



The Scope of Adolescent Prescription Drug Abuse

Abuse of prescription drugs by young people is a national epidemic. The authors survey the problem, review existing responses, and suggest practical ways emergency physicians can prevent and treat it.

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Abuse of prescription drugs has been a national problem for decades, but the number of young Americans using these drugs for nonmedical purposes is increasing at an alarming rate. According to the U.S. Department of Health and Human Services, the number of people aged 12 to 17 who reported nonmedical use of a psychotherapeutic medication within the past year increased by more than 60% between 1999 and 2006.

High-profile cases have thrust the problem into the popular press. In January 2008, 28-year-old actor Heath Ledger was found dead from acute in-

toxication by the combined effects of oxycodone, hydrocodone, diazepam, temazepam, alprazolam, and doxylamine. And in July 2007, former vice president Al Gore's son was arrested on suspicion of illegal possession of hydrocodone, alprazolam, diazepam, and amphetamine/dextroamphetamine. Recent public awareness campaigns have taken up the fight against prescription drug abuse as demonstrated in television ads by The Partnership for a Drug-Free America, emphasizing that abuse of these drugs can be just as dangerous as abuse of cocaine or heroin.

In 2005, an estimated 1.4 million emergency department visits in the United States were related to substance abuse and 37% involved prescription drug abuse. Prescription drugs have potentially serious side effects that can cause accidental disability or death. These drugs are also frequently implicated in suicide attempts, with 45% of all attempted suicides involving prescription pain medication and 56% involving sedatives or stimulants.

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Appreciating the magnitude of this problem among adolescents is a key first step toward recognizing, treating, and preventing prescription drug abuse. Understanding the basic pharmacology and toxicology of commonly abused prescription medications will enable emergency physicians to effectively diagnose and manage abuse of these drugs and cases of overdose.

DEFINING PRESCRIPTION DRUG ABUSE

How is prescription drug abuse defined? Using the three behavioral variables of intent, practice, and consequences, this definition has been proposed by Isaacson: "Prescription drug abuse is the use of a controlled substance for a reason other than that for which it was prescribed, often in dosages different than prescribed, resulting in disability or dysfunction, and often involving illegal activity and risk of harm to the abuser."

The National Institute on Drug Abuse designates prescription drugs with potential for abuse as "psychotherapeutics" and divides them into four categories in the following descending order of prevalence of abuse: pain relievers (see table on page 10), tranquilizers, stimulants, and sedatives.

The most recent National Survey on Drug Use & Health (NSDUH) from the Substance Abuse & Mental Health Services Agency showed the use of illicit drugs and overall teen drug use at a five-year low. The latest NSDUH data suggest that since 2002, illicit drug use among 12- to 17-year-olds is down 16%. The survey shows that in that same time period, marijuana use has decreased 18%, with a marked 25% decrease among teenage boys.

Unfortunately, these promising findings are overshadowed by the alarming increase in the number of young people who report misusing prescription drugs. In fact, more adolescents are now beginning drug use with pain relievers than with marijuana. According to the 2006 NSDUH, 5.2 million people aged 12 and older had used prescription pain medications nonmedically in the previous month, marking a 10% increase from 2005 (4.7 million). Among 12- to 17-year-olds, nonmedical use of prescription drugs increased by 12% during this same time period.

Among adolescents, pain relievers are the most commonly abused prescription drugs. In 2006, on an average day, 2517 adolescents used pain relievers nonmedically for the first time. One factor likely

contributing to the high rate of abuse of these drugs is their wide availability. A recent Associated Press analysis of U.S. Drug Enforcement Administration data shows that between 1997 and 2007, the volume of five major painkillers (codeine, hydrocodone, meperidine, morphine, and oxycodone) distributed in the United States rose by 90%. The most dramatic rise was seen in the sales of oxycodone, which increased nearly 600% between 1997 and 2005.

The concurrent decline in the use of illicit street drugs and the increase in abuse of prescription drugs may be due to the perception among young people that prescription drugs are less harmful than street drugs. Also, prescription drugs are often easier to obtain—they are commonly traded among friends or stolen from family members. In addition, widespread direct-to-consumer advertising for psychotherapeutics may have helped rationalize prescription drug abuse in the minds of many young people.

DEMOGRAPHIC TRENDS

The prevalence of prescription drug abuse by adolescents aged 12 to 17 varies by region, ethnicity, and gender. Rates of abuse are highest in small cities and western states and lowest in urban areas of the northeast. Abuse of prescription medications is highest among American Indians and Alaska natives (17%) and lowest among Asians (7%). In general, Caucasians have higher rates of misuse of prescription psychotherapeutic drugs than African American or Asians.

Among 12- to 17-year-olds, the rates of prescription drug abuse are higher among females than males for any prescription psychotherapeutic drug, including pain relievers, stimulants, and tranquilizers. This gender difference among adolescents is notable, because prescription drug abuse is more prevalent among males in all other age groups. The apparent reversal in gender vulnerability may

be due to unique pressures faced by adolescent females. Whereas males typically tend to abuse drugs for sensation-seeking purposes, females may abuse drugs to increase their confidence, reduce tension, cope with problems, lose inhibitions, or lose weight. These factors, combined with easier access and less social stigma, make prescription drug abuse a unique threat for adolescent females. *continued*

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Lifetime Nonmedical Use of Pain Relievers in People Aged 12 and Older*

Pain reliever**	Estimated number of people	Percent of population	Percent of nonmedical users of pain relievers
any pain reliever	30,862	13.0	100.0
propoxyphene (Darvocet); propoxyphene napsylate/acetaminophen; acetaminophen/codeine	19,366	8.1	62.7
hydrocodone/acetaminophen	15,172	6.4	49.2
oxycodone/acetaminophen; oxycodone/aspirin	10,473	4.4	33.9
codeine	6859	2.9	22.2
hydrocodone	5398	2.3	17.5
meperidine	2788	1.2	9.0
oxycodone	2609	1.1	8.5
morphine	2067	0.9	6.7
methadone	1131	0.5	3.7
tramadol (Ultram)	1060	0.4	3.4
hydromorphone	963	0.4	3.1
acetaminophen/codeine	772	0.3	2.5
aspirin/butalbital/caffeine	492	0.2	1.6
pentazocine	457	0.2	1.5
butalbital/acetaminophen/caffeine	455	0.2	1.5
propoxyphene	321	0.1	1.0
tramadol	188	0.1	0.6
butorphanol tartrate	148	0.1	0.5
pentazocine/naloxone	86	0.0	0.3
pentazocine/acetaminophen	71	0.0	0.2
propoxyphene (SK-65)	42	0.0	0.1

*annual averages based on 2002-2004

**in descending order of prevalence

Source: Adapted from SAMHSA, Office of Applied Studies, National Survey on Drug Use and Health, 2002, 2003, and 2004 (see Suggested Reading)

Several risk factors correlate significantly with nonmedical use of prescription drugs among adolescents. These include mental health treatment, use of illicit drugs, female gender, and binge drinking. Self-reported lack of religious beliefs, family conflict, and sensation-seeking behaviors are also risk factors.

DIVERSION OF PRESCRIPTION DRUGS

Diversion is the primary way in which prescription drugs are obtained for abuse by adolescents. In addition to the long-established routes of drug diversion—such as theft, forgery, doctor shopping, and malingering—there is now a growing trend of prescription drug exchange among teenagers, includ-

ing selling, trading, or sharing medications originally obtained legally through an appropriate doctor-patient relationship. In fact, the NSDUH data indicate that while all prescriptions for opioid medications have increased, most people abusing these medications obtain them from family or friends. And a growing threat comes from the Internet, where anonymity helps teenagers obtain medications from no-prescription Web sites.

According to DEA data, from 1997 to 2004, there was a 556% increase in the number of grams of oxycodone prescribed. Methadone, fentanyl, morphine, hydrocodone, and hydromorphone increased 812%, 400%, 142%, 178%, and 172%, respectively. Similarly, the National Ambulatory Medical Care Survey data from 1994 to 2001 showed an increase in stimulant and anxiety/sedative medication prescriptions for 14- to 18-year-olds of 209% and 385%, respectively. These increases may stem from a fear of litigation for under-treating patients' pain, a paradigm shift in pain management, the ever-increasing use of emergency departments for chronic pain, or the pharmaceutical industry's influence. Other factors may include evaluation of providers made by the Joint Commission as well as the interest of individual hospitals in their patient satisfaction survey results.

A Web-based survey of 1086 secondary students conducted by Boyd in 2005 found that 49% had received a doctor's prescription for a sleeping aid, sedative, stimulant, or pain medication at some point in their lives. In addition, 24% of students with legal prescriptions reported giving away their medication to other students, and significantly more girls reported doing this than boys (27.5% versus 17.4%). These statistics illustrate the great potential for abuse in this population by virtue of sheer access to controlled substances.

The Internet offers nearly endless opportunities to buy from no-prescription Web sites. The U.S. Government Accountability Office estimated there were approximately 400 Internet pharmacies selling drugs illegally in 2003, with about 200 based overseas. Only

Street Value of Selected Prescription Drugs

Generic name	Brand cost/100	Street value/100
acetaminophen w/codeine, 30 mg	\$56	\$800
diazepam, 10 mg	\$298	\$1000
hydromorphone	\$89	\$10,000
methylphenidate	\$88	\$1500
oxycodone	\$1081	\$8000

Source: Kentucky All Schedule Prescription Electronic Reporting (KASPER), 2006.

a credit card is necessary for these purchases. Search engines help buyers find the purchasing sites. In 27 Internet searches using terms such as "no prescription vicodin," Gordon had an 80% to 90% hit rate for no-prescription Web sites (with a complete lack of links to addiction-related Web sites). Less discreet methods for purchasing prescription psychotherapeutic medications are also available, although they are often more expensive (see table).

CLASSES OF PSYCHOTHERAPEUTIC DRUGS

Most teenagers abuse prescription drugs from three primary classes: opioid pain relievers, stimulants, and sedative-hypnotics. Dose-response curves can suggest anticipated effects from prescription medication abuse, but individual responses vary, and anyone taking a prescribed medication for nonmedical purposes is at risk for adverse effects. The following is a brief review of presenting signs and symptoms, appropriate interventions, and long-term complications of prescription drug abuse and overdose.

Opioids. Opioids are the most popular class of drugs used for nonmedical purposes. This class consists of both naturally derived opiates (heroin, morphine, and codeine), semisynthetic opioids (hydrocodone and oxycodone), and synthetically-made opioids (fentanyl, methadone, and meperidine). Following ingestion, the initial effect is relaxation and blunted response to pain. With increasing doses, drowsiness occurs along with a clinically insignificant decrease in heart rate and blood pressure. Other common

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Classification of Controlled Substances

Schedule	Restrictions	Examples of drugs
I no approved medical use	illicit, cannot be prescribed	heroin, PCP, LSD
II high abuse potential	no refills or verbal orders allowed; some states require triplicate prescriptions	morphine, oxycodone, cocaine, methamphetamine, secobarbital
III moderate abuse potential	maximum 5 refills every 6 months; verbal orders allowed in some states	hydrocodone or codeine combined with acetaminophen
IV low to moderate abuse potential	maximum 5 refills every 6 months; verbal orders allowed	benzodiazepines
V limited abuse potential	may be OTC in some states	diphenoxylate

findings include muscle flaccidity, pupillary miosis, bradypnea, and decreased bowel sounds. Of note, meperidine differs from other opioids in that it does not cause miosis. Significant overdose results in the classic presentation of central nervous system (CNS) depression, respiratory depression, and miosis that may culminate in coma, apnea, and even death.

Oxycodone and its sustained-release form are of particular concern, in part due to their prevalence. According to the Monitoring the Future survey, there was a 5.3% prevalence of sustained-release oxycodone use in 12th graders in 2007. When taken as prescribed, 80 mg of oxycodone is slowly released over

a 12-hour period. However, many methods are used to circumvent the time-release function of the pill. Known as “hillbilly heroin,” crushed sustained-release oxycodone tablets are rapidly absorbed.

Insufflation and injection are methods that result in faster absorption and more intense euphoria. Injection of sustained-release oxycodone requires more preparation and can cause significant intravascular complications from impurities. The basic process involves removal of the wax coating, crushing the pill into a fine powder, mixing it with water and liquefying it over heat, extracting any remaining wax, and finally filtering it with cotton before injection.

Treatment for opioid overdose consists of airway

and ventilatory support, with special consideration given to opioid antagonists like naloxone that competitively inhibit the binding of opioid agonists. The goal of naloxone therapy is to achieve appropriate spontaneous ventilation and not necessarily complete arousal. Attention should be paid to preventing withdrawal symptoms, and physicians should be aware of the relatively short half-life of naloxone, especially compared to methadone, that can result in re sedation following initial improvement.

Stimulants. Stimulants include amphetamines and amphetamine-like drugs, such as phendimetrazine and benzphetamine, which are marketed as weight loss medications. The two most commonly abused prescription stimulants are methylphenidate and dextroamphetamine, with lifetime use rates of 1.7% and 1.1%, respectively. But as a class, prescription diet pills have a higher rate of nonmedical lifetime use (3.4%). Amphetamines have a low therapeutic index, but people using them are known to develop high tolerances with ongoing use. Clinical responses to amphetamines can be described as sympathomimetic effects. Central nervous system signs and symptoms range from anxiety and euphoria to severe agitation, hyperthermia, and seizures. Tachycardia, hypertension, diaphoresis, and tremors are classic symptoms. Potentially lethal complications include tachyarrhythmias, myocardial infarction, rhabdomyolysis, status epilepticus, and intracranial hemorrhage. Chronic use can lead to cardiomyopathy, dental decay, paranoia, and pulmonary hypertension.

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The mainstay of treatment is blunting the sympathomimetic response with benzodiazepines and addressing secondary complications of stimulant use. Managing agitation, hyperthermia, rhabdomyolysis, seizures, and tachyarrhythmias are critical following severe toxicity.

Sedative-hypnotics. There are a variety of drug classes that fall under the umbrella of sedative-hypnotic agents, including benzodiazepines, barbiturates, skeletal-muscle relaxants, antidepressants, and antihistamines. Benzodiazepines dominate this assorted category, but numerous other medications pose serious risk with nonmedical use. Despite their preponderance, benzodiazepines cause relatively few deaths compared to barbiturates, especially when used alone.

The clinical presentation varies according to the type of sedative-hypnotic ingested, but some common features include drowsiness, CNS depression, stupor, nystagmus, hypothermia, respiratory depression, and coma. Though ataxia may be the only presenting sign of unintentional benzodiazepine ingestion in the pediatric population, CNS depression is also usually present. Cardiovascular instability can result either indirectly from respiratory compromise or directly from depression of myocardial contractility, medullary depression, and vasodilation. Ancillary signs, such as barbiturate blisters, may also occasionally assist with diagnosis.

The primary treatment is still airway support and symptomatic care. Although rarely indicated following benzodiazepine poisoning, flumazenil is a competitive inhibitor of benzodiazepine receptors. It should only be considered in patients who are not taking benzodiazepines chronically (for example, in unintentional pediatric ingestion) or following iatrogenic sedation. Use of flumazenil in patients with chronic benzodiazepine use or with a lowered seizure threshold may precipitate an acute withdrawal state, arrhythmias, and seizures. With proper airway support and monitoring, most of these patients improve clinically as the drugs are metabolized.

GOVERNMENT RESPONSE

Several U.S. government agencies have enforced controlled substance laws in an attempt to curb distribution of drugs that have abuse potential. These laws classify drugs into schedules I through V and restrict prescription of controlled medications (see table on page 20). Schedule I drugs are those judged to have no medicinal or therapeutic benefit and the highest

risk of adverse effects. Schedule V drugs are deemed to have high therapeutic benefit and lower risk.

The government continues to address the problem of prescription drug abuse by collecting data and designing interventions, including updating, revising, and enforcing controlled substance laws. The DEA has used a tracking system to determine which practitioners and pharmacies are likely to be illicitly distributing controlled substances via the Internet. Also, the agency is working to educate and, when necessary, take legal action against pharmaceutical distributors that are providing large amounts of medication for distribution by Internet pharmacies. As the problem continues to grow and demand more attention, more legal action may need to be taken against those found to be negligent in distributing and prescribing controlled substances.

PREVENTIVE STRATEGIES

Because continuity of care is absent in emergency medicine settings, emergency physicians must intervene during the patient encounter to limit the non-medical use of prescription drugs. Three important intervention techniques are: recognizing the cardinal features of patients who try to obtain psychotherapeutic medications for nonmedical purposes, adapting prescription writing habits to more safely provide appropriate interventions, and educating patients and parents about prescription drug abuse.

Recognizing high-risk patients. In a short amount of time, emergency physicians must gather as much information as possible about a patient's illness and personal situation. Two obvious red flags are patterns in medical records indicating a history of prescription drug abuse and verbal aggression when confronted about the issue. But often, a more detailed history is necessary to illicit risk factors for abuse. These risk factors include a history of substance abuse or chronic pain, psychiatric disorders, and even smoking within one hour of waking in the morning.

According to a National Center on Addiction and Substance Abuse survey, 43% of all health care providers neglect to ask about prescription drug abuse during the patient history. But providers must be thorough when taking a history

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and reviewing old records in order to identify comorbid conditions and other independent risk factors for prescription drug abuse. If enough risk factors are present, strong consideration should be given to non-narcotic pain treatment and referral to a primary physician for multidisciplinary intervention.

Several screening tools are available that may increase the sensitivity while providing standardization of the process, such as the Screener and Opioid Assessment for Patients with Pain.

Adapting prescription-writing habits. The way providers write prescriptions can have a direct impact on medication diversion. In emergency department settings, prescriptions for sedatives and stimulants are less common than those for opioid pain medications. While care must be taken to provide adequate pain management, prescribing lower-potency opioids or even nonnarcotic pain relievers is often appropriate. Emergency physicians should also limit the total number of pills prescribed, and refills should not be provided, if for no other reason than to encourage timely follow-up. Delayed-release forms of opioids should be avoided for treatment of acute pain.

Similar to the protective measures built into delayed-release stimulants, efforts are now underway to provide such safeguards for opioids. For exam-

ple, research on viscous gel oxycodone may yield a drug form that is completely resistant to injection, which is a common practice with opioid pills that are crushed and mixed with a solvent.

Other efforts are focused

on combining opioids with the antagonist naloxone to blunt the immediate euphoric effects. Using watermark paper for computer-generated prescriptions and writing out the number of pills to be dispensed with handwritten prescriptions are fundamental practices that can also decrease forgery and diversion.

Educating patients and parents. Teaching patients about the potential for drug tolerance, dependence, and abuse plays an integral role in combating this problem. Education is particularly relevant in the teenage population, where parental involvement is vital. Most prescription psychotherapeutic medications diverted by teenagers for nonmedical use come from family or friends, so educating parents about safe-

guarding prescriptions in the household is critical.

Unfortunately, a huge discrepancy exists between what parents believe about their children's prescription drug use and what actually occurs. While 21% of teenagers report abusing prescription pain medication, only 1% of parents report that it is "extremely or very likely" that their child has done this. For parents who actively address this issue with their children, the result is clear: They can reduce the likelihood of drug abuse by up to 50%. In the end, teaching parents about the dangers of prescription medications may be the single most important thing emergency physicians can do to reduce prescription drug abuse in the teenage population. □

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