Mindful
Continuing Education

Analyzing Drugs of Abuse: Overview, Treatment, and Prevention

Introduction

Substance misuse is a major public health challenge that impacts individuals, families, communities, and society as a whole. Millions of people in the United States are using illicit drugs, misusing prescription drugs, and participating in binge drinking or have other issues with alcohol misuse. Not only is the annual economic impact of substance misuse in the billions of dollars, drug overdoses, both fatal and nonfatal, continue to impact communities nationwide. Providing drug education and prevention resources and services designed to reach targeted populations and address particular problems and needs is critical. Behavioral health providers need to be able to differentiate between drug abuse, dependence, and addiction and understand the abuse potential of numerous substances. Providers need to have an understanding of the harms and consequences of drug use, a drug's effects on the body and mind, overdose potential, origin, legal status, and other necessary facts on drugs of choice in their communities for them to be able to provide effective substance misuse treatment and prevention.

Substance Use Disorders

DSM-5-TR states that a substance use disorder consists of cognitive, behavioral, and psychological symptoms and that despite these symptoms and other substance-induced problems, individuals continue to use the substance(s) (APA, 2022).

For a person to be diagnosed with a substance use disorder, the DSM-5-TR assesses eleven different criteria that fall into four categories. They are as follows:

Impaired Control

1. The person takes the substance in larger amounts or over a longer period of time than planned.

2. The person desires to cut back use and may have multiple unsuccessful attempts to reduce or terminate use.

3. The person spends a lot of time obtaining the substance, using it, or recovering from its effects. In more severe use, almost all of the person's daily activities revolve around substance use.

4. The person experiences cravings to use the substance. Craving is defined as the intense urge or desire for a drug.

Social Impairment

5. The repeated substance use may hinder that individual's ability to fulfill obligations at work, school, or home

6. The person may continue to use despite recurring social or interpersonal problems that are caused or exacerbated by substance use.

7. The person may give up social, occupational, or recreational activities that may have previously been important because of substance use.

Risky Use

8. The person may use substances in physically hazardous situations.

9. The person may continue to use despite knowing such use is causing physical or psychological problems.

Pharmacological

10. Tolerance: The person needs an increased amount of the substance to achieve the desired effect, or a noticeably reduced effect is experienced when the same amount is consumed.

11. Withdrawal: Individuals who have used a substance heavily may experience withdrawal symptoms when the concentration of the substance decreases in their system. Withdrawal symptoms can vary greatly across substance

categories but are often unpleasant enough to cause the person to use the substance to relieve the symptoms.

Substance use disorders can range from mild to severe and are based on the number of symptoms the person is experiencing. Mild severity is the presence of two to three of the above symptoms, moderate severity is the presence of four to five symptoms, and severe is the presence of six or more symptoms. A person's severity rating may change based on a reduction or increase in the amount or frequency of use.

Addiction

Addiction is also known as psychological dependence. It is the repetitive and compulsive use of a substance despite the negative consequences to the person's life or health. Individuals may use substances in an unhealthy way without being addicted to the substance.

Addictive drugs activate circuits in the brain that respond to pleasures. Every brain has these pleasure circuits, so every person has the potential to become addicted to a drug. Many different factors in a person's life play a role in the development of addiction, including family history, personality, mental health, life experiences, and social and physical environment.

Addiction is also not the same as physical dependence. An example of a physical dependence is the headache some coffee drinkers experience if they miss their daily cup of coffee. Many people with moderate to severe substance use disorder are both addicted and physically dependent on the substance they use.

There are two parts to the addiction process, the pleasure of starting and the pain of stopping.

When individuals initially use a substance, they often experience an unexpected pleasure from the drug, as well as an increase in dopamine. This dopamine rush is

associated with pleasure and reward, which occurs even in anticipation of substance use. The brain remembers this feeling and wants the pleasure to reoccur.

The second part of the addiction process occurs as the drug's effects begin to wane and withdrawal symptoms begin. While withdrawal effects can range from mild to severe, depending on the individual and the drug itself, there is a general unpleasant feeling that occurs, which is the opposite of the pleasurable feeling that was initially present. At this point, rather than using to feel good, individuals may continue to use to avoid the unpleasant feelings of withdrawal (Kuhn et al., 2019).

Drug Classification

Alcohol

Alcohol is one of the most used drugs in the world and is the most commonly misused substance in the United States.

Alcohol use includes: beer, wine, fortified wine, spirits, liquor, whiskey

Alcohol use disorder is often labeled as alcoholism. Alcohol use disorder can range from mild, moderate, or severe. It is diagnosed when a person answers yes to two or more of the following questions.

In the past year have you:

- Had times when you ended up drinking more, or longer than you intended?
- More than once wanted to cut down or stop drinking, or tried to, but couldn’t?
- Spent a lot of time drinking? Or being sick or getting over the aftereffects?
- Experienced craving—a strong need, or urge, to drink?

- Found that drinking—or being sick from drinking—often interfered with taking care of your home or family? Or caused job troubles? Or school problems?
- Continued to drink even though it was causing trouble with your family or friends?
- Given up or cut back on activities that were important or interesting to you, or gave you pleasure, in order to drink?
- More than once gotten into situations while or after drinking that increased your chances of getting hurt (such as driving, swimming, using machinery, walking in a dangerous area, or having unsafe sex)?
- Continued to drink even though it was making you feel depressed or anxious or adding to another health problem? Or after having had a memory blackout (i.e., forgetting, after drinking, where you were, or what you did while drinking)?
- Had to drink much more than you once did to get the effect you want? Or found that your usual number of drinks had much less effect than before?
- Found that when the effects of alcohol were wearing off, you had withdrawal symptoms, such as trouble sleeping, shakiness, irritability, anxiety, dysphoria, depression, restlessness, nausea, or sweating? Or sensed things that were not there? (NIAAA, 2023).

History of Use

Alcohol had been used for thousands of years for pleasure, medicinal purposes, and as part of religious ceremonies and traditions. Alcohol use can be traced back 6,000 years to Egypt and Babylon. During the middle ages, distillation was introduced as a way to increase alcohol content. Alcohol was believed to have nutritional value and to be integral in curing multiple diseases. Alcohol has been

used historically and continues to be used at times to celebrate and mourn, to mark cultural events, and as part of religious ceremonies (Kuhn et al., 2019)

Mechanism of Action

Ethanol is the type of alcohol that is found in beverages. The amount of alcohol a person intakes does influence how it moves through the body. Ethanol is a small molecule that is quickly absorbed by the body. Once a beverage is consumed, about 20% of alcohol is absorbed through the stomach, and 80% is absorbed through the small intestines. Once the alcohol is in the bloodstream, it is carried throughout the body.

Consuming alcohol on an empty stomach increases the speed at which the alcohol is absorbed, leading to peak blood alcohol concentration happening in about an hour. Consuming alcohol with food dilutes and slows the absorption of the alcohol, leading to the peak blood alcohol concentration happening at about the two-hour mark.

The concentration of alcohol consumed also influences the absorption rate. The higher the concentration, the faster the absorption. The rapid absorption of higher concentrations of alcohol can suppress the brain centers that control breathing, causing an individual to lose consciousness and even die in extreme cases.

About 95% of alcohol is metabolized by the body before being excreted, with only 5% being eliminated unchanged through urine or the lungs. The rate at which alcohol is metabolized and removed from the body determines how long a person will be affected by the alcohol. Typically an adult metabolizes one ounce of whiskey in an hour. This is the amount the liver can efficiently handle. If more is consumed, the alcohol accumulates in the person's blood and tissues until it can be metabolized, resulting in higher blood alcohol concentrations and increased intoxication (Kuhn et al., 2019).

Physical and Psychological Effects

The following looks at the amount of ethanol consumed per hour and its impact on function and physical states. The degree of intoxication is measured by blood alcohol level, and the legal limit for blood alcohol content in the United States is 80 mg/100 ml.

- 1-4 oz/hour = up to 100mg/100 ml blood alcohol content

  Impaired judgment, fine motor coordination, and reaction time.

  The person may appear happy, boastful, and talkative.

- 4-12 oz/hour = 100-300mg/100 ml blood alcohol content

  Impaired motor coordination and reflexes.

  The person may experience staggering, slurred speech, nausea, and vomiting.

- 12-16 oz/hour = 300-400mg/100ml blood alcohol content

  Impaired voluntary responses to stimulation.

  The person may experience hypothermia, hyperthermia, and anesthesia.

- 16-24 oz/hour = 400-600mg/100 ml blood alcohol content

  Impaired sensation, movement, and self-protective reflexes.

  The person may be comatose.

- 24-30 oz/hour = 600-900mg/100 ml blood alcohol content

  Impaired breathing and heart functions.

  Death may occur (Kuhn et al., 2019).

Side Effects and Risks

Alcohol consumption can impact memory. In extreme situations, the person may have no memory over a set time period, known as a blackout. There are less extreme instances as well where individuals may have a hazy or incomplete memory of the events that happened while they were intoxicated. Anything that impacts the brain's ability to form memories should be viewed seriously and considered dangerous. Even at low doses, alcohol impairs a person's ability to form new memories. While it may promote relaxation, it compromises learning and memory. Hangovers with accompanying headaches and nausea are side effects of drinking that some people experience the next morning after a night of drinking.

The long-term effects of drinking depend on the amounts the person consumes. There is also a very small window of how much alcohol can be consumed for possible heart health benefits (½-1 drink/day) compared to the amount that will increase one's risk for heart disease or cancer (2 drinks/day).

Long-term effects include shrinkage of brain tissue; people who stop drinking and stay abstinent can recover brain tissue volume. There are five areas of mental functioning that chronic alcohol users tend to have difficulty with, including:

- Memory Formation: The ability to form new memories.
- Abstract Thinking: The ability to think in a manner that is not directly tied to concrete things.
- Problem-Solving: The ability to have the mental flexibility to find solutions to problems.
- Attention & Concentration: The ability to focus attention and maintain concentration, particularly with visual tasks.
- Perception of Emotion: The ability to recognize and interpret the emotions of others.

After a chronic heavy drinker stops drinking, the individual will recover some function in the first month or two. After that peak time period, recovery of mental functions in the above areas will be limited. Long-term deficits in mental functioning that occur from prolonged excessive alcohol use are characteristics of alcohol amnestic disorder or, in more severe cases, dementia associated with alcoholism (Kuhn et al., 2019).

Addiction and Withdrawal

The following may result with continued excessive alcohol use:

Tolerance: Tolerance occurs when consuming the same amount of alcohol has a lesser effect, and more is needed to be consumed to have the same original effect.

Abuse: Alcohol abuse is a pattern of drinking that leads to health problems, social problems, or both.

Dependence: Alcohol dependence is a disease characterized by abnormal seeking and consumption of alcohol that leads to a lack of control over drinking. The person craves alcohol and will consume it, even while knowing it is causing problems.

Withdrawal: A person who is physically dependent on alcohol will experience withdrawal within hours of abstinence. Withdrawal symptoms include tremors, anxiety, sleep disturbances, and in more severe cases, hallucinations, and seizures.

Risk factors for alcohol addiction include:

- Drinking 3-4 drinks/day for men and 3 drinks/day for women.
- Drinking to relieve emotional or social difficulties.
- Genetic factors or family environment factors show that a person's risk for alcohol abuse doubles if there is a family history of alcohol abuse.

- Sons of alcoholic fathers appear to experience more pleasurable effects of alcohol and less impairing effects of alcohol, setting them up for increased consumption over time and increasing their susceptibility to addiction (Kuhn et al., 2019).

Stimulants

Stimulants cause a sense of energy, alertness, talkativeness, and a general feeling of well-being.

Drugs: Cocaine, amphetamine (Adderall, Dexedrine), methamphetamine, ephedrine, methylphenidate (Ritalin), cathinones, methcathinone, 4-methyl methcathinone (mephedrone), 3,4-Methylenedioxypyrovalerone (MDPV), 3,4-methylenedioxy methcathinone (methylone), alpha-pyrrolidinovalerophenone (alpha-PVP, flakka)

History of Use

Cocaine has been used for centuries by the indigenous people of South America. Other stimulants are pharmaceutical creations, such as ephedrine, to help treat asthma.

Cocaine: Cocaine grows in the Andes Mountains in South America. There is documentation of the leaves being chewed for the effects of increased alertness and endurance, especially in high altitudes, as early as the sixth century. The purification of cocaine from the coca leaves happened in Europe in 1860. It was popular in the 19th century as a medicinal substance when coca leaves were steeped in wine and in the original Coca-Cola. As toxicities from these tonics increased, governments passed acts to restrict its use. In the late 1800s, cocaine was used for the first time in surgical procedures for its numbing effects.

Cocaine is still used medically as a local anesthetic. Illegally, the two most common forms are the white powder that is either snorted or dissolved for

injection, and crack, a solid chunk of cocaine that is heated directly in a pipe to form a vapor that is inhaled into the lungs.

Ephedrine & Amphetamine: The Chinese drug mahuang was long used to treat asthma, and in the 1920s, it was discovered that the active ingredient was ephedrine. Due to the short supply of the plants, there was an attempt to make a synthetic version which led to the creation of amphetamine and methamphetamine. Both of which increased alertness and euphoria. Use increased during World War II among soldiers. (Kuhn et al., 2019).

Mechanism of Action

Cocaine: Cocaine constricts blood vessels, and snorting it slows the delivery to the bloodstream. Peak blood levels are reached in 30 minutes. Cocaine in its crack form is consumed via inhaled vapors, and peak blood levels are reached within 1-2 minutes. Cocaine is degraded by the liver and blood enzymes in about an hour. Users typically seek another dose in 40 minutes or less. The quick rise in blood levels followed by the fast fall often triggers users to want that original high, causing them to take additional doses until their blood levels reach toxic levels. These incidences of drug use may not stop until the person runs out of drugs or experiences symptoms of toxicity.

Amphetamine & Methamphetamine: Both enter the bloodstream very quickly when they are smoked or injected, leading to a quick high and greater risk of toxicity. Effects also occur when consumed in pill form. They are degraded at a slower rate than cocaine, and effects last for two to four hours, resulting in less of a rush and crash pattern than when injected.

Ephedrine & Ephedrine Substitutes: Ephedrine is usually consumed as a pill or tea and enters the bloodstream easily. It peaks in about an hour, and its effects last for three to six hours.

Methylphenidate: Methylphenidate is consumed as a pill and absorbed in the intestines. The effects last for two to four hours, although there are extended-

release pills that change this timeframe. It enters the brain at a slower rate than other stimulates, making it a lower-risk drug to abuse.

Cathinones: Khat is traditionally consumed as a tea or by chewing the plant leaves. Purified cathinone is usually snorted or injected. Snorting or injecting enters the body quickly, and then high can last for several hours (Kuhn et al., 2019).

Physical and Psychological Effects

Cocaine and amphetamines increase attention, boost alertness, and eliminate fatigue. They also give the user a sense of euphoria which increases the likelihood for addiction. Stimulants cause an increase in movement, including talking, moving, exploring, and fidgeting. In higher doses, the movement becomes more focused and repetitive, and examples include drawing repetitive patterns, completing repetitive tasks, or picking at one's skin repeatedly. At very high doses or with chronic use, stimulants can cause psychotic-like states that resemble paranoid schizophrenia, but the symptoms will dissipate upon hospitalization and detox. Stimulants decrease appetite, and weight loss is a side effect of chronic use.

Cocaine and amphetamines imitate the effects of the sympathetic nervous system, initiating the body's fight or flight response. They increase blood pressure and heart rate, constrict blood vessels, dilate the bronchioles, and increase blood sugar.

Some of these effects can be beneficial; for example, the effects on the lungs may improve asthma symptoms. Additionally, they enable fat to be broken down to provide energy while also suppressing appetite and increasing physical activity, which may lead to weight loss. However, there are more negative side effects than benefits. Stimulants can cause irregular heartbeat and lead to cardiovascular system failure. They increase the body's temperature, which becomes dangerous if individuals exert themselves physically through exercise or dancing, such as at rave parties. The increase in body temperature from the stimulant, in conjunction

with the increased body temperature from physical activity, can be fatal (Kuhn et al., 2019).

Short-term effects include enlarged pupils, narrowed blood vessels, increased body temperature, heart rate, and blood pressure, headache, abdominal pain, nausea, euphoria, increased energy, alertness, insomnia, restlessness, anxiety, erratic and violent behavior, panic attacks, paranoia, psychosis, heart rhythm problems, heart attack, stroke, seizure, and coma.

Long-term effects include loss of sense of smell, nosebleeds, nasal damage and trouble swallowing from snorting, infection and death of bowel tissue from decreased blood flow, poor nutrition and weight loss, and lung damage from smoking.

For those who use substances during pregnancy, the effects on children include premature delivery, low birth weight, difficulties with self-regulation, and difficulties with attention once they reach school age (Kuhn et al., 2019).

Side Effects and Risks

Single-dose toxicity can cause death by overdose. Chronic use with increased doses can lead to behavioral problems. Long-term health problems occur not only from drug use but also from the stimulant-using lifestyle.

As blood levels rise to toxic levels, the typical drug responses become exaggerated. This may include:

- Initial energy and alertness may be heightened to the point of jitteriness, paranoia, and hostility.
- Increased movement becomes repetitive, aimless activity or constant talking without listening.
- Increased heart rate leads to palpitations, chest pains, and irregular heart rhythm.

- Skin becomes flushed as body temperature rises.
- Headaches
- Nausea and vomiting
- Seizures
- Increased hostility, paranoia, and belligerence
- Strokes, heart attacks, or fatal elevation of body temperature

Because stimulants are vasoconstrictors, long-term use can cut off blood supply to the area where the drug is delivered. Snorting cocaine can cause nasal ulcers, smoking stimulants can cause bleeding in the lungs, and oral consumption can cause stomach ulcers and damage the intestines. Long-term stimulant use accelerates the development of atherosclerosis (fatty plaques that block blood vessels) and may cause heart muscle damage from lack of oxygen.

Stimulant users face additional risks including malnourishment due to suppressed appetite and exposure to HIV, hepatitis, and other infectious diseases due to sharing injection equipment or engaging in unsafe sex practices (Kuhn et al., 2019).

Addiction and Withdrawal

The addictiveness of cocaine and other stimulants seems to be linked to how fast they enter the bloodstream and affect the brain, and the rush that the user feels. No other drug acts directly on reward systems or is as commonly addicting as stimulants. The drive to use cocaine and amphetamines is stronger than for any other addictive drug.

Tolerance to some stimulants develops more easily with continuous use rather than irregular use.

During the withdrawal period, the drug craving is very strong. Withdrawal symptoms from stimulants are not life-threatening and include exhaustion,

excessive sleep or insomnia, vivid, unpleasant dreams, depressive symptoms, return of appetite, slowed thinking and movement, and restlessness. One of the more difficult symptoms is anhedonia, the inability to feel pleasure. This is due to the person intensely and artificially stimulating the brain's pleasure center with excessive use of a drug. When it is removed, the dopamine neuron activity seems to be suppressed for the first few days after withdrawal. The lack of positive feelings increases the temptation to use the drug again (Kuhn et al., 2019 & NIDA, 2020).

Depressants

Almost all sedatives used recreationally are drugs manufactured for medical use and have been diverted into illicit use, either through illegal prescriptions, theft, or importing from other countries where they can be purchased without a prescription. They come in pill form, liquid, or prepared injection.

Drugs: Barbiturates: (phenobarbital, pentobarbital [Nembutal], secobarbital [Seconal], amobarbital [Amytal]), chloral hydrate (Notec, Somnos, Felsules), glutethimide (Doriden), others (Equanil, Miltown, Noludar, Placidyl, Valmid, methaqualone [Quaaludes]). Benzodiazepines: Flunitrazepam (Rohypnol), diazepam (Valium), chlordiazepoxide (Librium), Ativan, Dalmane, Xanax, Serax, Tranxene, Verstran, Versed, Halcion, Paxipam, Restoril (and hundreds more) (Kuhn et al., 2019).

History of Use

The modern pharmacology of sedation began in the mid-1800s with the synthesis of chloral hydrate, a sedative that is still used today. It was followed by barbital, the first of the barbiturates, in 1903. Early sedatives had the dangerous side effect that, at high doses, they depressed brain functions that support life, such as breathing. In 1957 the first benzodiazepine-like compound was synthesized. This breakthrough established a drug that could reduce anxiety without making the

person too drowsy, and that would not suppress respiration. Since then, there have been more than 3000 sedating compounds synthesized (Kuhn et al., 2019).

Mechanism of Action

All sedatives are the same in the mechanism of action but vary by their potency, which can make the difference between life and death. For example, when an individual uses phenobarbital, which is a mild sedative, the person will feel a bit drowsy and less anxious. Increasing the amount will cause further sedation, but it will take a significant amount to stop critical life functions. However, if someone mistakenly took the same amount of pentobarbital instead, which is a much more powerful sedative, they would be in serious danger of an overdose, as it impacts the nerve networks that control breathing.

All of the sedatives, except those designed specifically to promote only sleep, produce about the same psychological effects. First, there is a sense of relaxation and reduced anxiety, which creates a general "mellow" feeling. At higher doses, these effects are followed by light-headedness, vertigo, drowsiness, slurred speech, and uncoordinated muscle movements. Learning is inhibited, and memory for events that occurred while under the influence of these chemicals, especially benzodiazepines, may be impaired. The duration of action can vary from a couple of hours to more than a day, so it is important to be alert to the possibility of prolonged impairment. Unexpected side effects such as anxiety, nightmares, hostility, and rage (the opposite of the calming effects the drug is expected to have) occasionally occur. All of these drugs impair the ability to drive, and in general, their effects are increased by alcohol. A person who has had a sedative and a drink of alcohol should never drive (Kuhn et al., 2019).

Physical and Psychological Effects

Barbiturates: Short-term effects include vomiting, drowsiness, slurred speech, poor concentration, confusion, dizziness, difficulties with movement and memory, nightmares, lowered blood pressure, and slowed breathing. When used with

alcohol, heart rate and breathing are slowed even more, which can lead to death. Long-term side effects include liver damage and sudden death (NIDA, 2020 & Kuhn et al., 2019).

Benzodiazepines: Short-term effects include drowsiness and muscle incoordination, especially during the first few days of use. They can cause problems with learning and amnesia.

Side Effects and Risks

Barbiturates: At high doses, the greatest risk of barbiturate use is death by respiratory depression. At normal doses, barbiturates can have ongoing sedative effects beyond their sleep-inducing properties so that driving or performing other activities requiring muscle coordination can be impaired for up to a day after a single dose. For some people, instead of experiencing the sedative effects, they become excited, and their nervous system is actually stimulated instead of sedated (Kuhn et al., 2019).

Addiction and Withdrawal

Tolerance will develop for all sedatives if they are used regularly.

Barbiturates: Withdrawal can be serious as the central nervous system adapts to sedatives by decreasing the inhibitory systems that these drugs enhance. The GABA system in the brain stops being enhanced and is in a weakened condition, so the brain becomes over excited and may experience electrical discharges that cause epileptic seizures. Because individuals who are in a state of constant anxiety or agitation get relief with sedatives, psychological dependence may occur. As with other forms of substance misuse, when individuals stop using, they are miserable because their problems have only been suppressed, not cured.

Benzodiazepines: Tolerance develops and will require increased doses for similar effects. Serious withdrawal effects include seizures so cessation should be done in consultation with medical care (Kuhn et al., 2019).

Opioids

Opioids are found in nature in the opium poppy plant and can be synthetically manufactured in laboratories. Medicinally they are used to relax the body and alleviate pain. Recreationally people use opioids for the high they provide. Opioids are highly addictive, and overdose and death are common side effects (NIDA, 2021).

Drugs: Opium, heroin, morphine, codeine, hydromorphone (Dilaudid), oxycodone (Percodan, OxyContin), meperidine (Demerol), hydrocodone (Vicodin), fentanyl (Sublimaze), buprenorphine (Suboxone), propoxyphene (Darvon), Tramadol (Ultram), Tapendatol (Nucynta), diphenoxylate (Lomotil), loperamide (Imodium), desomorphine (Krokodil), Kratom

History of Use

Heroin: Heroin is an opioid drug made from morphine, a natural substance taken from the seed pod of the opium poppy plant. Heroin can be a white or brown powder or a black sticky substance known as black tar heroin. Opium use was documented over five thousand years ago among the Assyrians & Babylonians, and opium pipes have been found at archeological sites in Asia, Egypt, and Europe dating between 1000 - 300 BCE. Use of opium was common in Europe in the Middle Ages and into the 1800s. Opium was a major ingredient in many patented medicines in the 1800s in the United States, and laudanum, an alcoholic tincture of opium, was taken by many. In 1805 morphine was purified, and with the invention of the hypodermic syringe in 1853, there was a vast increase in the use of injected morphine during the Civil War. In 1898 the Bayer Company modified morphine and created heroin (NIDA, 2022 & Kuhn et al., 2019).

Fentanyl: Fentanyl is a synthetic opioid similar to morphine but with a 50 to 100 times increase in potency. It is a prescription drug that is made and used both legally and illegally. It is legally used to treat patients with severe pain, such as after surgery or for those with chronic pain, who have a physical tolerance to

other opioids. Brand names include Actiq, Duragesic, and Sublimaze. A current concern with fentanyl is that some dealers are mixing it with other drugs, such as heroin, cocaine, methamphetamine, and MDMA, as it takes very little to produce a high, making it a cheap but effective additive. This also makes it dangerous as many people taking the modified drugs are unaware that they contain fentanyl and are, therefore, more potent and more likely to cause an overdose (NIDA, 2021).

Prescription opioid misuse includes taking the medication in a way or dose other than what is prescribed, taking someone else's prescription medication, or taking the medication expressly to get high and not for the prescribed treatment (NIDA, 2021).

Mechanism of Action

Heroin: People snort, smoke, or inject heroin. Some people mix heroin with crack cocaine, known as speedballing. Heroin rapidly enters the brain, binding to opioid receptors, particularly to cells involving feelings of pain and pleasure and those controlling heart rate, breathing, and sleeping (NIDA, 2022).

Fentanyl: Legally prescribed fentanyl is taken as an injection, patch, or lozenge. Illegal fentanyl is typically sold as a powder, blotter paper, eye drops, nasal spray, or in pill form. Fentanyl binds to the opioid receptors in the brain that control pain and emotions. Regular use of opioids leads to the brain adapting to the drug, lowering the body's sensitivity to it and making it harder for the person to feel pleasure from anything other than the drug (NIDA, 2021).

Opioids bind to and activate opioid receptors on cells in the brain, spinal cord, and organs, particularly those involved in feeling pain and pleasure. When opioids attach to the receptors, they block pain signals sent from the brain to the body and release large amounts of dopamine. This strong release throughout the body reinforces taking the drug as users want to repeat the experience (NIDA, 2021).

Physical and Psychological Effects

Heroin: Short-term effects include a rush of pleasure or euphoria, dry mouth, nausea and vomiting, warm flushing skin, heavy feeling in the arms and legs, severe itching, clouded mental functioning, and nodding off (an in and out state of consciousness and semi-consciousness).

Long-term effects include insomnia, collapsed veins (for those who inject the drug), damaged nasal tissues (for those who sniff or snort the drug), heart lining and valve infections, abscesses, constipation, stomach cramping, liver and kidney disease, lung infections, mental health disorders, sexual dysfunction in men, and irregular menses for women. Long-term use can also lead to loss of brain white matter, impacting a person's decision-making capabilities, behavior control, and ability to manage stressful situations (NIDA, 2022).

Fentanyl: Short-term effects include extreme happiness, drowsiness, nausea, constipation, confusion, sedation, difficulty breathing, unconsciousness, and hypoxia, which is an effect of all opioids.

Prescription Opioids: Short-term effects include pain relief and a general sense of well-being, feeling relaxation and happiness. While euphoria is a desired effect, it also can lead to increased and frequent use of heroin so that the user can maintain that feeling. Harmful effects include drowsiness, confusion, nausea, constipation, and slowed breathing. Slowed breathing can reach the level of hypoxia, which is when too little oxygen reaches the brain. The short and long-term psychological and neurological effects of hypoxia include coma, permanent brain damage, and death (NIDA, 2021).

Side Effects and Risks

Older adults are at higher risk for abuse and accidental misuse as they tend to have multiple prescriptions and health issues. This leads to increased risk for drug-drug interactions and drug-disease interactions. An additional risk factor for older adults is a slowed metabolism that impacts the breakdown of drugs.

There is a high risk of overdose with opioid use. Emergency medical services should be sought immediately through 911 if an opioid overdose is suspected. Naloxone can be administered to treat an opioid overdose. Naloxone works by quickly binding to the opioid receptors, blocking the effects of the opioid, and helping the person to start breathing again. Depending on the drug, the amounts taken, and the individual, it may take more than one dose of naloxone to help the person recover from the overdose, which is why it is imperative to seek medical treatment immediately (NIDA, 2021 & NIDA, 2022).

Because fentanyl is being mixed in with other drugs, it is sometimes difficult to know what drug is causing the overdose. Also, because fentanyl is so much stronger than other opioid drugs, it frequently requires multiple doses of naloxone to reverse the overdose. People who are given naloxone should be monitored for at least two hours after the last dose is given to ensure breathing does not slow or stop (NIDA, 2021).

A person experiencing a heroin overdose will experience slowed or complete cessation of breathing. This decreases the flow of oxygen to the brain, resulting in hypoxia. This can cause temporary short-term effects or permanent and long-term effects on the nervous system, including coma, permanent brain damage, and death (NIDA, 2022).

An additional risk with heroin use is that it frequently contains additives, including sugar, starch, or powdered milk, which can block blood vessels leading to the lungs, liver, kidneys, or brain, and may cause permanent damage. Sharing drug injection equipment and having impaired judgment due to drug use are two risk factors for contracting infectious diseases such as HIV and Hepatitis (NIDA, 2022).

Addiction and Withdrawal

Heroin addiction can have severe withdrawal symptoms within a short time of stopping the drug. Symptoms include restlessness, cold flashes with goosebumps,

uncontrollable leg movements, severe muscle and bone pain ,and severe drug cravings (NIDA, 2022).

Fentanyl is addictive because of its potency; even those who are legally prescribed fentanyl are warned they may develop a dependency that could lead to an addiction. Severe withdrawal symptoms, which are similar to those seen with heroin, can be experienced within a few hours after usage stops. The effects of withdrawal can be extremely uncomfortable, which is one reason why many people find it difficult to stop using. Lofexidine can be prescribed to help diminish withdrawal symptoms.

Prescription opioid withdrawal symptoms can also be very unpleasant, including sleep problems, diarrhea, vomiting, cold flashes with goosebumps, muscle and bone pain, uncontrollable leg movements, and severe cravings. There are some medications that can be given to reduce the withdrawal symptoms, such as lofexidine (NIDA, 2021).

Hallucinogens

Hallucinogens are drugs that cause extreme distortions in a person's perception of reality and can change an individual's thought process, mood, and perception. Hallucinogen experiences vary greatly. Even the same person can experience the same drug differently on a different occasion.

Drugs: Serotonin-like group: lysergic acid diethylamide (LSD), psilocybin, mescaline (peyote), N,N-dimethyltryptamine (DMT), 4-bromo-2,5-dimethoxyphenethylamine (2C-B), ayahuasca; belladonna alkaloids: Jimsonweed; dissociative anesthetics: phencyclidine (PCP), ketamine; dextromethorphan; Salvia.

History of Use

Hallucinogen use has been documented on every continent for thousands of years. There is documentation of hallucinogen use dating back 3,500 years ago in

India and, prior to that, in early Greece. Archeological evidence also dates the use of peyote back thousands of years. Native Americans and others have used hallucinogens for religious ceremonies and experiences. The most used hallucinogen now is LSD, with an estimated 10% of American adults having tried it.

Mechanism of Action

Serotonin-like group: LSD, psilocybin, mescaline, etc. LSD is usually consumed on blotter paper, candy, or pills. Mushrooms and cacti are usually consumed in their plant form. Ayahuasca is consumed as a tea. The other “alphabet soups” are usually consumed as a pill.

Belladonna alkaloids have been used medicinally and ritually for thousands of years. Their use recreationally is relatively recent. They are usually consumed through prescription medication or tea from the wild-growing Jimsonweed plant.

Dissociative anesthetics include PCP, ketamine, and dextromethorphan. Ketamine is taken as an injection or as a powder to ingest or snort. PCP can be consumed as a pill, a powder for snorting, rocks to be smoked, or occasionally dissolved and injected. Dextromethorphan, the main ingredient in many cough syrups and pills, causes a unique dissociative state at doses higher than those used for cough suppression (Kuhn et al., 2019).

Hallucinogens are almost always taken by mouth and are easily absorbed from the stomach and intestines. The time between ingesting the drug and experiencing its effects depends on the drug. An LSD experience usually starts 30-60 minutes after consumption and lasts 4-6 hours but could last up to 12 hours. Peyote trips have a similar duration as LSD. Psilocybin trips last 2-4 hours, and DMT has the shortest experience, with effects felt within 10 minutes of consumption, peaking at 30 minutes and usually over in 60 minutes.

LSD activity is predominantly on serotonin receptors (5-HT) and dopamine receptors. LSD, like other classical hallucinogens, are partial agonists on serotonin 5-HT2 receptors and also on the 5-HT1A/1C receptors, both presynaptic and

postsynaptic. There is a positive correlation between the relative affinity of these compounds for 5-HT2 receptors and their potency as hallucinogens in humans.

The hallucinogenic effects appear to be related to the agonistic action on 5-HT2A receptors in the cortex. Ketanserin, a 5-HT2 antagonist, blocks some of the specific effects of LSD and other hallucinogens. It also activates the dopaminergic receptors and causes glutamatergic activation. All these actions seem to cause a functional imbalance at various levels (cortical areas and limbic system, which is a group of brain structures involved in emotional regulation), contributing to distorting the integrative action. At a peripheral level, it acts as a serotonergic antagonist, has an action in the dopaminergic system (D1 and D2 at least), and is alpha-adrenergic. Most classical hallucinogens share actions of LSD, but dissociative anesthetics and dextromethorphan are NMDA receptor antagonists (N-methyl-D-aspartate or NMDA), and salvinorin A is a potent kappa-opioid receptor agonist. Some anticholinergic derivatives (*Amanita muscaria* mushroom, plants containing atropine derivatives) at high doses can induce an intoxication with hallucinations due to their action as antagonists of the muscarinic receptor in the CNS (Farre et al., 2021)

Physical and Psychological Effects

Mild effects produced by low doses can include feelings of detachment from one's surroundings, emotional swings, and an altered sense of space and time. Hallucinations, pseudohallucinations, and illusions can all occur. Hallucinations are sensory experiences that are unreal.

Pseudohallucinations are sensory experiences that are unreal but understood to be unreal, and illusions are sensory distortions of normal reality. A hallmark of the hallucinogen experience is a sensation of separation from one's body. Some users experience intense feelings of insight with mystical or religious significance. These effects can last for minutes (with DMT) or for hours (with LSD).

Physical effects vary from drug to drug, but with LSD and similar drugs, users report jitteriness, racing (or slowed) heartbeat, nausea, chills, numbness (especially of the face and lips), and sometimes changes in coordination (Kuhn et al., 2019).

Side Effects and Risks

Hallucinogens should be divided into two groups: the drugs that produce mainly psychological problems—the LSD-like drugs—and the much more physically dangerous belladonna and PCP-like compounds. The belladonna drugs that are taken for intoxication or pleasure can be lethal. These drugs stimulate the heart and increase body temperature to dangerous levels. PCP can be lethal at high doses, causing seizures, coma, or a psychotic state lasting for days. The most common negative side effect of hallucinogens, such as LSD, is a bad trip. The most common of which is having a frightening experience that produces acute anxiety. People can accidentally injure or kill themselves as they are not thinking clearly about themselves or their surroundings. In 1-3% of cases, there is a psychotic reaction that may require hospitalization. In addition, there is the concern for hallucinogen persisting perception disorder (HPPD), where visual disturbances or other events of the drug experience emerge after the drug is out of the body. This is estimated to happen for 30-60% of heavy hallucinogen users. Another concern is the lack of identification knowledge surrounding mushroom use, which can be very dangerous, ranging from fatal to kidney or liver damage, should the wrong mushroom be consumed (Kuhn et al., 2019).

Addiction and Withdrawal

Most hallucinogens do not activate the brain's pleasure centers; therefore, addiction and physical dependence rarely occur (Kuhn et al., 2019).

Cannabis

Cannabis or marijuana comprises the dried leaves, stems, flowers, and seeds from the Cannabis sativa, Cannabis indica, and Cannabis ruderalis plants. These plants contain THC, which is a mind-altering chemical. There are hundreds of identified cannabinoids, with tetrahydrocannabinol (THC) and cannabidiol (CBD) being the two most used. THC is what is responsible for the psychoactive effects of Cannabis and is what has made it a drug of use for medical, recreational, and spiritual purposes. The focus here will be on its recreational use, which is what most frequently leads to its misuse (NIDA, 2019; Sheikh & Dua, 2023).

History of Use

The first documented case of the use of Cannabis for its healing properties dates back to 2800 BC in the Chinese medicine pharmacopeia of Emperor Shen Nung. It is mentioned in the historical texts of Hindus, Assyrians, Greeks, and Romans. It was attributed to treating numerous health problems, including arthritis, depression, amenorrhea, inflammation, pain, lack of appetite, and asthma. It wasn't until the late 19th and early 20th centuries that the extraction and isolation of cannabinoids took place (The University of Sydney, 2023).

Smoking Cannabis has been the traditional method of consumption, either in hand-rolled cigarette style (joints), pipes, water pipes (bongs), or cigar style (blunts). Those who wish to avoid inhaling smoke use vaporizers. Others prefer ingesting marijuana through food (edibles), mixing it into cookies, brownies, gummies, or brewing it as tea (NIDA, 2019; Sheikh & Dua, 2023).

Mechanism of Action

THC quickly enters the bloodstream, traveling to the brain and other organs when it is smoked. When it is eaten or drunk, the body absorbs the THC more slowly, and it can take up to an hour for the person to feel the effects (NIDA, 2019).

Cannabinoids function by stimulating two receptors, cannabinoid receptor type 1 (CB1) and type 2 (CB2), within the endocannabinoid system. This system is a complex network of organs throughout the body, expressing the cannabinoid receptors and playing a homeostatic role. Functions of the endocannabinoid system include pain, memory, movement, appetite, metabolism, lacrimation/ salivation, immunity, and even cardiopulmonary function. Most effects from cannabinoids, including psychotropics, are from the activation of CB1.

Endocannabinoids serve as neuro-regulatory modulators responsible for retrograde neurotransmission. A post-synaptic neuron releases endocannabinoids that bind to predominantly CB1 receptors on the presynaptic neuron. This binding results in inhibited presynaptic calcium channel activation and subsequent presynaptic neurotransmitter release. If the presynaptic neurotransmitters are predominantly inhibitory such as GABA, the net effect is excitatory and vice versa.

Binding to the different parts of the central nervous system mediates different psychotropic properties of cannabinoids, particularly THC. These areas and effects include (Sheikh & Dua, 2023):

- Hippocampus: impairment of short-term memory
- Neocortex: impairment of judgment and sensation
- Basal ganglia: altered reaction time and movement
- Hypothalamus: increased appetite
- Nucleus accumbens: euphoria
- Amygdala: panic and paranoia
- Cerebellum: ataxia
- Brainstem: anti-emesis
- Spinal cord: analgesia

CB1 activation can have additional effects, including dry mouth, conjunctivitis, tachycardia, hypotension, and bradypnea (Sheikh & Dua, 2023).

In the brain, CB1 is found in neurons, and this is the receptor with which tetrahydrocannabinol (THC) binds to produce its psychoactive effects. Notably, many phytocannabinoids do not bind to CB1 and are, therefore, unlikely to be intoxicating.

CB2 is found largely in immune tissues, including the brain's immune cells, the microglia. Triggering CB2 on these cells reduces inflammation of the brain. Targeting CB2 may then offer hope in treating various conditions that involve brain inflammation, such as epilepsy, multiple sclerosis, Alzheimer's disease, and various psychiatric conditions (The University of Sydney, 2023).

Marijuana over-activates parts of the brain that contain the highest number of these receptors. This causes the "high" that people feel. Other effects include:

- altered senses
- altered sense of time
- changes in mood
- impaired body movement
- difficulty with thinking and problem-solving
- impaired memory
- when taken in high doses - hallucinations and delusions
- psychosis (risk is highest with regular use of high-potency marijuana) (NIDA, 2019)

Physical and Psychological Effects

Short-term effects include enhanced sensory perception and euphoria followed by relaxation and drowsiness, slowed reaction time, problems with balance and

coordination, increased appetite, increased heart rate, problems with learning and memory, and anxiety.

Long-term effects include mental health problems, chronic cough, and frequent respiratory infections.

Other health concerns include serious lung illnesses and death when THC vaping products are mixed with fillers, including Vitamin E acetate and other chemicals. Babies born to those who use cannabis during pregnancy may have difficulties with attention, memory, and problem-solving (NIDA, 2020).

Side Effects and Risks

Short-term mild side effects include euphoria, anxiolysis, tachycardia, visual-temporal distortion, sensory amplification, tachycardia, postural hypotension, conjunctivitis, hunger, dry throat, mouth, and eyes. More severe side effects include panic attacks, myoclonus, psychosis, hyperemesis, inhalation burns, acute respiratory distress syndrome, and bronchospasm. The more severe side effects could require emergency medical services or hospitalization.

Long-term cannabis use is linked to numerous health concerns, including

- Addiction, altered brain development, and cognitive impairment in adolescents

  Research has found that those who begin using marijuana in the teenage years have impaired thinking, memory, and learning. One study found that those who used marijuana heavily as teenagers and continued to have a marijuana use disorder as adults lost, on average, 8 IQ points between the ages of 13 and 38. The lost mental capabilities did not return if marijuana use was discontinued.

- Chronic bronchitis, acute respiratory distress syndrome, lung cancer

Smoking irritates the lungs, and those who smoke frequently have similar problems to those who smoke tobacco. This includes daily cough and phlegm, increased lung illnesses, and a higher risk of lung infections.

- Increased risk for myocardial infarction, stroke, and thromboembolic events

  Marijuana increases the heart rate for up to three hours after smoking. This can increase some people's risk of heart attack.

- Exacerbation of mood disorders (anxiety, depression) and psychotic disorders (schizophrenia)

  There is evidence to support that cannabis use is linked to the earlier onset of psychosis for those with a genetic risk for psychotic disorders and for those who already have a psychotic disorder. Cannabis use and its link to other mental illnesses has been mixed. Research has supported the increased risk of depression in adolescent cannabis use. And there has been research to support a link between cannabis use and suicidal thoughts and behaviors among adolescents and American military veterans.

- Problems with child development during and after pregnancy

  Marijuana use during pregnancy is linked to preterm birth, lower birth weight, and increased risk of brain and behavioral problems in babies. Those exposed to marijuana in utero have increased risks for problems with attention, memory, and problem-solving. One study found 20% of pregnant women 24 years old or younger tested positive for marijuana use. They were also twice as likely to screen positive with drug tests versus self-report.

- Cannabinoid Hyperemesis Syndrome

  Some people who use marijuana long-term develop this syndrome, and as a result will regularly experience severe nausea, vomiting, and dehydration

requiring emergency medical services (NIDA, 2019; NIDA, 2023; Sheikh & Dua, 2023).

Addiction and Withdrawal

Studies show that 9% to 30% of people who use marijuana may develop a marijuana use disorder. People who begin using before 18 years of age are four to seven times more likely to develop a marijuana use disorder as an adult.

Withdrawal symptoms tend to be mild but do cause difficulties when one is trying to quit using. These include

- Restlessness
- Irritable mood
- Insomnia/difficulties sleeping
- Decreased appetite
- Anxiety
- Cravings (NIDA, 2019 & NIDA)

Treatment Recommendations

Behavioral support treatment, including therapy and motivational incentives, is the most effective in treating marijuana use disorder. Currently, no medication is available to treat withdrawal symptoms, block the effects, or prevent relapse for marijuana use disorder (NIDA, 2019).

Typically, adults seeking treatment for marijuana use disorder have used marijuana almost daily for ten years and have tried quitting six or more times. Often people seeking treatment have comorbid mental health disorders or other substance use disorders. Treating the person's mental health disorder with medications and/or behavioral therapy often reduces marijuana use (NIDA, 2020).

Designer Drugs/New Psychoactive Substances

New psychoactive substances (NPS) are drugs designed to mimic established illicit drugs, such as cannabis, cocaine, MDMA, and LSD. The creators of these drugs are constantly developing new chemicals to replace the ones that are banned. They are changing the chemical structure of the drugs to stay ahead of the law.

Drugs: Synthetic drugs, legal highs, herbal highs, party pills, synthetic cocaine, synthetic cannabis, herbal ecstasy, NBOMes, bath salts, plant fertilizer, herbal incense, room deodorizers, aphrodisiac tea, social tonics, new and emerging drugs (NEDs), drug analogs and research chemicals. These products are sometimes labeled "not for human consumption."

Since these drugs are advertised as legal, they are often perceived as being safe to use. Since these drugs emerge and change rapidly, it is hard to know what their effects may be and what doses cause what reactions. NPS generally do not have a recommended dose printed on their labels, and they are untested and unregulated. As the chemical composition of these drugs is constantly changing to stay ahead of the law, it is impossible to know if one is getting the same product in each batch, even if the name and the packaging are the same.

Synthetic cannabinoids

Synthetic cannabinoids have been sold online since 2004 and are designed to have similar effects to cannabis. However, many of the current drugs claiming to be synthetic cannabis do not produce THC-like effects.

Synthetic cannabinoids are powdered chemicals that are mixed with solvents and added to herbs and frequently sold in colorful packets. From batch to batch, the chemical makeup varies, so even though the product may look the same, it may have very different effects. Well-known synthetic cannabinoids are sold as "Spice" and "K2".

Synthetic cannabinoids are most often smoked, and the effects are felt within minutes of ingestion. The side effects and risks include:

- relaxation
- euphoria
- loss of coordination
- fast and irregular heartbeat
- racing thoughts
- agitation, anxiety, paranoia
- psychosis
- aggressive and violent behavior
- chest pain
- vomiting
- raised blood pressure (hypertension)
- breathing difficulties
- hyperthermia (overheating)
- breakdown of muscle tissue (rhabdomyolysis)
- acute kidney injury
- seizures
- stroke
- death

Long-term effects include mental health conditions, heart problems, and behavioral and cognitive impairments. Those who use synthetic cannabinoids

have a higher risk of depression and anxiety symptoms. Long-term use has also been linked to serious mental health conditions. Healthy and vulnerable persons can experience psychosis after using synthetic cannabinoids. Compared to cannabis, the psychotic symptoms associated with synthetic cannabinoids are more severe and can last for weeks following the last use. Those with mental health conditions should avoid using synthetic cannabinoids.

Dependence can be established quickly among those who regularly use synthetic cannabinoids. Individuals may feel they need these substances to get through the day and to participate in routine activities like working, studying, and socializing. It is possible to develop a tolerance to synthetic cannabinoids, so that users need to take larger amounts to get the same effect.

Those who use synthetic cannabinoids heavily and regularly may experience withdrawal symptoms when they try to stop, including:

- insomnia
- nausea and vomiting
- loss of appetite
- paranoia
- panic attacks
- agitation and irritability
- anxiety
- mood swings
- rapid heartbeat (ADF, 2022).

Phenethylamines

Phenethylamines are a group of psychoactive drugs with stimulant effects and include amphetamine and MDMA. This group also contains the 2C series, NBOMes, PMMA, and benzofurans (Bromo-Dragonfly).

Phenethylamines have a high risk of overdose as there is a slight difference between the amount required to get high and that which causes an overdose.

NBOMes are created to be similar to LSD and produce the following effects:

- seeing and hearing things that aren't there
- mood changes which can include relaxation or agitation
- euphoria
- increased appreciation for music
- enhanced sense of touch
- confusion
- sweating
- short term memory problems
- high blood pressure
- fast heartbeat
- high body temperature
- panic and paranoia (ADF, 2023)

PMMA is created to be similar to MDMA and produces the following effects:

- moderate stimulation
- seeing shapes and colors

- heightened senses
- dizziness
- dry mouth and dehydration
- increased bodily temperature
- increased perspiration
- teeth grinding
- increased sweating
- increased heartbeat and blood pressure
- difficulty breathing
- irregular eye movements
- muscle spasms
- decreased appetite
- nausea and vomiting
- seizures (ADF, 2021)

Because these drugs have not been on the market for very long, there is not an established list of long-term effects. People who use phenethylamines can build up a tolerance. There does not appear to be a dependence link to these drugs or a withdrawal period.

Synthetic Cathinones

Synthetic cathinones is a group of drugs related to the khat plant. They are stimulants, speeding up the messages between the brain and the body and having similar effects to amphetamines. These are often sold as Bath Salts or Flakka.

Synthetic cathinones are usually white or brown powders but also come in small crystals or capsules. They are snorted, swallowed, or injected. The effects are felt when taken orally in 15-45 minutes and quicker if snorted or injected. These effects generally last for 2-4 hours.

Smaller doses result in the following effects:

- a rush of intense pleasure
- feeling happy, energetic, and talkative
- intense connection with music
- restless sleep
- facial muscle tension
- blurred vision
- light-headedness, dizziness
- distorted sense of time
- enlarged (dilated) pupils, blurred vision
- dry mouth, thirst
- sweating
- memory loss
- reduced appetite

While larger doses have more adverse effects of:

- anxiety
- paranoia
- nose bleeds from snorting the drug

- stomach pains, nausea, vomiting
- skin rashes
- fast or irregular heartbeat
- high blood pressure and hot flashes
- strong urge to redose
- chest pain
- tremors, convulsions, death

There is limited information on tolerance and withdrawal at this time (ADF, 2023).

Phencyclidine-type substances (novel dissociatives)

Phencyclidine-type substances (or novel dissociatives) are structurally similar to phencyclidine and ketamine and they mimic the effects of traditional drugs such as cocaine, amphetamine, and ecstasy. Phencyclidine-type substances are like classic dissociatives but with more stimulating effects. They were first identified in 2010.

Piperazines

Because of their stimulant effects, piperazines are frequently sold as MDMA. Piperazines are available as pills, capsules, or powders and are usually swallowed. Piperazine was originally developed as an antidepressant, but because of its similarity to amphetamines, its use was stopped due to the risk for non-prescribed misuse. Some examples of piperazines are 1-benzylpiperazine (BZP) and trifluoromethylphenylpiperazine (TFMPP). When mixed together, these two drugs have similar effects to MDMA.

Novel Benzodiazepines

Several new psychoactive substances belonging to the benzodiazepine class have emerged in the last several years. They are most often being sold under the names

"legal benzodiazepines," "designer benzodiazepines," or "research chemicals." Novel benzodiazepines are either drugs that were developed but not medically approved or illicitly manufactured drugs that are different from the structure of existing benzodiazepines. Some examples of novel benzodiazepines are:

- diclazepam
- flubromazepam
- pyrazolam

There is a lack of information on the short and long-term health effects of novel benzodiazepines.

Treatment for Substance Abuse

Types of Treatment Settings

Treatment for substance misuse varies greatly, based on numerous factors, and recovery is generally a long process. Depending on the severity and complexity of a person's addiction, one type of substance abuse treatment may be recommended, or the individual may progress through multiple types of interventions.

Detoxification Treatment

Detoxification programs are medically managed interventions that stabilize the individual and help to manage withdrawal symptoms from drugs or alcohol. These programs can last anywhere from a few days to weeks. Once the person is stabilized and no longer experiencing medically significant withdrawal symptoms, transition into an inpatient program may be recommended.

Inpatient Treatment

Inpatient and residential rehabilitation programs enable individuals to receive supervised treatment and structured care plans to overcome and manage their addiction while residing in a facility. Some programs have 24/7 monitoring by licensed professionals. Inpatient programs can last anywhere from a few weeks to months. Upon completion of inpatient treatment, the individual may choose to transition to outpatient treatment.

Outpatient Treatment

Outpatient programs give people the flexibility to receive treatment and attend therapy without requiring an on-site or live-in level of care. Treatment appointments are regularly scheduled and may occur at a substance use treatment center, community health clinic, hospital-affiliated clinic, or other facility. Some outpatient programs offer night and weekend programs, making them easier to attend for those with personal, family, and/or professional responsibilities that may prevent them from attending during regular business hours (Miller, 2023).

Behavioral Therapy

Substance use treatment often consists of a combination of group and individual therapy sessions focused on teaching skills to become sober, maintain abstinence from substance use, and navigate situations and triggers without relapsing to drugs or alcohol. Individual therapy is guided by a therapist in one on one sessions. Group therapy is usually led by a therapist with a group of peers in a safe and supportive environment. Family therapy is led by a therapist and includes the person in treatment and significant others, family members, or other significant people in the person's life.

Behavioral therapy is the most often used type of treatment in substance use rehabilitation programs. The following are evidence-based treatment modalities that are effective in treating substance use disorders (Miller, 2023).

Cognitive Behavioral Therapy

Cognitive behavioral therapy (CBT) encourages people to question and explore their recurring thoughts in order to eliminate those that are negative and unhealthy. CBT teaches techniques to recognize and change maladaptive behaviors. CBT helps people learn coping skills and identify risky situations and what to do about them, and offers strategies for relapse prevention. CBT can be used to treat problematic substance use as well as co-occurring mental or physical health disorders (Miller, 2023).

Contingency Management

Contingency Management (CM) is effective in treating several substance use disorders and is used to encourage and reinforce sobriety. This treatment method provides physical rewards to motivate desirable behaviors (maintaining sobriety). A benefit of CM is that it reduces two of the biggest treatment barriers: dropping out and relapse (Miller, 2023).

Motivational Interviewing

Motivational interviewing (MI) is a treatment method of addressing the ambivalence some people experience in recovery, allowing them to embrace their treatment efforts in a way that works best for them to address their substance use. The goal is to strengthen the individuals' motivation for and commitment to change in a way that is consistent with their values. Rather than the therapist imposing or enforcing a specific change, participants are met where they are, and they are helped to move toward their goals by building on their readiness to change. A benefit of MI is that while it is facilitated by a therapist, individuals in recovery develop their own motivation and plan for change in the initial sessions,

which gives them more of a sense of control over the course of their treatment (Miller, 2023).

Dialectical Behavioral Therapy

Dialectical Behavioral Therapy (DBT) teaches people how to regulate their emotions to reduce their self-destructive behaviors driven by extreme, intense emotions. DBT focuses on four skill sets: distress tolerance, emotion regulation, mindfulness, and interpersonal effectiveness. DBT works to reduce cravings, help people avoid situations or triggers that may lead to relapse, support them in giving up behaviors that reinforce substance use, and help them learn healthy coping skills (Miller, 2023).

Eye Movement Desensitization and Reprocessing

Eye Movement Desensitization and Reprocessing (EMDR) helps people recover from traumatic experiences that result in ongoing distress. EMDR uses "dual stimulation" exercises to discuss past trauma while simultaneously engaging other parts of the brain through bilateral eye movements, tones, or taps. EMDR helps heal the brain's information-processing system and promotes emotional stability and symptom reduction. It is extremely effective in treating those with post-traumatic stress disorder and other trauma disorders (Miller, 2023).

Rational Emotive Behavior Therapy

Rational Emotive Behavior Therapy (REBT) helps people identify, challenge, and replace their destructive thoughts and convictions with healthier, adaptive thoughts. It helps people understand their own thoughts and then to develop better habits and think in more positive and rational ways and gain healthier emotions. The foundation of REBT treatment is that rational thinking comes from within and that external situations are not what contribute to a person feeling happy or unhappy (Miller, 2023).

Seeking Safety

Seeking Safety is a present-focused therapy that helps people attain safety from trauma and substance use disorders through coping skills, grounding techniques, and education. Some of the treatment's key principles are helping people attain safety in their thinking, emotions, behaviors, and relationship, integrating treatment of substance use and trauma, and focusing on ideals to counteract the loss of ideals that are often experienced in both trauma and substance misuse (Miller, 2023).

Matrix Model

The Matrix Model helps people through a combination of various therapeutic techniques. These include rewarding good behaviors and teaching people to believe in themselves with a focus on improving self-esteem, dignity, and self-worth. The Matrix Model's main goal is relapse prevention with the use of family and group therapy, drug education, and self-help participation (Miller, 2023).

12-Step Facilitation

The 12-step facilitation goal is to promote abstinence through involvement with 12-step peer support groups. Meetings are hosted by different fellowships, such as Alcoholics Anonymous and Narcotics Anonymous (Miller, 2023).

Medication-Assisted Therapy

Medication-assisted treatment provides pharmacological interventions for alcohol and opioid use disorders. Some medication can help alleviate cravings, which in turns helps the person overcome physical dependence, while others can help minimize withdrawal symptoms. Through stabilization the person can build healthy psychological, social, and lifestyle changes. Research shows that medication-assisted therapy reduces opioid use, overdoses, criminal activity, and other risky behaviors (Miller, 2023).

Alcohol

There are three FDA-approved medications to treat alcohol use disorder, including:

Naltrexone: Once a person stops drinking, taking naltrexone helps them to maintain their sobriety. Naltrexone binds to the endorphin receptors in the body, and blocks the effects and feelings of alcohol. It reduces alcohol cravings and the amount of alcohol consumed.

Acamprosate: Acamprosate helps by decreasing cravings to use alcohol. This allows people who take the medication to control urges to drink and maintain sobriety. Acamprosate does not help with symptoms of alcohol withdrawal.

Disulfiram: Disulfiram causes unpleasant effects when alcohol is consumed. While it is not a cure for alcohol misuse, the unpleasant effects do discourage drinking. The effects begin within ten minutes of consuming alcohol and last for at least an hour. The effects include flushing of the face, headache, nausea, vomiting, chest pain, weakness, blurred vision, mental confusion, sweating, choking, breathing difficulty, and anxiety (Cleveland Clinic, 2022).

Opioids

Medication for opioid use disorders interact with the same opioid receptors in the brain as the opioid drug. Medications include:

Methadone is an opioid receptor full agonist that attaches to and activates opioid receptors to reduce withdrawal symptoms and cravings. It is taken as a daily liquid or tablet. Brand names are Dolophine and Methadose; generic options are available.

Buprenorphine is an opioid receptor partial agonist that attaches to and partly activates opioid receptors to reduce withdrawal symptoms and cravings. It is taken as a daily tablet or monthly injection. The brand name is Sublocade, and generic options are available.

Naltrexone is an opioid receptor antagonist that prevents opioids from attaching to the opioid receptors, blocking their potential effects. It is taken as a monthly injection. The brand name is Vivitrol, and no generic option is available at this time.

Buprenorphine/Naloxone is a partial agonist and antagonist combination that partly activates the opioid receptor while at the same time preventing opioids from attaching to the opioid receptors. It is taken as a daily tablet or film dissolved under the tongue. Brand names are Zubsolv and Suboxone; generic options are available.

Lofexidine is an adrenergic receptor agonist that attaches to and activates adrenergic receptors to help reduce withdrawal symptoms. It is taken as needed as a tablet. The brand name is Lucemyra; no generic option is available at this time.

Naloxone is the drug used to reverse overdoses and is available as a nasal spray for emergencies and as an injection for medical personnel to use. Brand names are Kloxxado, Narcan, and Simhi; generic versions are available (NIDA, 2021 & NIDA, 2022).

Prevention of Drug Abuse

During times of transition, the risk of drug use increases greatly. Children who transition to middle school from elementary school face new and challenging social, family, and academic situations. This is often when they are exposed to cigarettes and alcohol for the first time. Starting high school, adolescents may encounter more readily available drugs, drug use by peers, and social activities where drugs are used. Additional high-risk transitions for adolescents include moving, family divorce, or changing schools. After high school graduation, individuals tend to transition to living more independently, either in college or as employed adults; they may now be exposed to drug use without the protective

structure that was previously provided by family and school. For adults, the times of increased risk are typically around major life changes such as a divorce or loss of a job.

Adolescent prevention programs tend to focus on diminishing risk factors for substance misuse, while increasing protective factors within families, schools, and the community. There are three types of prevention programs, including:

1. Universal programs address risk and protective factors common to all children and adolescents in a particular setting, such as a school or community.
2. Selective programs are for groups of children and teens with specific factors that increase their risk of drug use.
3. Indicated programs are interventions for youth who have already started using drugs (NIDA, 2023).

Risk Factors of Drug Abuse

The likelihood that someone develops an addiction differs from person to person, and there is no single determining factor. Typically, the more risk factors a person has, the greater the probability that using drugs will lead to addiction. Risk factors can be environmental or biological. Risk factors that contribute to addiction to substances can be divided into three categories, including individual risk factors, family risk factors, and community risk factors.

Individual Risk Factors

Biology: Biological factors that can impact a person's risk of addiction are genes, stages of development, gender, and even ethnicity. Some people like the feeling the first time they use a drug and want to experience it again, while others hate it and never want to try it again, which may be related to biology. Research shows

that genes and the environmental impact on a person's gene expression (epigenetics) account for 40%-60% of a person's risk of addiction.

Personal Traits: Personality traits may impact substance abuse and addiction. For example, studies indicate that teenagers with high impulsivity traits have a significantly higher association with drug addiction. The impulsivity trait alone increases the odds between two to four times for using any drug when compared to a non-impulsive peer group. Furthermore, one research group found that teenagers with rebellious traits had higher use of marijuana and were predisposed to engage in risky behaviors, including drug use. Another study of adolescents and young adults in treatment for opioid abuse found that the majority struggled to regulate their emotions.

Mental Health: Having a mental health disorder increases one's risk for substance misuse. Teens and those with untreated mental health disorders are likelier to use and become addicted than others. Many use drugs as a way to self-medicate and feel better.

Previous Substance History: Using psychoactive substances may lead to further use of addictive substances. For example, one study found that exposure to e-cigarettes within the past month is linked to an increase in the rate of marijuana and prescription drug use by at least four times in the eighth and tenth grades and by at least three times in the twelfth grade.

Comorbidity: Individuals who misuse substances often experience co-occuring conditions. For example, those who receive medical pain treatment are more likely to misuse opioids, and those who abuse substances are often also experiencing mood disorders, PTSD, personality disorders, or other behavioral health concerns.

Attitude and Perception: Those who perceive use as low or no risk for a substance are more likely to abuse the substance. The availability of a substance in the neighborhood or school increases the likelihood of use. Additionally, there has

been a correlation among adolescents between increased screen time and cannabis use.

Age of First Use: The earlier individuals begin to use drugs, the more likely they are to develop serious problems and to become addicted. This is likely due to the harmful effects drugs can have on brain development, as well as other risk factors the person is experiencing at a young age within the family or environment..

How the Drug is Taken: If a substance is smoked or injected, it increases its addictive potential. Both of these modes of delivery cause the drug to enter the brain within seconds, creating a powerful rush of pleasure. This intense high quickly fades, leading the person to repeatedly use the drug to chase the pleasurable feeling (Nawi et al., 2021 & MedlinePlus, 2019 & NIDA, 2020).

Family Risk Factors

The home environment during childhood is an important risk factor. Having parents and other family members who use drugs, misuse alcohol or participate in criminal activity increases the child's risk of future drug use. Those who grew up in unhappy, abusive, or unsafe homes are more likely to have substance use problems. Any type of maltreatment, including physical and psychological abuse and neglect, is linked to an increased risk of substance use.

One study found that the mother's psychological control was two times higher in influencing her children to be involved in substance abuse compared to the other factors. An indirect risk factor for youth drug abuse may be poor parental education, as having an uninformed parent may reduce a youth's perception of harm and can lead to a greater risk of future drug misuse. Parental neglect also contributes to this problem. A lack of parental supervision, uncontrolled pocket money spending among children, and the presence of substance-using family members were the most common negligence factors (Nawi et al., 2021 & MedlinePlus, 2019 & NIDA, 2020).

Community Risk Factors

Spending time with people who use substances: During adolescence, friends and peers strongly influence an individual's drug use. When substance use is normalized by peers, family, or community members, young people will be more likely to misuse substances. In addition to the positive association between adolescent drug abuse and peers who abuse drugs, availability and engagement in structured and unstructured activities can also impact substance use.

Difficulties at School or Work: Struggling in school or having poor social skills can put a teen at risk of using or becoming addicted. Those who have difficulties in academic, occupational, or social situations may use drugs as a way to disassociate from those challenges (Nawi et al., 2021 & MedlinePlus, 2019 & NIDA, 2020).

Protective Factors Against Drug Abuse

Protective factors reduce a person's risk of using drugs and becoming addicted to them. Protective factors may be either environmental or biological.

Individual Protective Factors

Some individual traits have been determined to protect adolescents from developing substance use disorders. Youth with an optimistic trait were less likely to become drug dependent, and mindfulness was a protective factor. Individuals with anti-substance use values and those with a strong desire to maintain their health were more likely to be protected from involvement in drug abuse.

Other individual protective factors include self-efficacy, positive relationships with others, and good grades.

Family Protective Factors

One study found that fathers who were well informed and aware were more likely to protect their adolescent children from drug abuse. Additionally, positive family support and advice may help deter substance misuse.

Other family protective factors include parental monitoring and support and positive family relationships.

Community Protective Factors

Strong religious beliefs integrated into society serve as a crucial protective factor that can prevent adolescents from engaging in drug abuse. In addition, school connectedness and adult support also play a major contribution to drug use.

Other community protective factors include school anti-drug policies and neighborhood resources (NIDA, 2020 & Nawi et al., 2021).

Conclusion

Drug use and misuse can be very complex, but having information is key to saving lives and to helping people. Having knowledge about specific substances and understanding addiction can inform individualized treatment care and lead to more effective outcomes. Identifying risk and protective factors can help build effective prevention programs for one's community. Additionally, understanding what drugs of choice are most prevalent in one’s community can inform where continuing education is needed for providers.

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