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Prescription and Over-the-Counter Medications

Prescription medications such as pain relievers, central nervous system (CNS) depressants (tranquilizers and sedatives), and stimulants are highly beneficial treatments for a variety of health conditions. Pain relievers enable individuals with chronic pain to lead productive lives; tranquilizers can reduce anxiety and help patients with sleep disorders; and stimulants help people with attention-deficit hyperactivity disorder (ADHD) focus their attention. Most people who take prescription medications use them responsibly. But, when abused—that is, taken by someone other than the patient for whom the medication was prescribed, or taken in a manner or dosage other than what was prescribed—prescription medications can produce serious adverse health effects and can lead to addiction.

Patients, healthcare professionals, and pharmacists all have roles in preventing the abuse[1] of and addiction to prescription medications. For example, patients should follow the directions for use carefully, learn what effects and side effects the medication could have, and inform their doctor/pharmacist whether they are taking other medications [including over-the-counter (OTC) medications or health supplements], since these could potentially interact with the prescribed medication. The patient should read all information provided by the pharmacist. Physicians and other healthcare providers should screen for past or current substance abuse in the patient during routine examination, including asking questions about what other medications the patient is taking and why. Providers should note any rapid increases in the amount of a medication needed or frequent requests for refills before the quantity prescribed should have been finished, as these may be indicators of abuse.[1]

Similarly, some OTC medications, such as cough and cold medicines containing dextromethorphan, have beneficial effects when taken as recommended, but they can also be abused and lead to serious adverse health consequences. Parents should be aware of the potential for abuse of these medications, especially when consumed in large quantities, which should signal concern and the possible need for intervention.

Commonly Abused Prescription Medications

Although many prescription medications can be abused, the following three classes are most commonly abused:

- **Opioids**—usually prescribed to treat pain.
- **CNS Depressants**—used to treat anxiety and sleep disorders.
- **Stimulants**—prescribed to treat ADHD and narcolepsy.

Opioids

What are Opioids?

Opioids are commonly prescribed because of their effective analgesic, or pain-relieving, properties. Studies have shown that properly managed medical use of opioid analgesic compounds (taken exactly as prescribed) is safe, can manage pain effectively, and rarely causes addiction.

Among the compounds that fall within this class are hydrocodone (e.g., Vicodin), oxycodone (e.g., OxyContin—an oral, controlled-release form of the drug), morphine, fentanyl, codeine, and related medications. Morphine and fentanyl are often used to alleviate severe pain, while codeine is used for milder pain. Other examples of opioids that can be prescribed to relieve pain include propoxyphene (Darvon); hydromorphone (Dilaudid); and meperidine (Demerol), which is used less often because of its side effects. In addition to their effective pain-relieving properties, some of these medications can be used to relieve severe diarrhea (for example, Lomotil, also known as diphenoxylate) or severe coughs (codeine).

How are Opioids Abused?

Opioids can be taken orally, or the pills may be crushed and the powder snorted or injected. A number of overdose deaths have resulted from the latter routes of administration, particularly with the drug OxyContin, which was designed to be a slow-release formulation. Snorting or injecting opioids results in a rapid release of the drug into the bloodstream, exposing the person to high doses and causing many of the reported overdose reactions.

How do Opioids Affect the Brain?

Opioids act by attaching to specific proteins called opioid receptors, which are found in the brain, spinal cord, and gastrointestinal tract. When these compounds attach to certain opioid receptors in the brain and spinal cord, they can effectively change the way a person experiences pain.

In addition, opioid medications can affect regions of the brain that mediate what one perceives as pleasure, resulting in the initial euphoria or sense of well-being that many opioids produce. Repeated abuse of opioids can lead to addiction—a chronic, relapsing disease, characterized by compulsive drug seeking and abuse despite its known harmful consequences.

What Adverse Effects Can be Associated with Opioids?

Opioids can produce drowsiness, cause constipation, and, depending upon the

amount taken, depress breathing. Taking a large single dose could cause severe respiratory depression or death.

These medications are only safe to use with other substances under a physician's supervision. Typically, they should not be used with alcohol, antihistamines, barbiturates, or benzodiazepines. Because these substances slow breathing, their combined effects could lead to life-threatening respiratory depression.

What Happens When you Stop Taking Opioids?

Patients who are prescribed opioids for a period of time may develop a physical dependence on them, which is not the same as addiction. Repeated exposure to opioids causes the body to adapt, sometimes resulting in tolerance (that is, more of the drug is needed to achieve the desired effect compared to when it was first prescribed) and withdrawal symptoms upon abrupt cessation of drug use. Thus, individuals taking prescribed opioid medications should not only be given these medications under appropriate medical supervision, but should also be medically supervised when stopping use in order to reduce or avoid withdrawal symptoms. Symptoms of withdrawal can include restlessness, muscle and bone pain, insomnia, diarrhea, vomiting, cold flashes with goose bumps ("cold turkey"), and involuntary leg movements.

Are there Treatments for Opioid Addiction?

Individuals who abuse or are addicted to prescription opioid medications can be treated. Initially, they may need to undergo medically supervised detoxification to help reduce withdrawal symptoms—however, that is just the first step. Options for effectively treating addiction to prescription opioids are drawn from research on treating heroin addiction. Behavioral treatments combined with medications have proven effective. Currently used medications are:

- *Methadone*, a synthetic opioid that eliminates withdrawal symptoms and relieves craving, has been used for more than 30 years to successfully treat people addicted to heroin.
- *Buprenorphine*, another synthetic opioid, is a more recently approved medication for treating addiction to heroin and other opiates. It can be prescribed in a physician's office and has a better safety profile than methadone.
- *Naltrexone* is a long-acting opioid receptor blocker that can be employed to help prevent relapse. It is not widely used, however, because of poor compliance, except in highly motivated individuals (e.g., physicians at risk of losing their medical license). It should be noted that this medication can only be used for someone who has already been

detoxified, since it can produce severe withdrawal symptoms in a person continuing to abuse opioids.

- *Naloxone* is a short-acting opioid receptor blocker that counteracts the effects of opioids and can be used to treat overdoses.

CNS Depressants

What are CNS Depressants?

CNS depressants (e.g., tranquilizers, sedatives) slow normal brain function. In higher doses, some CNS depressants can be used as general anesthetics or pre-anesthetics.

CNS depressants can be divided into three groups, based on their chemistry and pharmacology:

- *Barbiturates*, such as mephobarbital (Mebaral) and sodium pentobarbital (Nembutal), are used as preanesthetics, promoting sleep.
- *Benzodiazepines*, such as diazepam (Valium), alprazolam (Xanax), and estazolam (ProSom), can be prescribed to treat anxiety, acute stress reactions, panic attacks, convulsions, and sleep disorders. For the latter, benzodiazepines are usually prescribed only for short-term relief of sleep problems because of the development of tolerance and risk of addiction.
- *Newer sleep medications*, such as zolpidem (Ambien), zaleplon (Sonata), and eszopiclone (Lunesta), are now more commonly prescribed to treat sleep disorders. These medications are non-benzodiazepines that act at a subset of the benzodiazepine receptors and appear to have a lower risk for abuse and addiction.

How are CNS Depressants abused?

CNS depressants are usually taken orally, sometimes in combination with other drugs or to counteract the effects of other licit or illicit drugs (e.g., stimulants).

How do CNS Depressants Affect the Brain?

Most of the CNS depressants have similar actions in the brain—they enhance the actions of the neurotransmitter gamma-aminobutyric acid (GABA). Neurotransmitters are brain chemicals that facilitate communication between brain cells. GABA works by decreasing brain activity. Although different classes of CNS depressants work in unique ways, it is ultimately their ability to increase GABA activity that produces a drowsy or calming effect.

What Adverse Effects Can Be Associated with CNS Depressants?

Despite their beneficial effects for people suffering from anxiety or sleep disorders, barbiturates and benzodiazepines can be addictive and should be used only as prescribed.

CNS depressants should not be combined with any medication or substance that causes drowsiness, including prescription pain medicines, certain OTC cold and allergy medications, or alcohol. If combined, they can slow both the heart and respiration, which can be fatal.

What Happens When you Stop Taking CNS Depressants?

Discontinuing prolonged use or abuse of high doses of CNS depressants can lead to serious withdrawal symptoms. Because it works by slowing the brain's activity, when one stops taking a CNS depressant, this activity can rebound to the point that seizures can occur. Someone who is either thinking about ending their use of a CNS depressant, or who has stopped and is suffering withdrawal, should seek medical treatment.

Are there Treatments for Addiction to CNS Depressants?

In addition to medical supervision during withdrawal, counseling in an inpatient or outpatient setting can help people who are overcoming addiction to CNS depressants. For example, cognitive-behavioral therapy has been used successfully to help individuals in treatment for abuse of benzodiazepines. This type of therapy focuses on modifying a patient's thinking, expectations, and behaviors while simultaneously increasing their skills for coping with various life stressors.

Stimulants

What are Stimulants?

Stimulants such as amphetamines (Adderal, Dexedrine) and methylphenidate (Concerta, Ritalin) have chemical structures that are similar to key brain neurotransmitters called monoamines, which include dopamine and norepinephrine—stimulants increase the levels of these chemicals in the brain and body. This, in turn, increases blood pressure and heart rate, constricts blood vessels, increases blood glucose, and opens up the pathways of the respiratory system. Stimulants increase alertness, attention, and energy; and because they increase dopamine, they can produce a sense of euphoria.

Historically, stimulants were used to treat asthma and other respiratory problems, obesity, neurological disorders, and a variety of other ailments. As their potential for abuse and addiction became apparent, the use of stimulants began to wane. Now, stimulants are prescribed for treating only a few health conditions, most notably ADHD, narcolepsy, and, in some instances, depression that has not responded to other treatments.

How are Stimulants Abused?

Stimulants may be taken orally, but some abusers crush the tablets, dissolve them in water, and inject the mixture; complications can arise from this because insoluble fillers in the tablets can block small blood vessels. Stimulants have been

abused for both "performance enhancement" and recreational purposes (i.e., to get high).

How Do Prescription Stimulants Affect the Brain?

All stimulants work by increasing dopamine levels in the brain. Dopamine is a brain chemical (neurotransmitter) associated with pleasure, movement, and attention. The therapeutic effect of stimulants is achieved by slow and steady increases of dopamine that are similar to the natural production of this chemical by the brain. The doses prescribed by physicians start low and increase gradually until a therapeutic effect is reached. However, when taken in doses and routes other than those prescribed, stimulants can increase brain dopamine in a rapid and highly amplified manner—as do most other drugs of abuse—disrupting normal communication between brain cells, producing euphoria, and increasing the risk of addiction.

What Adverse Effects Can Be Associated with Stimulant Abuse?

The consequences of stimulant abuse can be extremely dangerous. Taking high doses of a stimulant can result in an irregular heartbeat, dangerously high body temperatures, and/or the potential for cardiovascular failure or seizures. Taking high doses of some stimulants repeatedly over a short period of time can lead to hostility or feelings of paranoia in some individuals.

Stimulants should not be mixed with antidepressants, which may enhance the effects of a stimulant, or OTC cold medicines containing decongestants, which may cause blood pressure to become dangerously high or lead to irregular heart rhythms.

Are there Treatments for Stimulant Addiction?

Treatment of addiction to prescription stimulants is based on behavioral therapies proven effective for treating cocaine or methamphetamine addiction. At this time, there are no proven medications for the treatment of stimulant addiction.

Depending on the patient's situation, the first step in treating prescription stimulant addiction may be to slowly decrease the drug's dose and attempt to treat withdrawal symptoms. This process of detoxification could then be followed with one of many behavioral therapies. Contingency management, for example, improves treatment outcomes by enabling patients to earn vouchers for drug-free urine tests; the vouchers can be exchanged for items that promote healthy living. Cognitive-behavioral therapies—which teach patients skills to recognize risky situations, avoid drug use, and cope more effectively with problems—are proving beneficial. Recovery support groups may also be effective in conjunction with a behavioral therapy.

Dextromethorphan (DXM)

What is DXM?

Dextromethorphan is the active cough suppressant found in OTC cough and cold medications. When taken in recommended doses, these medications are safe and effective.

How is DXM Abused?

DXM is taken orally. In order to experience the mind-altering effects of DXM, excessive amounts of liquid or gelcaps must be consumed. The availability and accessibility of these products make them a serious concern, particularly for youth, who tend to be their primary abusers.

What are the Consequences Associated with the Abuse of DXM?

In very large quantities, DXM can cause effects similar to that of ketamine and PCP by affecting similar sites in the brain. These effects can include impaired motor function, numbness, nausea/vomiting, and increased heart rate and blood pressure. On rare occasions, hypoxic brain damage has occurred due to the combination of DXM with decongestants often found in these medications.

What are the Trends in the Abuse of Prescription Drugs and Cough Medicine?

Monitoring the Future (MTF) Survey[2]

Each year, the Monitoring the Future (MTF) survey assesses the extent of drug use among 8th-, 10th-, and 12th-graders nationwide. Nonmedical use of *any* prescription drug is reported only for 12th-graders. In 2007, 21.7 percent reported lifetime[3] use (down significantly from 2006); 15.4 percent reported past-year use; and 7.6 percent reported past-month use. Prescription and OTC medications were the most commonly abused drugs by high school students after marijuana. They represent 6 of the top 10 illicit drugs reported by 12th-graders.

Prescription Painkillers. In 2002, MTF added questions to the survey about past-year nonmedical use of Vicodin and OxyContin. For Vicodin, past-year nonmedical use has remained stable at high levels for each grade since its inclusion in the survey.

Rates of abuse in 2007	8th Grade	10th Grade	12th Grade
Vicodin	2.7%	7.2%	9.6%
OxyContin	1.8%	3.9%	5.2%

CNS Depressants. Nonmedical use of *tranquilizers* (benzodiazepines and others) has remained stable for all three grades in all prevalence periods (lifetime, past-year, and past-month use). For *sedatives* (barbiturates), data are collected only from 12th-graders.

Rates of abuse in 2007	8th Grade	10th Grade	12th Grade
Tranquilizers	2.4%	5.3%	6.2%
Sedatives	---	---	6.2%

Stimulants. Nonmedical use of stimulants is broken up by the type of stimulant used: amphetamines, methamphetamine, and Ritalin. Amphetamine and methamphetamine abuse have been decreasing among 8th-, 10th-, and 12th-graders over the past 6 years; nonmedical use of Ritalin has decreased in 10th-graders during the same time period.

Rates of abuse in 2007	8th Grade	10th Grade	12th Grade
Amphetamines	4.2%	8.0%	7.5%
Methamphetamine	1.1%	1.6%	1.7%
Ritalin	2.1%	2.8%	3.8%

Cough Medicine. In 2006, a question about the use of cough and cold medicines to get high was asked for the first time.

Rates of abuse in 2007	8th Grade	10th Grade	12th Grade
Cough Medicine	4.0%	5.4%	5.8%

National Survey on Drug Use and Health (NSDUH)[4]

According to the 2006 NSDUH, an estimated 7 million persons, or 2.8 percent of the population, age 12 or older had used prescription psychotherapeutic medications nonmedically in the month prior to being surveyed. This includes 5.2 million using pain relievers (an increase from 4.7 million in 2005), 1.8 million using tranquilizers, 1.2 million using stimulants, and 0.39 million using sedatives.

Past-month nonmedical use of prescription-type drugs among young adults aged 18 to 25 increased from 5.4 percent in 2002 to 6.4 percent in 2006. This was primarily due to an increase in pain reliever use, which was 4.1 percent in 2002 and 4.9 percent in 2006. However, nonmedical use of tranquilizers also increased over the 5-year period, from 1.6 to 2.0 percent.

Among persons aged 12 or older who used pain relievers nonmedically in the past 12 months, 55.7 percent reported that they got the drug most recently used from someone they knew and that they did not pay for it. Another 19.1 percent reported that they obtained the drug from one doctor. Only 3.9 percent purchased the pain reliever from a drug dealer or other stranger, and only 0.1 percent reported buying the drug on the Internet. Among those who reported getting the pain reliever from a friend or relative for free, 80.7 percent reported

in a followup question that the friend or relative had obtained the drug from just one doctor.

Other Information Sources

For more information on addiction to prescription medications, visit **http://www.drugabuse.gov/drugpages/prescription.html.**

[1] A common vocabulary has not been established in the field of prescription drug abuse. Because much of the survey data collected in this area refer to nonmedical use of prescription drugs, this definition of "abuse," rather than that of the Diagnostic and Statistical Manual of Mental Disorders (DSM), is used. Also, because physical dependence to prescription medications can develop during medically supervised appropriate use, the term "addiction" is used to reflect dependence as defined by the DSM.

[2] These data are from the 2007 Monitoring the Future survey, funded by the National Institute on Drug Abuse, National Institutes of Health, Department of Health and Human Services, and conducted annually by the University of Michigan's Institute for Social Research. The survey has tracked 12th-graders' illicit drug use and related attitudes since 1975; in 1991, 8th- and 10th-graders were added to the study. The latest data are online at **www.drugabuse.gov**.

[3] "Lifetime" refers to use at least once during a respondent's lifetime. "Past year" refers to use at least once during the year preceding an individual's response to the survey. "Past month" refers to use at least once during the 30 days preceding an individual's response to the survey.

[4] NSDUH (formerly known as the National Household Survey on Drug Abuse) is an annual survey of Americans age 12 and older conducted by the Substance Abuse and Mental Health Services Administration. Copies of the latest survey are available at **www.samhsa.gov** and from NIDA at 877-643-2644.

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