstinence through brief, clear medical advice and educational counseling.

Limited Use: Usually occurs with friends on weekends, in lower risk situations and without related problems. Again, providers should promote patient strengths and further encourage cessation through brief, clear medical advice and educational counseling. In addition, pediatricians should thoroughly clarify which substances are being used and should educate about risks inherent even in infrequent use.

Problematic Use: Any use in a high-risk situation, such as when driving or babysitting. Use is associated with problems such as legal charges, school suspension, and fights. Substances may be used to relieve stress or depression. Intervention goals include those listed for limited use but in addition, close follow-up appointment or referral for brief intervention is suggested. At this stage, a provider should consider breaking confidentiality.

Use Disorder: The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) identifies 11 criteria by which to gauge the severity of substance use. These include: craving, using more or longer than intended, unsuccessful attempts to cut down or quit, excessive time spent obtaining substances, failure to fulfill academic, work or family responsibilities because of substance use, continued use despite recurring problems, stopping or reducing important personal activities because of use (e.g., quitting an athletic team), recurrent substance use in hazardous situations, continued use despite acknowledgement of physical or psychological

problems associated with use, tolerance (diminished physical effect of the same dose or needing a higher dose to achieve desired effects), and withdrawal. A substance use disorder is considered mild if two or three of the criteria are met within the same year, and a moderate substance use disorder is present when 4–5 criteria are met. Intervention goals for a mild or moderate substance use disorder in addition to those mentioned above should include brief motivational enhancement through exploration of ambivalence. These adolescents should be referred for a comprehensive assessment and treatment in a subspecialty clinic. Providers should strongly consider breaking confidentiality and monitor for progression to severe use disorders.

Severe Use Disorder: Six or more of the above criteria indicate a severe substance use disorder. At this stage, pediatricians should make a referral to subspecialty treatment and work to enhance motivation to accept such a referral. Providers should strongly consider breaking confidentiality and parental involvement is strongly encouraged.

Additional red flags for which to consider breaking confidentiality with family and/or make a referral to treatment, regardless of stage of use:

- Any intravenous (IV) drug use
- Prescription medication misuse
- Cocaine, heroin, or methamphetamine use more than once
- CRAFFT score >2 in an adolescent 14 years or younger
- CRAFFT score of 5 or higher
- Daily or near daily use of any substance
- Alcohol-related blackouts
- Change in medical status resulting from substance use (e.g., passing out from use, any physical problem requiring medical attention)

Adolescents that have been identified as misusing substances should have a complete psychosocial history, physical examination, and mental status evaluation as there may be a dual psychiatric diagnosis along with the SUD. In fact, data suggests that nine

out of ten adolescents with a SUD have a comorbid psychiatric disorder (e.g., attention-deficit hyperactivity, mood, anxiety, and/or conduct disorders).

Licit Drugs

Tobacco

It is known that delaying an adolescent's use of tobacco until at least age 18 will significantly decrease the chance that the teen will become an established smoker. Most teens who try tobacco smoke their first cigarette between ages 14 and 15 and become regular users between 16 and 17 years. Most teens are in a trajectory from early users of tobacco to tobacco addiction when initially screened by the clinician.

Pediatricians should be comfortable with strategies to reduce tobacco use in adolescents (and their parents) by screening for tobacco use and intervening if tobacco use is detected. The following is a brief scheme with more details in the reference (Pbert et al.):

ASK: if the teen uses tobacco; if no, then congratulate and encourage abstinence; if yes, then
ADVISE: the teen to quit and offer the teen your help
ASSESS: will the teen make a quit attempt in the next 30 days—if no, then provide motivational intervention. If yes, then
ASSIST: in helping the teen to quit tobacco by helping to develop a quit plan, giving key advice to successful quitting and consider the use of pharmacologic treatment.
ARRANGE: for follow-up; that may include referring the teen to intensive services and reviewing the teen's progress in quitting.

Tobacco cessation methods consist of behavioral interventions, pharmacologic treatments, or a combination. The reference section has a citation and website (Fiore et al.) endorsed by the American Academy of Pediatrics for treatment of tobacco use and dependence. Successful behavioral programs have the following qualities: easy accessibility, adolescent friendly and adolescent specific, and provision of ongoing support to teens trying to quit tobacco.

Alcohol

Widely used by adolescents, alcohol is a rapidly absorbed CNS depressant. At mild levels, euphoria and disinhibition occur, at moderate levels there is sedation, ataxia, and slurred speech, and at high levels there may be coma, respiratory depression, and death. Motor vehicle accidents, violence, traumatic experiences, and other injuries may occur secondary to use. The best acute tests for alcohol intoxication are a breathalyzer or blood alcohol level. Adolescents who require medical care for intoxication need follow-up and referral for appropriate counseling.

Illicit Drugs

Marijuana

This is the most commonly used illicit drug in adolescence, generally by smoking and less commonly by vaporization of marijuana concentrates (oil, dabs, wax, shatter) or by ingestion of the whole plant matter. Effects include euphoria, time distortion, and memory issues. At higher levels, teens may encounter anxiety, panic, or hallucinations. There is no clear lethal potential from the drug itself, but injuries occur from the drug's effects on the user's behavior. Marijuana is detectable in the urine or saliva up to 2 weeks after an acute exposure and up to 6 weeks after heavy, chronic use. Quantitative urine monitoring is available to guide a clinician in estimating the amount and frequency of marijuana use and to monitor treatment. See below for a discussion on medical marijuana.

Prescription Drugs

Prescription drug misuse is second to marijuana as the most frequently misused class of agents by adolescents. For instance, prescription pain killers, followed by sedatives (benzodiazepines) and stimulants (e.g., mixed amphetamine salts) are used by approximately one in ten teens in the past year. Data indicate that three-quarters of teens locate prescription medications from friends or family (e.g., medicine cabinet, old prescriptions not being used or monitored). It is strongly advised that parents be

advised to turn back or dispose of all controlled substances no longer being used, and lock up any controlled substances they or their children are currently taking.

Opiates

These include the illicit drug heroin as well as prescription morphine, oxycodone, methadone, hydromorphone, and others—that can be obtained in an illicit manner. Opiates may be taken by a variety of routes. Effects include euphoria, sedation, diminished reflexes, analgesia, and somnolence. Overdose can cause cardiorespiratory arrest and death. Teens may start with prescription drugs but then because of lack of availability or cost, transition to using heroin. Heroin is detectable for 24 h in the urine; other opiates are detectable for 2–3 days. Some synthetic opiates are not detectable in the urine.

Depressants

Barbiturates and benzodiazepines may be very short, short, intermediate, or long acting in their effects. They produce sedation, drowsiness, fatigue, and euphoria and can depress the vital signs. Barbiturates are a common cause of fatal accidental overdose in young individuals; benzodiazepines are less lethal than barbiturates and more commonly misused. Both barbiturates and benzodiazepines are detectable in the blood and urine and both classes include a range of short acting to long acting agents which influences the time frame for positive urine screen. For barbiturates the range is 3–15 days and for benzodiazepines the range is 2–10 days.

Amphetamines (Speed)

This group includes licit medication such as (dextro)amphetamine, or methylphenidate and illicit substances such as crystal meth (methamphetamine). Amphetamines produce CNS stimulation with effects of euphoria, alertness, reduced fatigue, insomnia, panic, and occasionally hallucinations. Data suggest that young people who misuse stimulants often have other substance use disorders and/or neuropsychological deficits. In overdose, coma, circulatory collapse, arrhythmias, and stroke may occur. Crash may occur with a withdrawal syndrome seen also in cocaine. Amphetamines are detectable in the urine for up to 3 days.

Cocaine

The two chemical forms include the powdered, salt form which is snorted or injected intravenously and the water insoluble base ("freebase" or "crack"), which is smoked. Use leads to CNS and peripheral nervous system stimulation. Effects include anxiety, agitation, paranoia, delirium, and hallucinations. Cocaine is detectable in the urine for less than 24 h but the main metabolite, benzoylecgonine, is often screened for and will be positive for up to 5 days after use. Complications of cocaine use may include erosion of the nasal septum. Crack has shown a higher potential for addiction given a more immediate onset of effects.

Hallucinogens (e.g., LSD, Salvia, Mushrooms, PCP, Ketamine)

These drugs produce alterations in perception, dissociation, loss of time sense, depersonalization, body image changes, illusions, and hallucinations. Teen may present with restlessness, paranoia, and anxiety. LSD is detectable in the urine for less than a day but a metabolite can be tested for up to 5 days. PCP can be detected in urine for up to 8 days. Flashbacks may occur.

Inhalants

These drugs are more commonly used among young male adolescents often in group activities. Forms include model airplane glue, rubber cement, correction fluid, paint thinner, gasoline, butane, and aerosol propellants. Effects include euphoria, giddiness, impaired judgment, and drowsiness. Hallucinations and psychosis have been reported. Use of plastic bags or tents to enhance inhalation has produced fatalities. These drugs are not detectable in the urine or blood, but examination may show a rash on the face, odor to the teen's breath, or eye irritation.

Club Drugs

These include MDMA, ketamine, GHB, and rohypnol, which are termed "club drugs" because they are often used in social gatherings. MDMA (ecstasy) can produce euphoria, calm and an increase in perception and empathy. Ketamine (Special K) produces a disconnected feeling, pain relief, and visual hallucinations. Flashbacks may occur after long-term use. GHB (liquid ecstasy) produces

euphoria, relaxation, and drowsiness; it has the potential to suppress pulse, blood pressure, and respiration. It may be used by body builders to increase muscle mass; some have used it as a "date rape" drug. Rohypnol (roofies) is an illegal fast acting benzodiazepine that may lead to physical dependence; it has been used as a date rape drug.

Designer Drugs

These compounds are chemically synthesized with a goal to mimic the highs produced by other drugs but can have even more dangerous side effects and often evade detection on drug screens. Commonly marketed as "Spice" or "K2," synthetic marijuana can produce psychosis, stroke, heart attack, or kidney damage. "Bath Salts" (bloom, flakka, Ivory wave, vanilla sky, cloud nine), named for their physical resemblance to Epsom salts, contain a synthetic chemical related to the stimulant cathinone and seek to mimic the euphoria and energetic high produced by amphetamines or cocaine. These can lead to dangerous physiological excitation including hyperthermia, dehydration, muscle breakdown, and kidney failure as well as excited delirium. NBOMes is a synthetic hallucinogen meant to mimic the high of LSD but which has been associated with self-inflicted violence, paranoia, delirium, and seizures. As designer drugs are identified, made illegal, and added to drug screening panels, other synthesized compounds emerge with slight chemical alterations and with significant unknowns and associated risks.

Performance Enhancing Drugs

These substances are used to enhance performance or to improve body image. There are pharmacologic agents (such as methylphenidate) for studying, agents to reduce weight (such as diuretics, laxatives, or stimulants), nutritional supplements, blood doping, OTC agents to increase muscle mass (such as creatine) and human growth hormones and anabolic steroids. The use of performance enhancing drugs should be strongly discouraged in adolescents by pediatricians, parents, schools, and other sports organizations. Serious side effects may occur from their use especially with anabolic steroids, human growth hormone, laxatives, and diuretics (Table 23.5).

Table 23.5 Additional information on drugs commonly used by adolescents

Substance	Street names	Neurobiological effects	Signs and symptoms of intoxication	Withdrawal symptoms	Comments
Alcohol		Central CNS depressant via potentiation of GABA effect at GABA-A receptors	Euphoria and disinhibition at low levels, sedation, ataxia, and slurred speech at higher levels	Tremor, anxiety, insomnia, transient hallucinations; severe forms include seizure, autonomic instability, delirium	– Rates of use are additionally elevated among college enrollees – Advise about risk of even single episodes of binge drinking
Tobacco	Bidis, hookahs, snuff, chew	CNS stimulant via activation of nicotinic receptors	Elevated blood pressure, respiratory rate, and heart rate	Irritability, insomnia, inattention, increased appetite	– As cigarette smoking has steadily declined, e-cigarette use among adolescents is on the rise – Important to ask about chewing tobacco and not just smoking
Marijuana	Weed, hash, joint, bud, dope, reefer, grass, hemp	Main active ingredient, THC, binds to cannabinoid receptors throughout the brain (CB1>CB2)	Enhanced sensory perception and euphoria followed by drowsiness, increased appetite, slowed reaction time and impaired coordination; hallucinations, anxiety, panic, and psychosis at higher doses	Irritability, insomnia, decreased appetite, anxiety	– Possible loss of IQ points with early, repeated use – Most commonly used illicit drug by teens, nearly 50% of 12th graders have used it – Used in concentrated forms (hash or honey oil, wax or "budder," "shatter" which can deliver much higher amounts of THC per use

(continued)

Table 23.5 (continued)

Substance	Street names	Neurobiological effects	Signs and symptoms of intoxication	Withdrawal symptoms	Comments
Prescription stimulants	Speed, Uppers, MPH, The smart drug, black beauties	Central CNS stimulants	Alertness, increased energy, increased BP and pulse, hyperthermia	Depression, tiredness, sleep problems	– Most commonly misused drug is Adderall – Often associated with other SUD, academic decline
Prescription opioids	Many names depending on drug	Opioid agonists at the mu-opioid receptor	Euphoria, drowsiness, diminished reflexes respiratory depression	Body aches, restlessness, diarrhea, chills	– Most commonly used are Vicodin and OxyContin – Risk for progression to heroin use – Advise family members to dispose of old/unused prescriptions
Inhalants (aerosols, paint thinner, gasoline, permanent markers, glue, nitrous oxide)	Whippets, poppers, snappers, laughing gas	Generally, CNS depressants. Nitrates lead to vasodilation	Euphoria, giddiness, somnolence, confusion, disinhibition, slurred speech, dizziness	Nausea, loss of appetite, mood swings, sweating, tics	– More commonly used by younger adolescents – Facial rash or eye irritation
Synthetic cannabinoids	K2, spice, incense, black mamba, fire, skunk, yucatan, fake weed	Bind to cannabinoid receptors, often more strongly than THC	Tachycardia, agitation, confusion, anxiety, paranoia, increased blood pressure	Headache, depression, anxiety, irritability	– Persistent withdrawal symptoms not uncommon in users – Chemical composition of many products is unknown and they can produce unpredictable health effects

Cough medicine (Dextromethorphan or DXM) (codeine)	Triple C, robo, robotripping	Opioid-like actions	Euphoria, dissociation, slurred speech, increased BP and pulse	Unknown	– Consider effects of other ingredients as well, i.e., antihistamines
Prescription Tranquilizers/Sedative hypnotics	Candy, downers, tranks	Prominent GABA effects	Drowsiness, sedation, amnesia, impaired coordination and reaction time, confusion, respiratory depression	Headache, tension, anxiety, restlessness, numbness in hands and feet, hallucinations, seizures, delirium	– Withdrawal can be dangerous, detox/taper requires medical supervision – Some in this category, i.e., Rohypnol (flunitrazepam), are used as date rape drugs – Increased concern for overdose when used with alcohol
MDMA (Ecstasy)	Molly, Adam, Eve, Lover's speed, peace, uppers, "E"	Mixed serotonin and norepinephrine/ Dopamine effects, additional increase in serotonin release compared to amphetamines	Enhanced sensory perception, disinhibition, increased BP and pulse, bruxism, confusion, hyperthermia, dehydration	Fatigue, loss of appetite, depression, poor concentration	– Molly often contains more methamphetamine constituent – Other adulterants frequently found in tablets include cocaine, caffeine, ephedrine

(continued)

Table 23.5 (continued)

Substance	Street names	Neurobiological effects	Signs and symptoms of intoxication	Withdrawal symptoms	Comments
Hallucinogens – Classic: LSD, psilocybin, Peyote, DMT, ayahuasca – Dissociative Drugs: PCP Ketamine, DXM, Salvia	Acid, angel dust, vitamin K, shrooms	Prominent serotonergic properties, particularly in the prefrontal cortex. Dissociative drugs disrupt glutamate activity at NMDA receptors	Varied effects depending on drug used, visual, auditory and tactile hallucinations, nightmares, increased energy, tachycardia, psychosis	Varied effects depending on drug used, commonly includes headache, sweating	– Long-term effects can include persistent psychosis or perceptual disturbances
Heroin	Dope, junk, skunk, white horse, china white, brown sugar	Direct mu-opioid receptor agonist	Euphoria, constricted pupils, alternating wakefulness and drowsiness, clouded thinking, itching, slowed respiratory rate and heart rate	Restlessness, body aches, diarrhea, vomiting, chills, restless legs, insomnia	– Often preceded by prescription opioid use – Overdose antidote is intranasal naloxone – Buprenorphine and Naltrexone are approved treatments for older adolescents
Cocaine	Coke, crack, rock, blow, bump, snow, flake, charlie	Blockade of the dopamine transporter, preventing reuptake of dopamine into the presynaptic neuron	Increased energy, euphoria, enlarged pupils, hypertension, hyperthermia, headache, aggression, paranoia, psychosis	Fatigue, insomnia, restlessness, depression, increased appetite, vivid nightmares	– Risk of stroke, myocardial infarction or bowel infarction given vasoconstriction

CNS central nervous system, *GABA* gamma-aminobutyric acid, *THC* tetrahydrocannabidiol, *CB* cannabinoid, *BP* blood pressure, *NMDA* *N*-methyl-D-aspartate

Additional Recent Considerations

E-Cigarettes

Although there has been a decline in tobacco smoking, there has been a recent increase in the use of electronic cigarettes in adolescents. In 8th, 10th, and 12th graders, e-cigarettes are used more often (more than twice as often for 8th and 10th graders) than any other tobacco product, including cigarettes. Though most teens report only using flavoring, e-cigarettes are not regulated so those liquids might contain nicotine. The American Academy of Pediatrics issued a 2015 policy statement opposing any use of e-cigarettes for any purpose, pointing out the absence of supportive data that e-cigarettes can assist with smoking cessation. They encourage a ban on any internet sale of e-cigarettes, any sale to persons under age 21 and a ban on any flavoring in e-cigarettes or advertisement viewable by youth.

Medical Marijuana

In its most recent policy statement (2015), the American Academy of Pediatrics (AAP) reaffirmed its opposition to the legalization of marijuana for recreational purposes as well as opposition to any use of "medical marijuana" outside the regulatory process of the Food and Drug Administration. The AAP also supports the decriminalization of marijuana for adolescents and young adults and a change in schedule classification (from schedule I to schedule II) to support research and development of pharmaceutical cannabinoids.

Perceived risk is strongly impacted by efforts to legalize marijuana for both medicinal and recreational purposes. Nearly 70 % of high school seniors do not see regular marijuana use as harmful. Year after year, amount of use and perception and harm have been inversely proportional among adolescents. The potential benefits for life-limiting or debilitating conditions in pediatric groups appear to be more related to the action of cannabidiol (CBD, another active substrate of the plant; e.g., stimulants) rather than THC. Of concern, there are a number of studies that show persistent cognitive and brain functioning and structural changes in teens who beginning smoking marijuana heavily prior to age 16 years. Clearly more research is necessary.

Useful Clinical Resources

- National Institute on Drug Abuse. www.drugabuse.gov
- National institute on Alcohol Abuse and Alcoholism. www.niaaa.nih.gov
- Substance Abuse and Mental Health Services Administration. www.samhsa.gov
- www.monitoringthefuture.org

Sources

American Academy of Pediatrics, Committee on Substance Use and Prevention. Use of performance-enhancing substances. Pediatrics. 2005;115:1103–6.

American Academy of Pediatrics, Committee on Substance Use and Prevention. Substance use screening, brief intervention, and referral to treatment for pediatricians. Pediatrics. 2011;128(5):e1330–40.

American Academy of Pediatrics, Committee on Substance Use and Prevention. Testing for drugs of abuse in children and adolescents. Pediatrics. 2014;133:305–7.

American Academy of Pediatrics, Committee on Substance Use and Prevention. Adolescent drug testing policies in schools. Pediatrics. 2015;119(3):627.

Fiore MC, Jaen CR, Baker TB, et al. Treating tobacco use and dependence: 2008 update-clinical practice guideline. Rockville: Public Health Service, US Department of Health and Human Services; 2008. http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat2.chapter.28163

Hawkins JD, Catalano RF, Miller JY. Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: implications for substance use prevention. Psychol Bull. 1992;112(1):64–105.

Hazen EP, Goldstein MA, Goldstein MC. Mental health disorders in adolescents: a guide for parents, teachers, and clinicians. Piscataway: Rutgers University Press; 2010.

Johnston LD, O'Malley PM, Miech RA, et al. Monitoring the future national survey results on drug use, 1975–2015: overview, key findings on adolescent drug use. Ann Arbor: Institute for Social Research, The University of Michigan; 2016.

Kilpatrick DG, Acierno R, Saunders B, et al. Risk factors for adolescent substance abuse and dependence: data from a national sample. J Consult Clin Psychol. 2000;68(1):19–30.

Klein JD, Camenga DR. Tobacco prevention and cessation in pediatric patients. Pediatr Rev. 2004;25:17–26.

Levy S, Weiss R, Sherriff L, et al. An electronic screen for triaging adolescent substance use by risk levels. JAMA Pediatr. 2014;168(9):822–8.

Massachusetts Department of Public Health Bureau of Substance Abuse Services. Provider guide: adolescent screening, brief intervention, and referral to treatment using the CRAFFT screening tool. Boston: Massachusetts Department of Public Health; 2009.

Merikangas K, He J, Burnstein M, et al. Lifetime prevalence of mental disorders in US adolescents: results from the national comorbidity study-adolescent supplement (NCS-A). J Am Acad Child Adolesc Psychiatry. 2010;49(10):980–9.

National Institute of Alcohol Abuse and Alcoholism. Alcohol screening and brief intervention for youth: a practitioner's guide. http://www.niaaa.nih.gov; 2015

Pbert L, Moolchan ET, Muramoto MD, et al. The state of office-base interventions for youth tobacco use. Pediatrics. 2003;111:e6650–60.

Toumbourou JW, Stockwell T, Neighbors C, et al. Interventions to reduce harm associated with adolescent substance use. Lancet. 2007;369:1391–401.