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Addiction and Recovery 101

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LEARNING OBJECTIVES

Upon completion of this module, the subscriber will be able to:

1. Describe the impact that addiction has on our society.
2. Delineate the characteristics of different addicting drugs.
3. Describe why addiction is considered a brain disease.
4. Define where and how to get confidential help.
5. Outline various treatment approaches for addiction.



ACCREDITATION

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Recovery and Addiction 101

Pre-activity quiz

The rate of addiction in healthcare professionals is:

- A. 1 in 9
- B. 1 in 100
- C. 1 in 24

The addicting drug that kills more people than any other is:

- A. Alcohol
- B. Cocaine
- C. Nicotine
- D. Heroin

One of the many rules in AA states: (*Pick the best answer*)

- A. You must have quit drinking to be a member
- B. You must do all 12 steps
- C. You must have an AA sponsor
- D. There are no rules

Answers on page 32.

Introduction

Throughout the 20th century, addiction remained one of our nation's most prevalent and pervasive problems. Unfortunately, at the beginning of the 21st century, the same appears to be true. Throughout much of the 20th century, addicts were thought to be morally flawed and lacking character or willpower. Consequently, that shaped the prevailing attitude regarding both addiction and the individuals suffering from addiction – addicts. Many myths and a great deal of misunderstanding still surround the topic of addiction. Thankfully, a great deal of scientific evidence has led researchers to believe that addiction is a brain disease that mediates behavior.¹ The statistics suggesting that addiction is a serious medical condition are staggering. The Substance Abuse and Mental Health Services Administration (SAMHSA) describes addiction as potentially the most serious health problem facing the United States in the near future. Taking into account the economic, criminal, social impact, and medical costs of addiction, we spend upwards of half a trillion dollars (500 billion dollars) per year on addiction. Each year 540,000 Americans die from addiction related deaths.² In 2010,

2.3 million emergency room visits were attributed to drug misuse or abuse.² Interestingly, one in nine healthcare professionals will suffer from addiction at some point in their lives.³ Addiction adversely affects every age group in our society. Babies exposed to drugs (including alcohol) while their mothers are pregnant are often born prematurely or underweight or both. They often are slower to develop intellectually and often exhibit problematic behavior later in life. Adolescents who abuse drugs tend to do poorly academically, have unplanned pregnancies, and are more likely to be exposed to violence and disease. Drug abuse in adults often results in dysfunctional, chaotic and stress-filled homes. Adults frequently experience job loss, financial stress, accidents and diminished self-worth.¹

Given the enormity of this healthcare crisis, one would assume that healthcare professionals, being well positioned to help, have the knowledge and skills required to provide aid and direction to their patients who suffer from addiction. Sadly, this is not the case. Addicted physicians, pharmacists, and nurses who enter treatment settings describe the education they received regarding addiction as minimal and essentially unhelpful.³⁻⁵ Pharmacy professionals are arguably the healthcare professionals most accessible to the public for guidance and direction concerning a myriad of health related issues, most importantly issues surrounding proper prescription drug use. Pharmacy professionals are uniquely positioned to identify and provide direction to patients in trouble with addicting medications.⁶ This module will seek to provide basic but helpful information about addiction which should place pharmacy professionals completing this continuing education module in a better position to provide help and guidance to their patients who misuse or abuse potentially addicting medications.

Addiction Terminology and Definitions

The following section presents terminology and certain definitions which are important to grasp an understanding of the various issues related to addiction to be presented in the remainder of this module.

Addiction is defined by the National Institute on Drug Abuse (NIDA), a division of the National Institutes of Health and its director Nora Volkow, MD (neuroscientist and researcher), as a chronic, relapsing, brain disease characterized by compulsive drug seeking and use, despite harmful consequences.⁷

An **addict** would be an individual suffering from addiction as described above and exhibiting the DSM-5 criteria for a substance use disorder, e.g.; a mild, moderate or severe cocaine use disorder – a cocaine addict. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) defines and lists all of the criteria for all mental disorders including substance use disorders.⁸ It feels important, at this point, to state that this term “addict” does not carry the historical social stigma and baggage that it might for someone who is less familiar to addiction. Treatment providers have a clear understanding that addiction can happen to absolutely anyone regardless of social, economic, financial status, or intellectual capacity. It could happen to you.

Reinforcement refers to a potentially addicting drug’s ability to reinforce its own use.⁹ For example, when an individual takes an antibiotic, there is not anything in particular that the antibiotic does that would lead the individual to want to take another dose right away. However, if the same individual were to smoke crack cocaine they would experience an immediate and short-lived powerful euphoria described by users as comparable to a sexual orgasm. The defining characteristics of a reinforcing drug include: a reasonably fast onset of action, a pleasurable effect, and resultant short duration of action.⁹

Physical dependence vs. addiction: Can an individual be physically dependent on a drug, such as a narcotic, and not be an addict (someone suffering from an addiction)? The answer is yes. It occurs reasonably frequently with individuals taking higher doses of narcotics for severe pain issues. When they are weaned off of the narcotic they will likely not continue with drug seeking behavior. This issue will be explained further in a discussion below on chronic pain and narcotic use.

Tolerance is defined as either needing more of the drug to get the same desired effect, or if taking the same amount of the drug, the user experiences less of an effect.⁹ Tolerance occurs both in the liver and in the brain. Metabolic tolerance refers to tolerance that occurs in the liver as it produces more and more of the particular enzyme(s) that

breaks down a particular drug so it can be eliminated in the urine.⁹ Neurological tolerance refers to tolerance that occurs in the brain’s reward center (where addiction happens) when after larger and larger doses of the drug, the neurons (primarily dopamine neurons) become desensitized.¹⁰ Each type of tolerance leads the user to need larger doses of the drug to get the desired effect.

Cross tolerance refers to tolerance that exists between drugs in the same general category, e.g., stimulants to stimulants, narcotics to narcotics, depressants to depressants. It occurs only in drugs within the same category because they use essentially the same neurotransmitter systems. Cross tolerance does not occur between drugs of differing categories, e.g., between narcotics and stimulants.⁹

After significant tolerance has developed, sudden or abrupt discontinuation of the drug leads to a reaction of the individual’s central nervous system (primarily the brain) known as **withdrawal**. Withdrawal syndromes from drugs of the same category have similar and very definable symptoms. Depressants like barbiturates and alcohol will have a reasonably similar withdrawal syndrome, i.e., tremulousness, tremors, and delirium tremens (a life-threatening withdrawal symptom involving seizures and hallucination).⁸

Post-acute withdrawal (PAW) is simply a continuation of the brain’s reaction to the absence of the drug but is far more subtle with symptoms like cloudy thinking, memory problems, insomnia, emotional numbness, and even coordination problems. With strong stimulants like methamphetamine or crack cocaine, depression and a condition known as anhedonia (the inability to feel normal pleasures) may be present as PAW. PAW varies in length from weeks to months and in some cases can be present to some extent for a year or more.¹¹

Relapse refers to an individual with a once stable and viable recovery program returning to drug use. Relapse is a process not an event – it does not begin when the individual finally picks up a drug and uses it. Relapse begins prior to that and involves negative, self-defeating, and potentially self-destructive changes in the individual’s thinking. Alcoholics Anonymous (AA) members call it “stinkin thinkin”. To justify returning to use, this “stinkin thinkin” often involves the return of psychological defenses: blaming others for their use, rationalizing why they probably don’t have the problem, minimizing the consequences of their use, comparing themselves only to peers with severe

addictions, etc. Others who know this individual can intervene in this negative thinking process before the person actually returns to drug use. The relapse process involves very observable warning signs. Further examples include: feeling sorry for themselves because they can no longer drink, failing to stay in touch with others in recovery like their AA sponsor, isolating themselves, spending time in the liquor store at the grocery store – “just looking”, etc.¹¹

Genes vs Environment

It has been clear, for some time, that both the genes and the environment (nature and nurture) each play a significant role in the development of addiction. Approximately 50% of the vulnerability to addiction is due to an individual's genetic makeup while the other 50% is due to environmental influences.^{12,13}

The Genes

Early investigators were struck by the results of studies involving potential genetic influences on the development of alcoholism. Many studies using twins were conducted. In 1960, Kaij conducted a study using identical twins with the same genes. When one twin was alcoholic the other was as well 71% of the time. Statistically, this was a very significant concordance rate.¹⁴ While catching investigators' attention, the problem with twin studies was that identical twins tend to grow up in the same home, making it difficult to separate the genes from the environment. To separate the effect of the genes from environmental effects, adoption studies were conducted using Danish adoption records. This was an outcome study which studied the outcome in terms of rates of alcoholism in: 1) the children of known alcoholics who were adopted away to non-alcoholic parents and grew up in a non-alcoholic environment; and 2) the children of non-alcoholic parents who were inadvertently adopted away to alcoholic parents and who grew up in an alcoholic household. The children with alcoholic birth-parents regardless of their non-alcoholic living environment were four times more likely to become alcoholic themselves.¹⁵ The study provided strong evidence that the genes were a primary determinant in the risk for alcoholism. In 1975, Mark Schuckit conducted a study in which both the sons of alcoholics and the sons of non-alcoholics were each given a “challenge dose” of alcohol. The individuals doing the study did not know which kids were which. The amount of body sway (ataxia) was accurately measured in each of the kids. Very inter-

estingly, the sons of alcoholics could be accurately identified from the sons of non-alcoholics because they had less body sway. For investigators, this was further evidence that the children of alcoholics were physiologically different from other children, essentially at birth.¹⁶

The Environment

The environment as well as the genes plays an equal and significant role in the development of vulnerability to addiction. Environmental influences in adolescence can have a serious impact on the potential development of addiction. Influences such as ineffective parenting, chaotic home environment, absence of nurturing, poor social skills, and affiliating with drug using peers all play a role. A great deal of research indicates that early childhood trauma, e.g., sexual abuse, or physical and/or emotional abuse can create brain changes that make these individuals more susceptible to addiction as adults. Extreme stress suffered as an adult, e.g., prisoner of war, rape, physical or sexual abuse, severe illness in a spouse or child, or extreme stress at work, predisposes individuals to addiction.^{17,18} All of these stressful situations can lead to Post-Traumatic Stress symptoms which could potentially be self-medicated with addicting medications. Early and steady use of mood altering drugs in adolescence while a child's brain is still developing, can hard wire their brain as an adult to need a drug of some type to alter their mood.¹

Addictive Disease

Central to an understanding of addiction is the reality that addiction is a brain disease.^{12,19} This is one of those instances when something does not necessarily look like a duck, does not necessarily quack like a duck, but is, in fact, a real duck. To the outside world, an addict suffering severe consequences as the result of their use just needs to “grow up, get their stuff together and just quit using”. On the surface addiction looks like it is all about willpower – it is not. To miss this point would be to seriously misunderstand the basic causes of addiction. Addictive disease (addiction) involves long-term changes in the basic wiring of the individual's reward circuitry such that matters of choice and self-will are stolen from them. Without outside intervention and help it is highly unlikely that this individual will ever enjoy long-term recovery. They quite literally need to re-wire their brain. This section will seek to provide information sufficient to understand addiction as a brain disease.

Where Does Addiction Happen?

Addiction happens in the reward center located in the mid-brain, the most primitive part of the brain, often referred to as the lizard brain which is purely instinctual – no thinking takes place here. The brain's reward center is also referred to as the Mesolimbic Dopamine Reward Pathway or the Dopamine Reward Pathway. It is a part of our brain that is responsible for sustaining life. It is where the cravings of hunger, thirst, and sex are created – all of which sustain life. These cravings are entirely involuntary. When we have not eaten for a long period of time the reward center says to the body (using the craving of hunger), “Hey buddy we need to find food right now”. The longer the individual goes without food, the louder the message.¹²

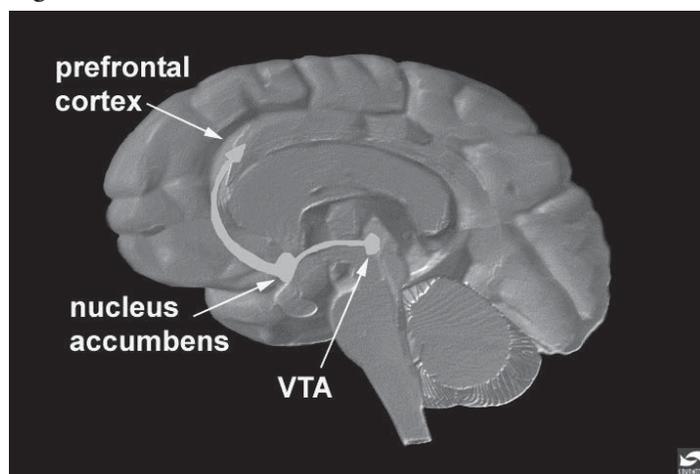
Figure 1, from NIDA presents the three basic areas of the reward center: the ventral tegmental area (VTA) on the right, the nucleus accumbens (NA) in the middle, and the prefrontal cortex on the left. These three brain structures constitute the basic components of the reward pathway. Simply understanding the role of dopamine in these areas will lead us to a basic but helpful understanding of the concepts involved in reward.²⁰ Dopamine is a neurotransmitter and like other neurotransmitters, is responsible for communication between brain cells (neurons) with resultant communication between different brain structures. Each brain structure has a different regulatory function, e.g., memory, movement, cognition (thinking), and feelings of pleasure or reward as in the case of the three structures discussed under the reward center.

The NIDA illustration identifies brain structures of importance in addiction. **Figure 2** (page 7).

Drugs of addiction produce their effect by directly or indirectly flooding the reward circuitry with dopamine. As a neurotransmitter, dopamine is responsible for buffering stress, providing feelings of reward (pleasure, even euphoria), for life sustaining tasks such as sex, eating and drinking, and is essential for effective movement and emotions. Human beings need dopamine in appropriate levels to simply feel okay.¹²

Using cocaine as an example, it is easy to see how an addicting drug produces its effect in the brain. If cocaine is smoked, for instance, it goes directly to the lungs which are rich with blood and have excellent access to the bloodstream. Cocaine then travels directly (in 6 to 8 seconds) to the brain where it quickly passes through the blood-

Figure 1. The brain's reward center



Reproduced with permission from: *The Neurobiology of Drug Addiction – The Reward Pathway*. In: National Institute of Drug Abuse. www.drugabuse.gov/publications. January 2007.

brain barrier due to its high fat solubility. It then diffuses throughout the brain producing its primary effect (but not its only effect) in the reward center. There, cocaine increases the action of dopamine in the VTA and the NA by binding to dopamine re-uptake transporters on the pre-synaptic membrane. This inhibits the removal of dopamine from the synaptic cleft. The resultant abundant free dopamine in the cleft binds with the receptors on the post-synaptic membrane increasing the activation of the reward pathway and producing feelings of pleasure and even euphoria.⁹ This mechanism of action for cocaine is depicted below in **Figure 3** (page 8).

Interestingly, this production of reward by addicting drugs often dwarfs the reward produced by the natural rewards necessary to sustain life, like satisfying thirst and hunger, by factors of 2 to 10 times. In time, serious and prolonged drug use can actually change the structure of the brain leading to profound changes in neurons and brain circuits. These changes have the potential to severely compromise the long-term health of the brain.¹ The clearest example would be with strong stimulants like crack cocaine or methamphetamine. Heavy and prolonged use often leads to decreased conductivity between dopamine neurons and a severely compromised reward center, even in terms of simply feeling okay. When this occurs, a condition known as anhedonia exists. *Anhedonia* involves the inability to feel even the simplest types of pleasure – no smiling going on in this individual. **Figure 4** (page 9) from NIDA demonstrates the profound effect of a drug's ability to change the brain, sometimes permanently.

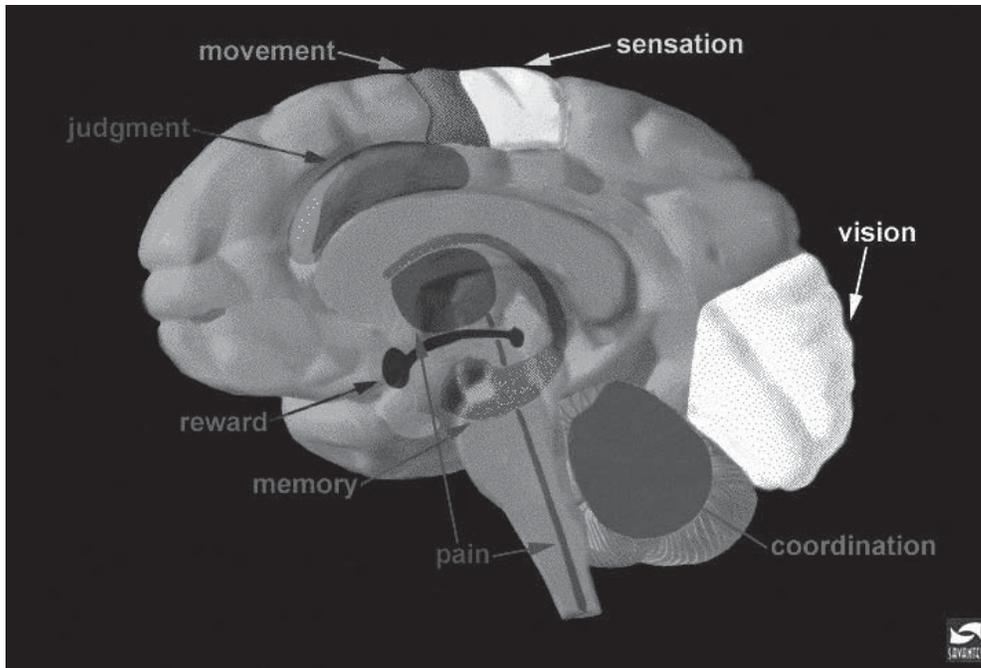


Figure 2. Brain areas of importance in addiction

Reproduced with permission from: *The Neurobiology of Drug Addiction – Brain Regions and Neuronal Pathways*. In: *National Institute of Drug Abuse*. www.drugabuse.gov/publications. January 2007.

Figure 4 (page 9) demonstrates the difference between a normal, unaffected brain and the brain of a cocaine addicted individual both 10 days after quitting and again 100 days after quitting. This figure demonstrates the profound and potentially permanent damage that an addicting drug can create.

As mentioned earlier, both the environment and the genetic nature of addiction play a role in the initial development of addiction. The *Reward Deficiency Syndrome* is a popular theory regarding what is potentially transmitted in genes from one generation to the next. It is hypothesized that what is passed along in genes is a defective dopamine 2 (D2) receptor gene. There appear to be two alleles (variations of the same gene) of the D2 receptor gene. The A1 allele potentially predisposes its carriers to addiction because they could have up to a 30% diminished capacity to process dopamine in their nucleus accumbens, i.e. feel reward.²¹ The importance of this capacity to feel reward was best demonstrated in an experiment conducted by Nora Volkow in 2009. A strain of mice was engineered that could not produce dopamine in their NA. The results of the study were very interesting. The mice starved to death, indicating how important the feeling of reward (hunger) is to us for survival, even when it is barely perceptible.¹²

Addiction Simplified

When an addicted individual can no longer get their drug of choice, their brain's reward center, having been tricked

(conditioned) into believing the drug is needed for survival, like food or water, begins a craving cycle much like severe thirst.

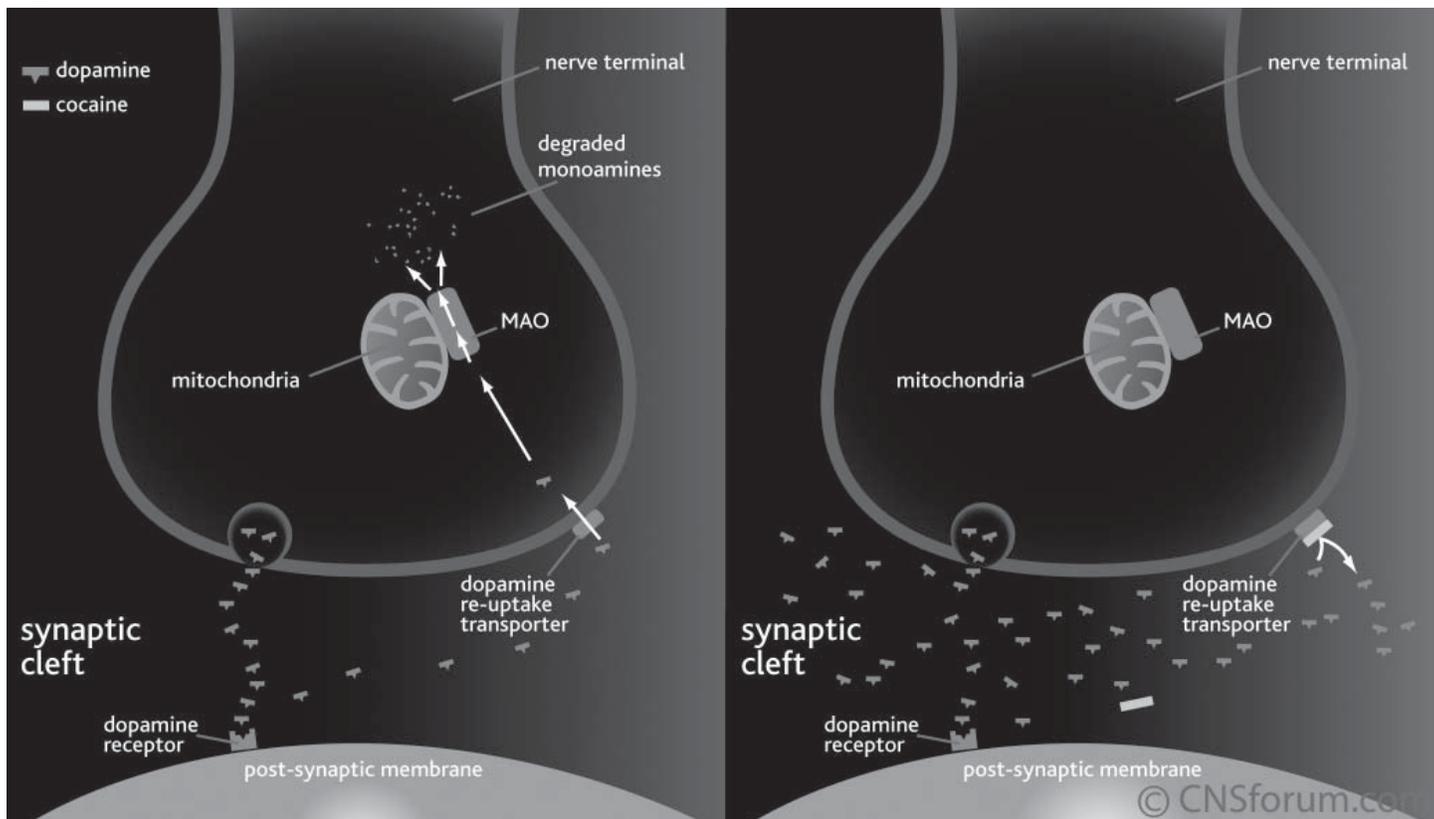
Imagine the Following Scenario

Tomorrow you are unable to find anything to drink but you actually make it all day. The next day you discover, once again, you are not able to find anything to drink. Two days have gone by now. Think about it. On the third day you are on a mission to find water and very little would get in your way. Your ability to think rationally would be compromised. This message from your reward center, this craving (thirst) *would quite literally rule you*. It is really pretty simple - the same thing happens with addicting drugs in the same primitive part of your brain.

Co-Morbid Psychiatric Disorders

Co-morbidity refers to the co-occurrence of two or more diseases, disorders, illnesses or health problems. Individuals with psychiatric disorders that exist with a substance use disorder are commonly referred to as **dual diagnosis** patients.²² There is a high prevalence of psychiatric disorders in populations of individuals with substance use disorders. It is estimated that 37% of those with alcohol use disorders experience a co-existing psychiatric disorder.²² This simply means that among individuals with a lifetime prevalence for substance use disorders, psychiatric disorders will occur at greater than expected rates in this popu-

Figure 3. The mechanism of cocaine



Reproduced with permission from: CNS Image Bank – Substance Abuse: The Mechanism of Action of Cocaine. In: CNSforum. Lundbeck Institute, Skodborg, Denmark. Copyright ©2002-2011.

lation. Psychiatric conditions in addicted populations are often inadequately assessed; diagnosed and treated; or are overlooked altogether. If undiagnosed or untreated, the individual is at much greater risk for relapse. Examples of a dual diagnosis would include: alcohol use disorder and depression; cocaine use disorder and attention deficit disorder; and opioid use disorder and bipolar disorder. **Table 1** lists the more common psychiatric conditions existing in populations with substance use disorders.

Depression

Depression (major depressive disorder), if untreated, can quickly lead to relapse because the individual is typically feeling hopeless, helpless, and worthless as well as isolated. This individual is also likely feeling sad, having difficulty sleeping or can't stay awake, has lost their appetite, and their motivation has been stolen from them. Psychiatric attention is required, and given the wide array of antidepressants available, depression is a very treatable illness.⁹

Bipolar Disorder

An individual experiencing a manic or hypomanic episode is said to be bipolar. They may at times experience depression, but the manic feature is what defines this disorder. When a person is manic or hypomanic they are likely restless, experience racing thoughts, have rapid and/

Table 1. Psychiatric or medical conditions that often co-exist with addiction

Depression Bipolar Disorder Generalized Anxiety Disorder Cognitive impairment Eating disorders Attention Deficit Disorder Sexual addiction Gambling addiction Severe chronic pain Personality Disorders (PD's) Antisocial PD, Borderline PD, Depressive PD, Narcissistic PD, Schizoid PD Post-Traumatic Stress Disorder

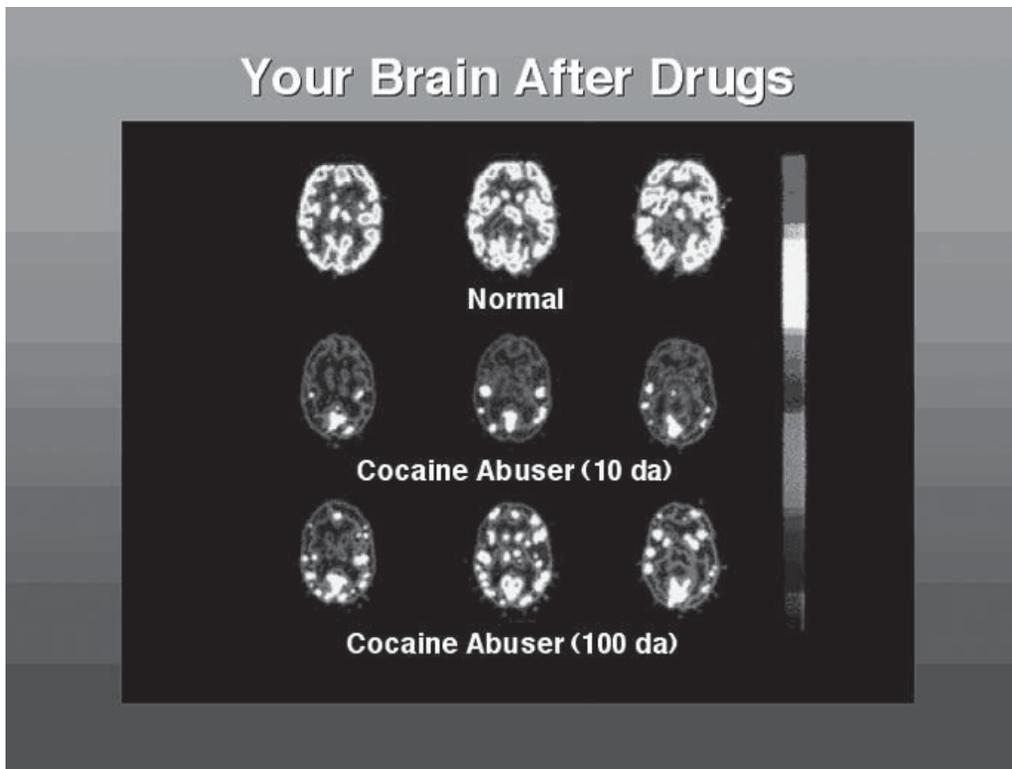


Figure 4. The effects of cocaine on the brain and rebound after quitting

Reproduced with permission from: Bringing the Power of Science to Bear on Drug Abuse and Addiction – Long-term Effects of Drug Use. In: National Institute of Drug Abuse. www.drugabuse.gov/publications. January, 2007.

or pressured speech, and feel excessively high or euphoric. These individuals are at greater risk for developing a drug problem to self-medicate their symptoms, and if they are in recovery, they are at greater risk to relapse because their judgement is uncharacteristically poor and they have grandiose and unrealistic beliefs in their own abilities, especially as they relate to drug use. When an individual is in a manic state (which is more severe than a hypomanic state) they often need to be hospitalized for their own protection and stabilization. Bipolar disorder is also a very treatable condition using mood stabilizers like lithium, divalproex (Depakote), quetiapine (Seroquel), and a number of other very effective pharmacologic interventions.⁹

Generalized Anxiety Disorder (GAD)

Like the psychiatric conditions listed above, the criteria for generalized anxiety disorder (GAD) are outlined in the DSM-5.⁸ GAD is characterized by a persistent and sustained anxious mood and is most commonly self-medicated with depressant medications like alcohol or benzodiazepines. The problem for a recovering individual with GAD is that medications like benzodiazepines cannot be safely used. Luckily, there are a number of other drugs which are used “off label” but very safely in this population. Examples would include certain antidepressants that

have a relaxing or mildly sedative-type effect. Gabapentin (Neurontin) is a drug most commonly used in seizure disorders but has mild sedative qualities which make its use in this instance quite safe as well as effective.²³

Attention Deficit Disorder (ADD)

Attention Deficit Disorder (ADD) may occur with or without hyperactivity. When hyperactivity is also present it is called Attention Deficit Hyperactivity Disorder (ADHD). ADD is a disorder characterized by problems in focusing attention and is often accompanied by increased impulsivity. Individuals presenting with ADD are often easily distracted, have difficulty listening, have difficulty following instructions, and have difficulty sustaining attention.⁹ They are often mis-classified in grade school as “slow”. ADD is included in this section because there is an increased incidence of addiction in this population.²⁴ There are many theories which seek to explain this phenomenon. Most involve environmental influences such as low self-esteem associated with poor academic performance, as well as potentially self-medicating practices to improve performance in school.⁹ Both ADD and ADHD are commonly treated with prescription stimulants like methylphenidate (Ritalin) and amphetamine/dextroamphetamine (Adderall). These stimulants tend to have

a paradoxical (opposite) effect in those individuals with ADHD where a stimulant would be expected to exacerbate the hyperactivity but instead reduces symptoms such as difficulty sitting still and excessive talking. Stimulants are frequently prescribed for adults claiming to have ADD. In order for ADD to be a valid diagnosis, it must have been present in childhood.⁸

Post-Traumatic Stress Disorder (PTSD)

Post-traumatic stress disorder (PTSD) is a severe anxiety disorder that is the result of psychological trauma. The symptoms that result place individuals with PTSD at increased risk for addiction. Many individuals experience psychological trauma but are able to cope reasonably quickly. The symptoms of PTSD are more enduring and involve diminished functioning in many areas of the individual's life. Examples of psychological trauma include: physical, emotional, or sexual abuse; receiving a life-threatening diagnosis; family violence; bullying; trauma experienced during war; or trauma experienced during an assault. Symptoms include: emotional numbing; re-experiencing the trauma through flashbacks or nightmares; persistent anger and angry outbursts; insomnia; avoidance of anything that might remind them of the trauma; and hypervigilance regarding their surroundings.⁸ Cognitive behavioral therapy is effective at helping the individual develop psychological coping skills. This type of therapy will be discussed further under the treatment section of this module. Probably the most effective therapy for PTSD is Eye Movement Desensitization and Reprocessing (EMDR).²⁵ There appears to be no clear drug treatment, although many drugs have been found to be effective at reducing some of the symptoms of PTSD. Antidepressants such as selective serotonin reuptake inhibitors have been proven helpful. The psychiatric disorders listed above are potentially the most common disorders co-existing with a chemical dependency diagnosis but are certainly not meant to be all-inclusive.

Personality Disorders

Personality disorders can be defined as enduring and pervasive patterns of abnormal or dysfunctional behavior.⁸ They typically lead to personal distress and a pattern of dysfunctional relationships with others. They are very subjectively based on societal norms and what is collectively termed “normal”. Personality disorders create stress both for the individual and often for those with whom they associate. They vary in severity from mild to severe.

In their milder forms, many are somewhat treatable while others are resistant to treatment of any kind. Individuals with personality disorders have a tendency to feel their behavior is normal and are resistant to implications that they should consider changing their behavior. This is particularly an issue with addicted individuals because they tend to self-medicate the emotional discomfort created by their behavior and interpersonal conflict. Many personality disorders can be treated with adjunctive pharmacotherapy. For example, treating the mood instability of a borderline personality with some of the same mood stabilizers used to treat the mood instability of bipolar disorder is often very helpful. There are many personality disorders, each with very different diagnostic criteria and each with different problem areas created by the disorder. Further information on each specific personality disorder can be found in Diagnostic and Statistical Manual of Mental Disorders.⁸

Principles Associated with the Actions of Addicting Drugs and Their Classification

This section of the module will define the principles associated with how addicting drugs work in the body and clarify how and where they are introduced, where they are supposed to go, how they get there and, finally, how they are eliminated. This section will also discuss how addicting drugs are classified and review some of the more significant drugs in each category. First, however, it is crucial to have an understanding of addiction in order to recognize why an individual selects a particular drug or drug class as their preferred drug of choice.

Drug(s) of Choice (DOC)

This is an interesting term because each individual becomes addicted to a drug for somewhat different reasons. Each individual picks a certain drug or drug class because it provides what they are looking for. Often, individuals unwittingly find themselves self-medicating some type of psychiatric issue. Generalized anxiety disorder, for instance, could be self-medicated with alcohol, a sedative preparation, or even a narcotic. Attention deficit disorder or depression could be self-medicated with a stimulant, and so on. Many, but not all, addicts pick a specific drug or class of drugs because it causes a strong euphoric effect – a “high”. Drugs like crack cocaine and intravenous heroin both create a powerful euphoric effect. Crack cocaine creates an “upper” type effect, while heroin creates a “downer” type effect. Each effect is the desired effect handpicked

by that individual to meet the specific qualities they most desire in the drug's effect. So the "high" for a heroin user would actually be a low.

Pharmacokinetics

The term pharmacokinetics refers to the life cycle of a drug and the four phases of this life cycle as it passes through the body. All drugs have a specific pharmacokinetic profile. These phases or stages are absorption, distribution, metabolism, and finally excretion.

Absorption

Absorption is the first phase of a drug's life cycle and is of significant importance because if the drug does not get into the body, it obviously can not have an effect. Integral to understanding absorption is an awareness of the route of administration or simply the method used to get the drug into the body. Routes of administration with addicting drugs include: oral, injectable, inhalation (lungs), intranasal (snorting), rectal, vaginal, sublingual, and topical (dermal patch). Drugs can be easily introduced anywhere in the body where there is a mucous membrane e.g., the nose, eye, mouth, vagina and rectum. The objective with absorption is to somehow get the drug into the bloodstream where it can then be distributed throughout the body and eventually reach its site of action. The primary site of action for addicting drugs is the brain. In terms of absorption, the more abundant the introduction site is in blood, the faster and more complete the absorption will be. As an example, the oral route is less efficient than the intravenous route since it results in the drug being immediately available in the bloodstream. The efficacy of any route of administration is defined by its bioavailability or the percentage of drug actually absorbed.^{9,26}

Distribution

Distribution defines how the drug is transported throughout the body, and in the case of addicting drugs, to the brain. Distribution is accomplished by way of the bloodstream. Distribution becomes very interesting when talking about the brain as the site of action. Luckily, not everything in the bloodstream can get into the brain. The brain has a protective barrier known as the blood-brain barrier. Anything with the capacity to pass this barrier must have certain characteristics. The barrier is made up of fatty protective cells. Therefore, all chemicals that have the capability of passing through this barrier must be at least partially fat soluble. The more fat soluble a drug is the faster the

onset of action for that particular drug. This explains why the very fat soluble drugs such as propofol (Diprivan) and crack cocaine are so fast acting.^{9,26}

Metabolism

Metabolism refers to the body's ability to break an active addicting drug down into inactive compounds known as metabolites. This "breaking down" process occurs primarily, but not exclusively, in the liver. When a drug is taken, the liver produces specific compounds (known as enzymes) that are responsible for breaking this fat soluble drug down into water soluble metabolites so that it can be eliminated in the urine. Because most addicting drugs are metabolized in the liver and eliminated in urine, the process lends itself well to the urine screening method of drug detection.^{9,26}

Excretion

Excretion simply refers to the method of elimination of the drug or its metabolites from the body. As discussed above, most drugs are excreted through the kidneys and eliminated in urine either unchanged, as a metabolite, or both. Other methods of elimination include the lungs (breath) and the skin (sweat) as in the case of alcohol.²⁶

Pharmacodynamics (Drug Effects on the Body)

There are a number of variables which influence why the same dose of the same drug may vary in effect from one individual to another. These include: 1) age – elderly people tend to have less plasma proteins and therefore the initial dose of a drug is likely to have a greater initial effect; 2) weight – heavier individuals have a larger blood volume which dilutes the drug in their bloodstream as compared to a much smaller individual; 3) race – different races occasionally have differences in physiology which can place them at greater risk for adverse reactions (e.g., Asians have a flushing reaction to alcohol); 4) organ function – a severe alcoholic with liver damage will be less likely to metabolize alcohol effectively compared to a healthy individual; 5) tolerance – the effects of alcohol on a non-drinker versus a heavy drinker would likely be very different; 6) bioavailability – food in the stomach would slow the absorption of an oral preparation and may decrease the amount absorbed; 7) placebo effect – the influence of the expectations of the user – someone expecting to have a "bad trip" on LSD will likely have a bad trip; and 8) drug interactions – can influence the effects of a given dose by increasing or decreasing the final effect.²⁷

Classification of Addicting Drugs

Drugs, in general, can be classified in a number of different ways depending on the varying disciplines of the individuals investigating or categorizing them. Examples include classification by therapeutic use, site of action, abuse potential, chemical structure, mechanism of action and so on. Addicting drugs are generally classified according to the effect they create for the user and include four categories: Depressants, stimulants, narcotic analgesics, and hallucinogens.⁹ Several drugs do not fit any particular category well and are customarily classified under “miscellaneous”. For purposes of this module, the only drugs that will be discussed individually will be those drugs about which patients or customers are most likely to inquire.

Depressants

Depressants are a chemically heterogeneous group of drugs that work by depressing the functions of the brain and other parts of the central nervous system. They include ethyl alcohol (alcohol), hypnotics (sleeping pills), sedatives (benzodiazepines and barbiturates), and inhalants (volatile solvents, aerosol propellants, gasoline). Depressants derive their sedating effect from their action on the neurotransmitter gamma-aminobutyric acid (GABA) in the central nervous system. GABA is the chief inhibitory neurotransmitter in the brain. Because GABA essentially mediates the actions of all depressants, there is cross tolerance between members of this group. They all have a potentially life threatening withdrawal syndrome characterized by delirium tremens with resultant symptoms of elevated blood pressure and heart rate, delusions, amnesia, and seizure activity. With the exception of benzodiazepines, the cause of death in overdose cases is due to respiratory depression.⁹

Benzodiazepines and Barbiturates

Benzodiazepines have become far more popular than barbiturates for use as both hypnotics (sleep) and sedatives. This is primarily due to their increased safety margin – especially as it relates to overdose deaths due to respiratory depression. Benzodiazepines are used to treat anxiety (anxiolytics), acute stress reactions, and panic attacks. Examples include alprazolam (Xanax), clonazepam (Klonopin), diazepam (Valium), and lorazepam (Ativan). The more sedating benzodiazepines are prescribed for the short term treatment of sleep disorders and are known as hypnotics. Examples include estazolam (ProSom), fluzepam (Dalmane), temazepam (Restoril), and triazolam (Halcion). Several non-benzodiazepine substances

that work on the same receptors in the brain are eszopiclone (Lunesta), zaleplon (Sonata), and zolpidem (Ambien). These substances also carry a considerable risk for dependence.

Barbiturates are used less frequently and are generally used in combination or alone for anxiety, sleep problems, seizure disorders, and asthma. Examples include mephobarbital (Mebaral), pentobarbital (Nembutal) and phenobarbital.

Inhalants

Inhalants comprise a variety of volatile substances which are readily inhaled and therefore capable of reaching the brain quickly and at full strength. Included in this category are compounds like volatile solvents (gasoline, paint thinner, acetone), aerosols (spray paint), gases (nitrous oxide – “whippets”, ether), and nitrates (amyl nitrate – “poppers”). They are generally (but not exclusively) abused by adolescents, with abuse more common among younger adolescents. Adults who do not have the resources to buy alcohol also abuse inhalants, preferring gasoline or rubber cement in a plastic bag. The process used is called “huffing” and can produce an intoxication that resembles alcohol intoxication with slurred speech and staggering. Physical dependence is possible in heavier users, accompanied by potential life threatening withdrawal. Physical consequences of long-term inhalant abuse include brain, liver, kidney, and vision damage; hearing loss (ototoxicity); and heart failure. A very real potential consequence is “Sudden Sniffing Death” which can occur on first use and occurs most commonly with aerosol propellants, propane and methane.²⁸

Stimulants

Stimulants produce a variety of different effects by increasing the effects of norepinephrine, serotonin, and dopamine in the central and peripheral nervous systems. The primary stimulatory effect in the brain is produced by norepinephrine, while feelings of pleasure are mediated by dopamine. These effects include increased alertness, awareness, motivation, endurance, and pleasure/euphoria. Stimulants also increase heart rate, respiratory rate, and blood pressure. Long-term abuse can generate significant irreversible heart damage and significant brain damage. Medical uses include: narcolepsy, obesity, ADHD, and “off label” to treat depression refractory to antidepressant treatment. Examples of stimulants include cocaine, nicotine, amphetamine, methamphetamine, phen-termine, pseudoephedrine (OTC), MDMA (Ecstasy) and methylphenidate (Ritalin).²⁹

Nicotine

Interestingly, nicotine addiction is responsible for more deaths each year than cocaine, heroin, alcohol, methamphetamine and all other addicting substances combined. Curiously, however, it was not taken seriously as a deadly addicting drug until relatively recently. Given that 1 in 5 deaths in the U.S. each year is the result of cigarette smoking, it seems important that this addiction be taken seriously.³⁰ The adverse health consequences of nicotine addiction include cancers of the lip, larynx, esophagus, stomach, pancreas, cervix, kidney, ureter, and bladder. While breast cancer captures most of the publicity, lung cancer actually kills far more women each year. Death from lung cancer is the leading cause of death from nicotine addiction, followed closely by heart disease.³¹ Chronic obstructive pulmonary diseases (COPD) like emphysema are responsible for additional slow and painful deaths each year.³¹ Quitting can significantly decrease the risks for cancer, heart disease, COPD, and stroke. Genetic involvement makes it more difficult for some individuals to quit. Many recovering individuals state that it was more difficult to quit smoking than it was to quit drinking. There are several reasons why it is difficult to quit: 1) there are generally no short term consequences if the individual can't quit – “that's okay, I'll quit Monday”; 2) withdrawal (craving, anxiety, irritability) is somewhat different and begins as quickly as two hours after the last cigarette; and 3) because people smoke literally all day, they are exposed each day to many more cues and triggers which could initiate a craving cycle. There are effective treatments for nicotine addiction including cognitive behavioral therapy. There are several medications which greatly increase the likelihood of success. They include nicotine replacements, bupropion (Wellbutrin and Zyban) and varenicline (Chantix) which will be discussed in the section on drugs used as adjuncts to addiction treatment.

Cocaine and Methamphetamine

Cocaine and methamphetamine are stimulants responsible for very serious addictions and unimaginable suffering. Once addicted to either of these drugs it is very hard to quit without significant help. Cocaine is an alkaloid. Alkaloids are derived from plant sources and exist chemically as the “salt” (cocaine hydrochloride) or as the “free base”. Many other addicting drugs are alkaloids such as nicotine, morphine, and codeine. The free base of cocaine is also called “crack” cocaine. The salt and the free base differ significantly in terms of how they are used. The salt, cocaine hydrochloride (white powder), is commonly

“snorted” or dissolved in water and injected intravenously. Crack cocaine is not soluble in water like the salt but lends itself to being heated lightly, and like water changing to steam, can then be inhaled. This form of delivery results in a massive dose of pure cocaine, reaching the brain in eight seconds. The effect involves profound euphoria which is short lived, making it potentially the most reinforcing drug of abuse – intense euphoria/short duration of action. The withdrawal syndrome for cocaine and other powerful stimulants like methamphetamine includes powerful cravings, depression and anhedonia as the result of depleted reward center neurotransmitters, sleep disturbances, plus a complete lack of motivation. Treatment providers have identified this syndrome as the primary reason for the high relapse rate associated with strong stimulants. If one considers an individual having strong cravings, who is depressed, has a low level of motivation and generally cannot feel good about anything (including recovery), it is no wonder this situation necessitates a strong and organized intervention in order for this individual to have any chance at all. Unfortunately, most of these individuals do not have the resources required for adequate treatment.

Methamphetamine is similar to cocaine in that it is a powerful stimulant. Unlike cocaine, however, the effect lasts for very long periods of time.³² In time, methamphetamine takes a cruel toll on the brain and reward center and leaves many individuals in a place where they will never feel right in their world again.

MDMA (Ecstasy)

Chemically, MDMA is 3,4-methylenedioxy-methamphetamine. It is often classified as a stimulant because it has stimulatory effects but nothing approaching the effects of methamphetamine. It could also be classified as an hallucinogen because it also causes mind altering effects. It is popular as a club drug because of the above characteristics. “It produces feelings of increased energy, euphoria, emotional warmth and empathy toward others and distortions in sensory and time perception.” It is known as the “love drug”. It increases the activity of norepinephrine, dopamine and serotonin. “Serotonin triggers the release of the hormones vasopressin and oxytocin, which play a role in love, trust, sexual arousal and other social experiences.”³³

Hallucinogens

Hallucinogens comprise a group of heterogenous substances that characteristically produce profound distur-

tions in an individual's perception of reality. "Users often see images, hear sounds, and feel sensations that seem real but are not".³⁴ Melding of the senses can occur (synesthesia) where the user experiences "cross over" sensations like hearing colors and seeing sounds. Interestingly, physical dependence does not occur and the occurrence of psychological dependence is negligible. Tolerance develops quickly (tachyphylaxis) necessitating the desire to use larger doses in order to get a more profound effect which never comes. If a large initial dose is taken, however, it can result in a considerable loss of the individual's grasp on reality, experiencing delusions, visual and auditory hallucinations, and occasionally profound paranoia accompanied by panic and terror reactions. The expectations of the user are an essential component regarding the outcome of a hallucinogen-mediated experience. For instance, if the potential user is fearful of having a "bad trip" and is given a reasonably large dose of the drug, this experience is likely to end poorly with the user in an emergency room experiencing panic and terror.³⁵

The exact mechanism of action of hallucinogens is not well understood. Disruptions in serotonin neurotransmitter systems are clearly involved, but because hallucinogens comprise a diverse group, they likely have some different mechanisms of action.³⁴

D-lysergic Acid Diethylamide (LSD)

LSD is generally considered the prototype in this category because most of the characteristics of LSD are true for most of the other hallucinogens. LSD has a very colorful history. It was discovered in 1938 by a Sandoz chemist after working with a "new chemical" at work and returning home to experience mild hallucinations. LSD was investigated in the 50's as an investigational drug which was distributed to physicians across the country. Bill Wilson, one of the founders of Alcoholics Anonymous, tried it as a therapeutic tool during psychotherapy to help get to the "root" of his depression. CIA agents were putting it in foreigners' drinks to glean "secrets" they would not have otherwise obtained. It never really worked in therapy or to glean secrets or for any other useful purpose. A typical trip on LSD lasts about 8 to 12 hours which can cause an increased level of concern for a "bad trip".³⁵

Phencyclidine (PCP)

PCP is a drug classified as an hallucinogen but is really quite different than LSD. PCP is classified as a dissociative anesthetic and was originally used in anesthesia until it

became clear that because of the untoward psychotic reactions, it could not be used in humans. PCP produces distortions in perceptions of sight and sound and feelings of detachment and dissociation – as if you were observing yourself from "outside yourself". PCP use can result in delusional, paranoid, agitated and irrational thinking. PCP has somewhat of a bad reputation among frequent drug users with a common perception that the drug just is not worth it.³⁴

Peyote and Psilocybin

Peyote contains the active ingredient mescaline and is derived from the button shaped projections at the top of the peyote cactus. These buttons are usually sliced and chewed with the resultant effects being felt for approximately 4 to 6 hours. Psilocybin is the active ingredient in certain mushrooms common to Mexico and Southwestern states in the US. They are also referred to as "Shrooms". Both peyote and psilocybin have hallucinogenic properties very similar to those of LSD.³⁴

Narcotic Analgesics

The term "narcotic," generally speaking, refers to potentially addicting analgesics used medically for the relief of pain. Unfortunately, the term is loosely defined and imprecisely used by the public. Much of the confusion centers around federal "narcotic" laws which include cocaine and marijuana. Consequently, a news broadcast may refer to a "narcotics bust" but the drug confiscated in the bust may be cocaine or marijuana, neither of which are narcotics. When referring to a potentially addicting pain killer (analgesic), the more precise medical term would be referring to an "opioid". Opioids refer to either synthetic or semi-synthetic derivatives of morphine or codeine and denote a group of substances that derive their primary effects by occupying opioid receptors in the central and peripheral nervous systems.³⁶ Their capacity for addiction is directly associated with their effect on the reward center. They mediate pain relief by increasing the effect of endorphins in the central nervous system. The "high" described by users is, ultimately, the product of their effect on endorphins and later, on dopamine. When used appropriately, opioid analgesics are responsible for alleviating the pain and suffering of both severe acute and chronic pain. They comprise a group of substances that enable many individuals, who would not otherwise be able to do so, to function in their world and live productive lives. Nonetheless, they correspondingly have the capacity to produce the in-

comprehensible pain and suffering associated with addiction. In fact, they comprise the fastest growing category of abused prescription medications and are responsible for an appalling number of emergency room visits and overdose deaths.³⁷

Opioid withdrawal is the primary reason why it is so difficult for an addicted individual to quit without medical intervention. Withdrawal presents with the milder symptoms of restlessness, sweating, anxiety, and runny nose, but then evolves to the more severe symptoms of severe craving, severe abdominal cramps, diarrhea, muscle spasms, nausea, vomiting, and severe insomnia which may persist for 5 to 8 days. These symptoms are the direct result of the central nervous system's reaction to the absence of the drug. Post-acute withdrawal (discussed earlier) may persist for months.³⁶ Newer prescription medications like buprenorphine/naloxone (Suboxone) and naltrexone injection (Vivitrol), and older drugs like naloxone and methadone are used effectively as interventions and will be discussed in the section addressing the medications used as adjuncts in the treatment of addiction.

Miscellaneous Drugs of Interest

There are many drugs that constitute the principal drugs of abuse in younger adults and adolescents.

Marijuana (Cannabis)

Marijuana constitutes one of the most controversial drugs of abuse in this category. Many marijuana users are passionate about their belief that marijuana is essentially a harmless substance that, when used privately, should not be illegal (refer to state laws along with federal law). For a list of controlled substance classifications, you can go to <http://www.deadiversion.usdoj.gov/21cfr/21usc/812.htm>. They often refer to it as one of God's precious plants. Others feel that not all of God's precious plants were meant to be consumed by humans. In comparison with other drugs of addiction, however, marijuana does not carry the same potential for addiction nor does it create dependence of the magnitude that opioid, stimulant or depressant substances generate.

The use of medical marijuana may help to create the impression that because some people use it therapeutically, it could not be that harmful. It is important to understand that marijuana is not a benign substance. This drug impairs short term memory and learning, the ability to focus

attention, and coordination. It also increases heart rate, can harm the lungs, and can cause psychosis in those at risk.¹ Treatment centers across the country can most certainly vouch for the fact that marijuana is addictive. Its real potential for destruction lies in young people. One in 15 high school seniors use marijuana daily. Research suggests that one in six of these young people will become dependent on marijuana.³⁸ The problem for young people lies in the plasticity of their brains, which at this point in their lives, are still developing. Beyond impairing learning and memory, their reward centers are adjusting and adapting to the presence of marijuana and are slowly becoming hard wired for addiction.²¹ As a result, they may pay the price later as adults.

Spice (Synthetic Cannabis)

Synthetic cannabis is a potentially addictive designer drug derived from natural herbs that are sprayed with synthetic cannabinoids which mimic the effects of marijuana. Designer drugs are drugs that have been altered chemically so that they are not covered under federal regulatory laws which govern other potentially dangerous drugs specifically listed by the Drug Enforcement Administration (DEA). A good resource is the DEA website at <http://www.deadiversion.usdoj.gov>. Synthetic cannabis is marketed as "herbal incense" and sold as "Spice" or "K2". Spice works by binding to the same receptors in the brain that marijuana binds to. Some of the substances found in Spice, however, bind more strongly, potentially leading to a more powerful and unpredictable effect. The health consequences associated with Spice are similar to marijuana but psychosis, paranoia, and hallucinations are somewhat more prevalent. Withdrawal is an additional potential problem. Marijuana is the leading illicit substance of abuse with Spice coming in second.³⁹

Salvia – Hallucinogenic Herb

Salvia divinorum is a herb common to Mexico and Central America. The active ingredient in Salvia works at the kappa opioid receptor site in the brain (reward center). The other opioids discussed earlier work primarily at the mu-opioid receptor site which is where they produce their mood altering effects. Salvia is classified as a hallucinogen because it produces an intense "dream-like" state that experienced users of hallucinogens maintain is very different than states produced by the more commonly used LSD and psilocybin. The psychedelic-like effects include changes in visual perception, emotional swings, feelings of detachment and a highly modified perception of external reality leading to a decreased abil-

ity to interact with one's surroundings.⁴⁰ Salvia is most commonly smoked like a joint. Salvia started to become popular among younger people in 2006 when it was still legal to buy the plant online.

Bath Salts – Synthetic Cathinones

A group of synthetic chemicals marketed as “bath salts” contain amphetamine-like chemicals which are very similar to those found in the Khat plant. They typically appear as a white or brown crystalline powder sold in small plastic or foil packages.⁴¹ Bath salts can be taken orally, snorted, inhaled, or injected with the worst outcomes being associated with injecting. The effects of bath salts are comparable to the effects of Ecstasy: euphoria, increased sociability, and mild hallucinogenic effects. Their use is of great concern because in many new users, they have produced severe intoxication, paranoia, psychotic reactions, and violent behavior.^{41,42}

Gammahydroxybutyrate (GHB)

Gammahydroxybutyrate (GHB) is a central nervous system depressant with effects similar to other CNS depressants. It occurs naturally in the brain as a metabolite of gamma-aminobutyric acid but in far smaller concentrations than those found when GHB is used. GHB is heavily restricted by the FDA but is used medically for the treatment of symptoms associated with narcolepsy. GHB typically exists as a colorless and tasteless liquid and is often mixed with alcohol for illegal use. The effects generally last 2 to 3 hours. Intoxication is very similar to alcohol intoxication with slurred speech and staggering. It is most frequently used as a “club drug” because it lowers inhibitions and increases sociability. Overdose deaths are not uncommon with this drug and are the result of respiratory depression. When used with alcohol it lowers the elimination rate of alcohol and with this combination of effects, can result in vomiting. If an individual is unconscious and vomits, it can lead to “aspiration asphyxiation” and death. GHB has been used as a “date rape” drug because it is easy to slip into a drink, and it often causes amnesia, erasing all memory of the entire previous night. Many date rape victims may not be aware they were raped. GHB is metabolized quickly, making it difficult to detect in a urine screen the next day. This leads to complications when trying to prove date rape occurred.⁴³

Flunitrazepam (Rohypnol)

Flunitrazepam (Rohypnol) is also a central nervous system depressant and classified as a benzodiazepine. It is not

a legal drug in the United States but is in many European countries. It is very similar to GHB in its effects and is used as a “club drug” because of the loss of inhibition and increased sociability it produces. It is also used as a “date rape” drug because it also causes amnesia. Urine screens can detect Rohypnol for up to 60 hours after ingestion. Intoxication, like GHB, is very similar to alcohol intoxication resulting in slurred speech and staggering. When mixed with alcohol, Rohypnol may cause respiratory depression, aspiration and even death. The effects of this drug are more enduring than GHB and can last for up to 12 hours.⁴³

Test your knowledge of drug classification:

Match the drug on the left with the correct classification on the right.

- | | |
|----------------|-----------------|
| ___ 1. Cocaine | A. Depressant |
| ___ 2. GHB | B. Stimulant |
| ___ 3. PCP | C. Narcotic |
| ___ 4. Heroin | D. Hallucinogen |

Answers on page 32.

Drug Addiction Treatment Approaches

Drug addiction is well established, scientifically, as a chronic brain disease. Due to its chronic nature, it is incurable and enduring – meaning, it will not go away regardless of what else happens.^{1,6,10} That is the bad news. The good news is that it is very treatable. Given the brain changes that occur with addiction and its chronic nature, the only rational goal for treatment providers is abstinence from all mood altering, potentially addicting substances. Because addiction is a very complex and multivariate illness, its treatment must correspondingly address nearly every aspect of the addicted individual. Since, at least currently, the individual's genetic complexion is unalterable, it leaves environmental, physiological, and psychological influences as areas of concern for a treatment provider. This section will attempt to briefly describe the many aspects of addiction treatment. A more in depth description of addiction treatment can be found at <http://www.hbo.com/addiction/treatment/index.html?current=2> (HBO series). To be effective, treatment must address the multiple needs of the patient, not just his or her drug use. Therefore, treatment must address associated medical, psychological,

psychiatric, social, vocational, legal, and family problems. Treatment should also be appropriate to the patient's age, gender, ethnicity, and culture.⁴⁴ Treatment typically involves a combination of behavioral approaches coupled with effective pharmacotherapy (medication) when available. **Figure 5** depicts the components of a comprehensive treatment approach.

Behavioral Approaches

The most popular and potentially most effective form of behavioral therapy is cognitive-behavioral therapy (CBT). CBT can be used in both individual therapy and group therapy. Treatment centers typically use a combination of individual therapy and group therapy. CBT is designed to enhance problem-solving skills in every area of the patient's life. There are actually many different types of CBT. Examples would include: Gestalt Therapy, Motivational Interviewing (MI), Rational Emotive Therapy (RET), and Dialectical Behavioral Therapy (DBT).⁴⁴ CBT in general is considered a "brief therapy," meaning that it is typically time limited with a specific beginning, middle, and end. It is goal oriented and fast result driven. CBT promotes the identification of self-defeating behaviors and maladaptive belief systems. It endorses effective coping skills training while working to increase self-confidence, assertiveness, and enhanced interpersonal communication. Most importantly, with an addicted population, it augments cop-

ing skills related to high risk situations as well as increases the patient's capacity to work through drug cravings. **Figure 6** is a simple chart depicting the behavioral approach with an addicted patient.

Medications Used to Treat Addiction

Medications, when used as adjuncts to CBT, increase successful outcomes appreciably. Either type of therapy unaccompanied by the other is less effective. While there is no single medication that will "cure" addiction, there are certainly a variety of medication therapies available which increase a patient's chances at success. Currently, there are no effective medication therapies for stimulant dependence, depressant dependence (other than alcohol) or cannabis dependence. Listed below is an assortment of different drugs used to enhance recovery chances with differing drugs of choice.

Opioid Addiction

Methadone, buprenorphine, and naltrexone are the primary adjuncts used to treat opioid (narcotic) addiction. **Methadone** is used in both maintenance therapy and to decrease withdrawal symptoms. It can be used to replace a drug such as heroin or it can be used, in decreasing doses, to minimize withdrawal symptoms. **Buprenorphine** is used in much the same way but is generally considered

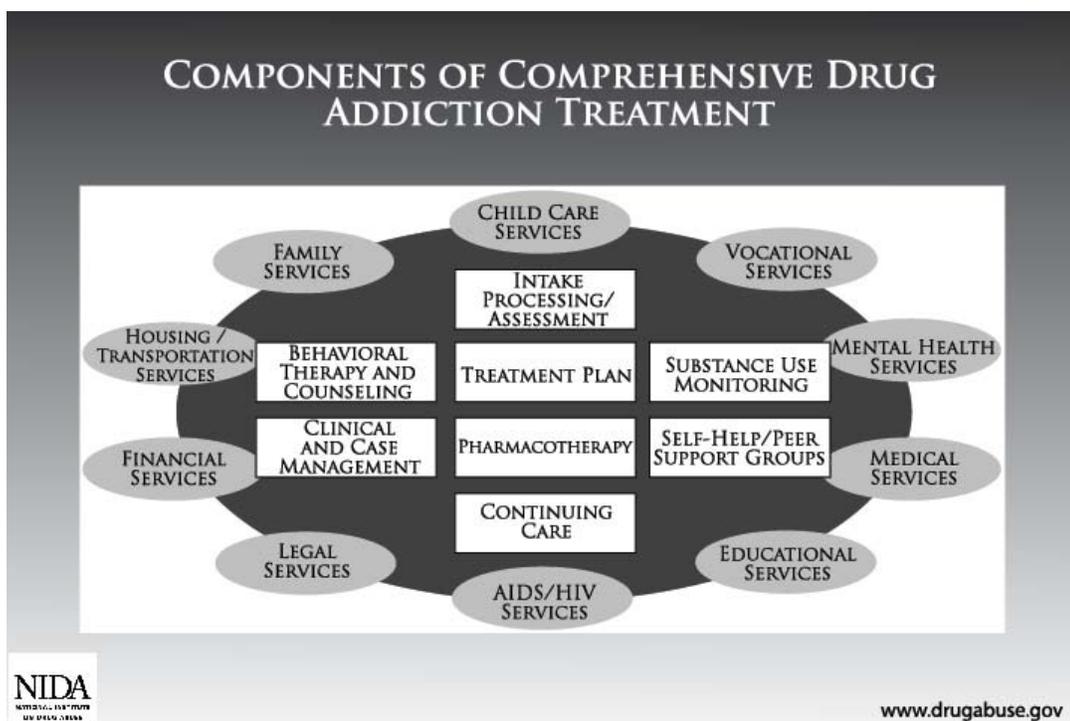


Figure 5. Components of Drug Addiction Treatment

Reproduced with permission from: *Understanding Drug Abuse and Addiction: What Science Says - Components of Comprehensive Drug Addiction Treatment*. In: National Institute of Drug Abuse. www.drugabuse.gov/publications. January, 2007.

a safer alternative. Buprenorphine is a partial narcotic agonist, meaning it is not as strong or “reinforcing” as a full agonist like methadone. It is combined with **naloxone** to produce the formulation Suboxone. Naloxone is a narcotic antagonist but is not active orally and is included in the preparation only to prevent the preparation from being ground up and injected. When the preparation is injected, the naloxone blocks the effect of the buprenorphine. When Suboxone is taken by a recovering narcotic-addicted individual, it has the added advantage of having a protective effect if the individual is using an additional narcotic as it simply will not work. The reason for this is that buprenorphine has a stronger affinity for opioid receptors than most other narcotics. **Naltrexone** is also a narcotic antagonist. It has an extremely strong affinity for opioid receptors and blocks the effect of narcotics if they are taken at the same time. A daily regimen of oral naltrexone is often prescribed for narcotic-addicted health professionals returning to a position where they have access to controlled substances including narcotics. Naltrexone tends to give narcotic-addicted individuals a feeling of safety because they are fully aware that if they use a narcotic it simply would not work. There is a newer injectable formulation of naltrexone that works up to 30 days and is now commonly used with narcotic addicted health professionals.⁴⁵

Alcohol Dependence

Naltrexone, acamprosate, and disulfiram are the primary medications used to treat alcohol dependence. **Naltrexone** (described above) is also very useful in the treatment of

alcohol dependence. While it does not block the effects of alcohol, it significantly decreases the intensity and severity of cravings for alcohol. **Acamprosate** (Campral) is used in much the same way as naltrexone for alcohol dependence by decreasing the intensity and severity of cravings for alcohol. Because they have different mechanisms of action and are metabolized differently, they are frequently used together in an individual. The mechanism of action of acamprosate is unclear but it may work at the GABA receptor site or may affect the excitatory neurotransmitter glutamate. **Disulfiram** (Antabuse) has been around since 1951. Currently, its use is limited to situations when a patient needs stabilization for short periods of time. It has never been terribly effective at producing long-term success because its use does not promote a long-term recovery program. Its mechanism of action involves inhibiting the enzyme aldehyde dehydrogenase which is responsible for breaking down acetaldehyde. Acetaldehyde is the alcohol metabolite directly responsible for hangovers (e.g., nausea, vomiting, headaches, etc.). So if the individual drinks alcohol after taking disulfiram they simply become very sick. Individuals taking disulfiram are acutely aware that this will happen. So at least, in the short term, disulfiram acts as a significant deterrent to drinking.⁴⁴

Nicotine Dependence

There are a number of different medications that are used as adjuncts in the treatment of nicotine dependence. **Nicotine replacement** in the form of nicotine patches, and nicotine gum, moderately decreases cravings for nicotine but is

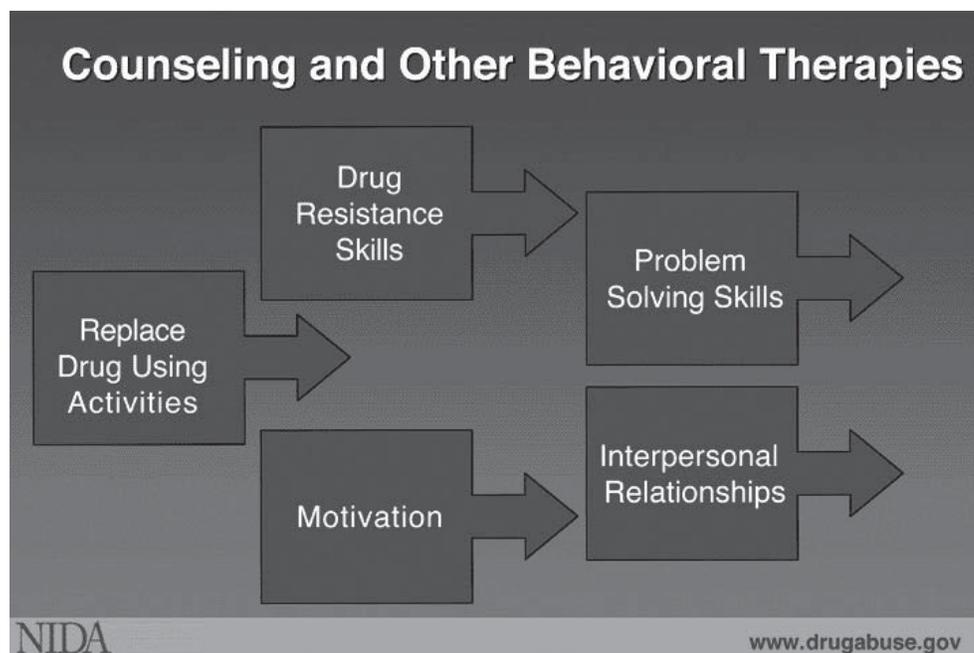


Figure 6. Counseling and Other Behavioral Therapies

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also used to decrease withdrawal symptoms. The antidepressant **bupropion** helps by significantly decreasing cravings for nicotine as well as decreasing problematic weight gain. Interestingly, women relapse at a higher rate than men but when weight is addressed women actually do better than men.⁴⁶ CBT can be used in the treatment of nicotine use disorder to address triggers and help develop relapse prevention strategies. Varenicline tartrate is probably the most effective adjunctive drug therapy for nicotine use disorder.⁴⁷ It is a partial nicotine agonist, meaning that it has mild nicotine-like effects. It significantly reduces withdrawal from nicotine as well as significantly decreases cravings for nicotine. Because it has a stronger affinity for nicotine receptors, it blocks the pleasurable effects of nicotine. Warnings include changes in behavior, hostility, agitation, depressed mood, and suicidal thoughts. Patients should be warned to watch for changes in mood, and if present, discontinue use. Patients with heart disease should only take varenicline with close physician supervision.⁴⁸

Twelve Step Recovery

Twelve step recovery is an invaluable community resource and is available to anyone having a desire to quit drinking or using drugs. Examples of 12 step programs include: Alcoholics Anonymous (AA), Narcotics Anonymous, Cocaine Anonymous, and Gamblers Anonymous. This module will refer primarily to AA as each 12 step program is patterned very closely after the AA program. Founded in 1935 by Bill Wilson and Dr. Bob Smith, AA currently has well over 100,000 AA groups and well over 3 million members worldwide. In 1938, the first 98 members of AA wrote the book *Alcoholics Anonymous* (affectionately called the Big Book) which was intended as a guide to sobriety for anyone wishing to quit drinking.⁴⁹ The first 98 members were predominantly late stage alcoholics who virtually everyone, including medical professionals, had given up on. When this first small band of 98 “hopeless” alcoholics wrote the Big Book of AA, their intention was to simply share their knowledge and experience with others struggling to stay sober. AA is indeed a unique organization for it has no “party line”, no official dogma or doctrine to which members subscribe, and no creed to recite. The principles of AA are presented merely as suggestions and not as rules or requirements.⁵⁰ It is very difficult to explain exactly how AA works. AA members define how it works by simply stating that there is magic in the rooms and around the tables of AA. Alcoholics Anonymous defines itself in its “preamble” which is read at the beginning of every AA meeting.

AA Preamble (General Service Offices of AA World Services)

“Alcoholics Anonymous is a fellowship of men and women who share their experience, strength and hope with each other that they may solve their common problem and help others to recover from alcoholism. The only requirement for membership is a desire to stop drinking. There are no dues or fees for AA membership; we are self-supporting through our own contributions. AA is not allied with any sect, denomination, politics, organization or institution; does not wish to engage in any controversy, neither endorses nor opposes any causes. Our primary purpose is to stay sober and help other alcoholics to achieve sobriety”. (Alcoholics Anonymous fourth edition)

The guidelines for staying sober are outlined in the 12 steps of Alcoholics Anonymous.

Anyone looking at the structure of AA would wonder how it has survived over time. The following is a list of what AA does not do and defines why it is such a unique organization.

- does not advertise or solicit members
- does not keep records of members
- does not accept money for its services
- does not have rules
- does not have leaders
- does not engage in politics
- does not have an opinion on any outside matter
- does not affiliate with anyone including religious groups or treatment centers
- does not ask a member to say he/she is an alcoholic
- does not endorse or oppose any causes

The guidelines for getting and staying sober are outlined in the 12 steps of AA: http://www.aa.org/en_pdfs/smf-121_en.pdf

There are a variety of different types of AA meetings available to AA members. There are open meetings which are available to anyone interested in either AA or alcoholism in general where either one or two AA members tell their AA stories. Big Book meetings go through the Big Book one chapter at a time. **Step meetings** discuss a different step each week. **Discussion/topic meetings** discuss AA related topics such as gratitude, honesty, anonymity, etc. There are AA meetings virtually everywhere, even on cruises where they are listed as **Friends of Bill W meetings**.

Treatment centers consider AA an invaluable adjunct and resource to effective treatment and recovery from addiction.⁵¹ For pharmacy professionals, potentially the most striking illustration of the importance of AA involvement

post treatment was demonstrated in a 14 year outcome study. One hundred and sixteen pharmacists with addiction issues were followed for two years post-treatment to determine success rates. Of the 116 pharmacists in the study, 15 relapsed in the two-year period following treatment making the success rate 87%. A number of variables with each pharmacist were tracked. One of the variables tracked in these pharmacists was whether or not they invested in an AA recovery program. Nine pharmacists failed to invest in AA. Amazingly, all nine of these pharmacists were in the relapse group making the relative risk (RR) for relapse without investment in AA is 17.83 times greater than if they had invested in AA. The P value was <0.001. In the language of statistics this simply means that it was profoundly significant. This became very black-and-white and for this group of pharmacists it simply boiled down to: if you don't invest in AA your chances at success are extremely limited.⁵

Addiction in Healthcare Professionals

Due to the stressful environmental influences associated professionals are at greater risk for developing an addiction. This would clearly include pharmacy technicians. Pharmacy professionals, especially those working in busy, high volume community pharmacies, appear to be the most vulnerable since job dissatisfaction and the stress associated with their work environment appears to be very high.⁵² Job stress associated with an increased workload, insufficient or untrained help, and longer hours are contributing factors. Add to that the usual stressors that occur during life e.g., a death in the family, a sick parent or child, marital conflict, or financial problems, there may be a tendency to self-medicate with some type of sedative medication and/or alcohol. Given all of that, if adding a genetic predisposition to addiction (family history of addiction) and easy access to addicting medications, it is a setup for addiction. See **Figure 7**.

Find the Word Puzzle

```

a d d i c t i o n
l f a m q x u p e
c n a r c o t i c
m h g e n e s o q
c e b w x j h i w
c o c a i n e d j
b s t r e s s g p
o w x d q o f h m
    
```

addiction: chronic, relapsing brain disease characterized by compulsive drug seeking and use, despite harmful consequences. (page 4)

cocaine: stimulant and alkaloid responsible for very serious addiction. (page 13)

genes: play a significant role in the development of addiction. (page 5)

narcotic: refers to potentially addicting analgesics used medically for the relief of pain. (page 14)

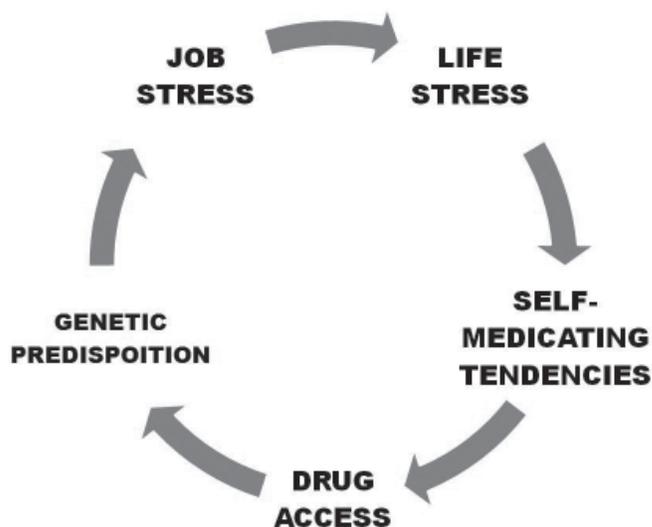
opioid: refers to either synthetic or semi-synthetic derivatives of morphine or codeine. (page 14)

reward: center; an area of our brain where the cravings of hunger, thirst, and sex are created. (page 6)

stress: one of contributing factors when it comes to addiction. (page 5)

Answers on page 32.

Figure 7. Setup for addiction



The greatest barrier for healthcare professionals, including pharmacists and pharmacy technicians, to getting needed help, if they find themselves in trouble with addicting medications, is fear of losing their job or their license to practice. It is of critical importance to understand that help is available – confidential help. **Help can be found at usa.prn.com. It is the national website for Pharmacy Recovery Network (PRN) programs across the country.** These programs offer confidential help to pharmacists and pharmacy technicians who find themselves in trouble with addiction. Finally, if you find yourself in trouble, do not be afraid to ask for help!

How you could be of help

Once again, addiction is potentially the most serious health problem facing the United States in the near future. Dissemination of information regarding addiction is undersupplied and scarce at best. You as pharmacy technicians (pharmacy healthcare professionals) are in a very unique position to be of help to your patients who may be struggling with addiction. One very simple way to help disseminate information about addiction would be to provide an information rack with pamphlets covering different aspects of addiction. The National Institute on Drug Abuse offers a variety of pamphlets on addiction related topics – free! They can be ordered online and mailed free of charge. AA offers low-cost pamphlets that can be ordered at www.chicagoAA.org. Information regarding treatment centers can be found at: www.DrugRehab.org. There are many treatment centers which offer addiction assessments free of cost. Recently, some pharmacies have posted a sign offering confidential information regarding help for alcohol or drug problems. Remember, you can be of help.

Addiction Information Resources

1. National Institute of Alcohol Abuse and Alcoholism (NIAAA) <http://www.niaaa.nih.gov/>
2. National Institute on Drug Abuse (NIDA) <http://www.drugabuse.gov/>
3. Substance Abuse and Mental Health Services Administration (SAMHSA) <http://www.samhsa.gov/>
4. Addiction Science and Education Research Center, University of Texas <http://www.utexas.edu/research/asrec/>
5. 10th Special Report to Congress on Alcohol and Health <http://pubs.niaaa.nih.gov/publications/10report/intro.pdf>
6. American Society of Addiction Medicine <http://www.asam.org/>

7. Center for Alcohol Studies <http://alcoholstudies.rutgers.edu/>
8. Faces and Voices of Recovery http://facesandvoicesofrecovery.org/resources/support_home.php
9. Neuroscience: Pathways to Alcohol Dependence <http://pubs.niaaa.nih.gov/publications/AA77/AA77.htm>
10. Who is at Risk for Alcoholism? <http://pubs.niaaa.nih.gov/publications/arh40/64-75.htm>
11. Neurobiology of Alcohol Dependence <http://pubs.niaaa.nih.gov/publications/arh313/185-195.htm>
12. Alcohol and Other Drugs <http://pubs.niaaa.nih.gov/publications/AA76/AA76.htm>
13. What is Addiction? <http://pubs.niaaa.nih.gov/publications/arh312/93-95.htm>
14. Helping Patients Who Drink Too Much: A Clinician's Guide <http://www.niaaa.nih.gov/guide>
15. Medication Management Support for Alcohol Dependence <http://pubs.niaaa.nih.gov/publications/clinician-Guide/guide/tutorial/data/resources/MedMgmtSupportTemplates.pdf>
16. Medications for Treating Alcohol Dependence <http://www.aafp.org/afp/2005/1101/p1775.html>
17. Addiction: Treatment <http://www.hbo.com/addiction/treatment/index.html?current=2>
18. Drug Enforcement Administration on Diversion <http://www.deadiversion.usdoj.gov>
19. Federal Controlled Substance Act <http://www.deadiversion.usdoj.gov/21cfr/21usc/index.html>
20. DEA Pharmacist's Manual <http://www.deadiversion.usdoj.gov/pubs/manuals/pharm2/index.html>
21. DEA Practitioner's Manual <http://www.deadiversion.usdoj.gov/pubs/manuals/pract/index.html>
22. National Association of Boards of Pharmacy (NABP) list of Boards of Pharmacy <http://www.nabp.net/boards-of-pharmacy>

Interactive Learning (for those with internet access)

Go to each link and answer the questions related to that link.

www.chicagoAA.org

List three meeting locations in a selected area.

www.AA.org

Find out about meetings in your area.

continued next page →

www.DrugRehab.org

On the home page in the “Find a Rehab Center” it says to check a box if you’re:

- A. a family member
- B. a friend
- C. a human

www.DrugAbuse.gov

List the major categories you can search.

Answers on page 32.

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ANSWER KEY: Test Your Knowledge

Exercise

Pre-activity Quiz: (1) A; (2) C; (3) D

Test Your Knowledge - Drug Classification:

(1) B; (2) A; (3) D; (4) C

Find the Word Puzzle:

a	d	d	i	c	t	i	o	n
l	f	a	m	q	x	u	p	e
c	n	a	r	c	o	t	i	c
m	h	g	e	n	e	s	o	q
c	e	b	w	x	j	h	i	w
c	o	c	a	i	n	e	d	j
b	s	t	r	e	s	s	g	p
o	w	x	d	q	o	f	h	m

Interactive Learning

www.DrugRehab.org (C)

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