Abstract

Methadone is a powerful narcotic that can be used to treat severe pain as well as the symptoms of withdrawal from heroin. However, methadone itself can be addictive, and the withdrawal symptoms can be severe. Medical marijuana is now being used to ease the symptoms of methadone withdrawal as patients are going through the detoxification process. Although it does not alleviate all withdrawal symptoms, it makes the process much easier on patients and medical staff alike.
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Statement of Need
Medical marijuana is used to treat several chronic conditions, including addiction to methadone. Health professionals are often uninformed of the underreported use of medical marijuana and trends for future research.

Course Purpose
To provide nursing professionals with current knowledge of new laws and evidence influencing the use of medical marijuana and methadone treatment programs.
Learning Objectives

1. Explain the purpose of methadone treatment.
2. Describe methadone withdrawal symptoms.
3. Define the role of methadone in detoxification.
4. Identify delivery methods for medical marijuana.
5. Analyze the physiologic changes that occur with medical marijuana.

Target Audience

Advanced Practice Registered Nurses, Registered Nurses, Licensed Practical Nurses, and Associates

Course Author & Director Disclosures

Jassin M. Jouria, MD, William S. Cook, PhD, Douglas Lawrence, MA, Susan DePasquale, CGRN, MSN, FPMHNP-BC – all have no disclosures

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There is no commercial support for this course.

Activity Review Information

Reviewed by Susan DePasquale, CGRN, MSN, FPMHNP-BC

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Please take time to complete the self-assessment Knowledge Questions before reading the article. Opportunity to complete a self-assessment of knowledge learned will be provided at the end of the course.
1. Use of cannabis may be able to help patients who struggle with addiction to the synthetic opioid ________________.
   a. heroin
   b. methadone
   c. oxycodone
   d. morphine

2. True or False: Methadone prescriptions can be filled at any licensed pharmacy ONLY if the drug is being used for pain relief and is not being prescribed for addiction withdrawal.
   a. True
   b. False

3. Methadone may be used as an analgesic medication because
   a. of methadone’s use in detoxification.
   b. methadone helps patients experience fewer side effects of withdrawal.
   c. methadone is a powerful pain reliever.
   d. methadone manages the effects of withdrawal from some very strong narcotics.

4. Some studies have determined that marijuana use may
   a. cause problems with fetal brain development.
   b. lower or raise blood pressure.
   c. contribute to ischemic heart disease.
   d. All of the above.
5. A patient who has asthma or breathing problems (*i.e.*, chronic lung disease) –
   a. may take methadone but only intravenously.
   b. may take methadone safely.
   c. should not take methadone at all.
   d. may take methadone so long as there are no other side effects.

6. True or False: Methadone use can also affect a patient’s ability to breathe while sleeping, which can be particularly dangerous if the patient takes the drug before going to bed.
   a. True
   b. False

7. Marijuana can be useful for patients receiving chemotherapy for cancer because
   a. marijuana gives the patient a better, overall sense of well-being.
   b. marijuana has been shown to be effective in controlling nausea.
   c. the body does NOT produce cannabinoids that could help cancer patients.
   d. marijuana helps control inflammation.

8. In a State where medicinal marijuana is legal, if a patient can benefit from medical marijuana,
   a. a physician may write a prescription for medicinal marijuana use.
   b. a physician may recommend marijuana use but only if the drug is a marijuana-based pharmaceutical.
   c. then the use of marijuana would be legal under federal law as well.
   d. a physician can make a recommendation for its use as part of treatment.
9. The most common method for the administration of methadone is ____________.
   a. pill form
   b. intravenous injection
   c. suppository form
   d. liquid form

10. For some patients with methadone addiction, marijuana may be an option for alleviating some of the withdrawal symptoms because
    a. the patient is substituting one drug (marijuana) for another drug (methadone).
    b. of marijuana’s recreational nature.
    c. marijuana is effective in controlling nausea and improving appetite.
    d. marijuana and methadone affect the body in a similar manner.
Introduction

The integration of science and nature come together when prescribing medical marijuana for a number of different health conditions and for treatment of various uncomfortable symptoms. Marijuana is a plant that has been grown and used for medicinal purposes for centuries, but legislation has limited its use in the medical arena. The various forms of its use, as well as its physical effects on the body, continue to be a treatment option available to some patients who struggle with health issues that have not responded to mainstream methods of treatment.

One condition in which medical marijuana has been effectively used is with the management of opioid addiction to substances such as methadone. This is a powerful drug that is used for pain relief as well as for managing the effects of withdrawal from some very strong narcotics, such as heroin. Methadone maintenance programs can successfully help patients who struggle with opioid addiction to overcome their painful and frightening symptoms of withdrawal and ease into a life without narcotics.

Alternatively, some patients move from their previous substance addiction to a methadone substance use disorder, the very drug used to try to help them overcome substance abuse. These patients then need further treatment and guidance to also overcome their addictions and to reach a point where they live drug-free lives. Use of cannabis may be able to help some of these patients who struggle with methadone addiction.

The terms substance use disorder and addiction will be used interchangeably in this learning module. Differences in terminology may vary based on national and regional terms and classifications as published by medical and psychological associations. The Diagnostic and Statistical Manual of Mental
Disorders, Fifth Edition (DSM-5) did away with the terms substance dependency and abuse and replaced them with the terms substance use disorder and addiction. Because of the growing numbers of states that have approved marijuana for medical use and the recent legalization in some areas for its recreational use, it is important for healthcare providers to understand newer legislation influencing marijuana use in their communities, as well as the drug’s purposes, methods, and the effects of medical marijuana, including its use as part of treatment for methadone addiction. Medical marijuana has proven to be useful for many, but controversy still exists about the use and regulation of this drug.

**Methadone**

Methadone is a narcotic analgesic that has been developed for relief of moderate to severe pain. Its effects are similar to those of other opioid analgesics and it most often resembles morphine in characteristics. Methadone has M1-opioid receptor agonist properties, which means that it activates a specific type of opioid receptor in the body, the M1 receptor, and makes it similar in effect to heroin or morphine.

Methadone is a synthetic drug. It was first developed during the early 20th century by several physicians who were searching for an opioid analgesic to administer during instances of severe pain among their patients, but they also wanted a drug that would not be as addictive as morphine. The drug was fully developed for use by the end of World War II and named methadone at that time. As illicit drug use increased in the United States during the middle of the 20th century, the use
of methadone expanded to become not only a potent analgesic, but also for use in helping those with drug addictions to go through withdrawal.

Today, methadone’s use is primarily centered on helping patients overcome an opioid substance use disorder and addiction; it also provides effective pain relief when prescribed as an analgesic. While not helpful for all patients, prescribing providers who want to use this specific medication should become familiar with the essential data about methadone and its prescriptive properties, its use as part of different treatments, its potential side effects, and its ability to cause addiction when misused by patients.

**Use in Detoxification**

A patient undergoing narcotic detoxification and withdrawal faces many physical and psychological difficulties throughout the process. The symptoms that develop during this period can be extremely uncomfortable and the body physically craves the drug, making it very difficult to simply stop taking it. Healthcare clinicians have discovered that transitioning from regular use of a narcotic to a drug-free state may be less complicated by giving the patient another drug in its place that has fewer side effects and that does not produce as strong of a high feeling. Replacing narcotic drugs of abuse with methadone has been shown to be effective in helping those who struggle with a substance use problem to overcome addiction.

Methadone’s use in detoxification helps the patient with a substance use disorder to recover from and experience fewer side effects of withdrawal because methadone is an opioid that provides some of the same effects. Methadone is also a powerful pain reliever, so it may help with some of the painful symptoms that develop with withdrawal. Conversely, methadone may also be used as an analgesic medication to combat other types of pain,
including cancer pain, neuropathic pain, and other situations that cause chronic pain.

**Pain Relief**

Although methadone use increased in popularity for the management of narcotic addiction, it is now also increasing in use for the treatment of moderate to severe pain, which may or may not be associated with narcotic withdrawal. This is evidenced by the increase in sales of methadone by over 70 percent between 1999 and 2002. More providers have recognized the effectiveness of using methadone outside of rehabilitation programs for addiction treatment and have started to focus more of its purpose on pain relief.

A patient may receive a prescription for methadone for pain relief and may fill the prescription at any pharmacy that would fill any other type of opioid drug; however, the patient who takes methadone for drug addiction, including its use for pain control during drug withdrawal, must only use a prescription from a provider who is registered with the U. S. Drug Enforcement Agency for this reason and may only use a specific type of pharmacy that has been approved by a regulatory agency to fill a prescription. In other words, methadone prescriptions can be filled at any licensed pharmacy only if the drug is being used for pain relief and not for addiction withdrawal. This is significant, because methadone users have the potential to abuse the drug and misuse the system by filling prescriptions for one purpose but using the drug for another.

Because of its action as an opioid agonist, methadone can successfully treat severe pain among some patients. Methadone has been shown to be a serotonin reuptake inhibitor, so it may successfully manage neuropathic pain
well.\textsuperscript{15} It can be administered several times each day to control pain, but because it has a long half-life in the body, it should not be used for breakthrough pain, since its levels cannot be well controlled. Methadone has a half-life of between 15 and 60 hours in the body; when the half-life is this long, it takes days for the plasma concentrations of methadone to reach a steady state. For this reason, it is also not used as necessary (PRN) medication, but instead should be given in scheduled doses.

Methadone provides a relatively powerful form of pain relief through analgesia. According to the Drug Enforcement Administration (DEA), an 8 - 10 mg dose of methadone is similar in analgesic effects to a 10 mg dose of morphine.\textsuperscript{14} As with other opioid analgesics, its pain relief lasts anywhere from 4 - 8 hours. When it is absorbed, methadone is distributed to the kidneys, muscles, liver, and lungs. Because it can treat moderate to severe pain, methadone may be added to an analgesic regimen if the patient is not otherwise responding to non-opioid medications for pain relief.

Methadone has been demonstrated to be effective as a pain reliever for a number of different types of pain, including neuropathic pain associated with such conditions as shingles, complex regional pain syndrome, back pain, and headaches. Methadone could potentially be used to treat some types of cancer pain, but it is not considered a first-line treatment because of its high potency and difficulties with titrating it to control its levels.

It may also be utilized in situations when a patient is experiencing chronic pain or under special circumstances, including hospice and palliative care. A study by Salpeter, et al., in the Journal of Palliative Medicine demonstrated that low doses of methadone, when combined with haloperidol, provided exceptional pain relief without the need for dose titration and did not result
in opioid-induced hyperalgesia, which is an abnormally high sensitivity to pain after chronic use of opioids. The study showed that the methadone was successfully used in treatment of chronic pain that occurred from both cancerous and non-cancerous states and that it could be effectively implemented as part of treatment with palliative care.\textsuperscript{16}

Despite this and other research results that have shown methadone’s effectiveness in managing chronic pain, the drug is not the first choice to use when it comes to managing chronic pain states. In fact, the American Academy of Pain Management issued a warning statement that methadone should not be considered the first choice of pain management methods when treating chronic pain because of the high number of deaths associated with its use. Methadone accounts for approximately 2 percent of opioid prescription analgesics in the U. S. but is responsible for up to one-third of deaths related to opioid toxicity and overdose.\textsuperscript{17} Because of this, prescribing providers must make careful considerations when preparing to prescribe and administer methadone for chronic pain.\textsuperscript{21} Before prescribing methadone, the provider should be familiar with the pharmacokinetics of the drug and should weigh its risks against its benefits for the particular client. Further, the provider should have a plan in place for monitoring the patient’s response to the drug when it is administered and develop a response plan for managing unexpected outcomes.

Methadone use for pain relief must be closely monitored and the patient carefully supervised while receiving the drug. The U. S. FDA has issued a statement that methadone use in pain control could cause respiratory depression and cardiac compromise, which can ultimately lead to death of the patient.\textsuperscript{14} Considering this, when administering methadone for pain control, the healthcare provider should increase doses very slowly and
monitor the patient’s pain relief with dose titration. Only those healthcare providers who are experienced in using methadone, including an understanding of the drug’s pharmacology and half-life, the parameters for its titration and discontinuation, and knowledge of its drug interactions, should administer methadone as a form of treatment.

In order to prescribe and administer methadone safely when giving the drug for pain relief, the provider should start with a low dose of the drug and increase the dosage very slowly. In fact, a common saying used among healthcare professionals to guide prescription of methadone is to “start low and go slow.” Those who have experience with its use and who can recognize its adverse effects should be the only ones administering methadone. Those without experience should undergo training or further education about the responsibilities of administering methadone before giving the drug to patients.

Recommendations for methadone administration are to start at no more than 2.5 mg total of methadone every 8 hours in the beginning.\(^\text{18,21}\) When titrating the dose of methadone among patients who have little experience with opioid analgesics, the provider should not increase the dose more often than at least every 5 to 7 days so as not to risk methadone toxicity. When giving methadone to a patient who has already been taking other types of opioids, such as morphine, the previous drug should first be stopped before administering a dose of methadone that is equal in analgesic strength.

Despite its safety considerations when being used for pain relief, methadone does provide benefits to patients who use it as an analgesic. Because of its long half-life, the patient may not need as many doses of the drug to achieve pain relief and may be comfortable with longer dosing intervals.
There are several methods of administering methadone as well, including in liquid, tablet, intravenous, and sublingual forms. Methadone is also relatively inexpensive when compared to some other opioid drugs; the drug itself may be cheaper to use but there are also cost differences if the patient uses less methadone overall because of its extended analgesic effects.

When using methadone, the patient should be instructed to avoid drinking alcohol or using any other kinds of drugs, as the combination of such substances can lead to drug toxicity. Methadone is particularly dangerous with substances that are depressants, such as alcohol, over-the-counter sleep aids, muscle relaxants, or benzodiazepine medications, which can suppress the respiratory system and cause difficulties breathing, changes in level of consciousness, or respiratory failure. Because methadone can cause drowsiness, the patient should also be taught to avoid engaging in any activities that could be dangerous or harmful while under the influence of the medication, such as driving a car. Methadone can affect a person’s ability to concentrate, which could be risky in situations when the person needs to focus on a specific task. The prescribing provider or nurse working with the patient who takes methadone must continue to remind the patient about this drug’s status as a narcotic and it that should be taken with care.

**Withdrawal Treatment**

The most well known use of methadone is its purpose in assisting some patients who are recovering from narcotic addiction. Methadone first started being used for narcotic withdrawal treatment during the 1960s, when illicit drug use had dramatically increased in the U. S. During that time, healthcare providers were seeing more and more patients with heroin addictions who could not overcome their substance use disorder successfully and endure the sequence of withdrawal from the drug. Methadone was given
to some of these patients as a substitution for heroin, in a process then known as *methadone maintenance*, which replaces the heroin and prevents withdrawal symptoms. In 1972, the federal government provided regulations for the controlled use of methadone HCl (Dolophine®) as part of treatment for those recovering from heroin addiction.\textsuperscript{12}

*Methadone maintenance* is the term used to describe the process of administering methadone to a patient overcoming opioid addiction. Methadone maintenance clinics are rehabilitation programs that work with patients who specifically struggle with drug addiction and who are trying to recover from a substance use disorder. Methadone is used for recovery from certain opioid addictions, but it is not useful in recovery for all types of substance use and addiction. The most common use of methadone in withdrawal treatment is for heroin addiction, however, it is also used for recovery from other drug addictions, including morphine and oxycodone. It should be noted that methadone is not administered to act as a substitute for heroin, as its effects differ between the two drugs. Heroin is a short-acting drug that typically requires 3 to 4 doses a day to prevent cravings from developing in an addicted person.\textsuperscript{27} Alternatively, methadone is a long-acting agent that can be used once a day to prevent heroin cravings from developing; it is considered a treatment for heroin addiction but is not meant to substitute for the drug.

There have been a number of studies that have shown the effectiveness of methadone use in the treatment and management of opioid drug withdrawal. In addition to management of withdrawal symptoms, methadone use may also be helpful in impacting other negative outcomes of addiction that may occur with some patients, such as with the spread of infectious disease and decreased quality of life. A study by Demaret, *et al.*, in the
Journal of Addiction Research and Therapy showed that heroin users with criminal histories had decreased their level of involvement in crime and had committed fewer crimes during a 12-month period when undergoing heroin addiction treatment. The study suggested that new methadone treatment through a methadone maintenance clinic, for example, could help some patients to decrease their criminal behavior. This and other studies like it have demonstrated that treating drug addiction, such as with methadone as a form of treatment, can improve behavior and quality of life for addicted persons.

When compared to using other narcotic drugs of abuse such as heroin or morphine, methadone has a much more gradual effect after administration; in essence, the person still receives the opioid analgesic effects of methadone but it happens at a much slower pace. Instead of feeling the rapid high of intravenous drug use, the person who is given methadone as part of a drug addiction treatment program will still experience some of the effects but in a much longer timeframe. Methadone has a slow onset and its effects are much milder when compared to some other opioid medications so that the patient will not experience the euphoria accustomed to with opioid drug abuse.

As an example, a patient who is receiving treatment for heroin addiction may have been abusing the drug for some time, developing a tolerance for it and needing it on a regular basis to avoid symptoms of withdrawal. When the patient uses heroin, the effects of the drug develop quickly and he or she experiences a rapid rush of euphoria. After entering treatment, if the patient is given methadone, he or she will experience fewer symptoms of withdrawal because a drug that is an opioid analgesic is still taken, however, he or she will not experience the same rush accustomed to while using heroin. A
A patient who develops a methadone substance use disorder during treatment for heroin may not be addicted to it. A substance use disorder occurs with many different types of drugs and often develops as part of the therapeutic effects of the drug. The physical response that occurs with methadone use as treatment for drug addiction differs from physical addiction to methadone.

Methadone is administered to patients experiencing symptoms of withdrawal from opioid drugs. The dosage and frequency of methadone prescribed is followed closely and based on how the patient responds to opioid withdrawal. The amount of methadone administered is titrated according to severity of cravings; continued cravings and symptoms of withdrawal require continued administration of methadone with an initial increase in dosage to overcome more of the severe symptoms. Alternatively, a decrease in cravings and improving symptoms of withdrawal can signify that it is time to decrease the amount and frequency of methadone administered. Each patient’s response to methadone treatment can vary based on his or her medical history and opioid tolerance.

Opiates are one of the oldest substances to cause a substance use disorder and addiction. The original substance comes from the poppy plant, and includes such drugs as morphine and codeine. Opioids have also developed as synthetic forms of opiates; some types of opioids include heroin, hydromorphone, hydrocodone, and oxycodone. Many of these drugs are used to treat pain, but at high enough doses, they produce feelings of euphoria, which makes them more likely to be misused. When a person develops a substance use disorder, he or she may seek to use the drug at all costs, despite the physical bodily harm caused. The body develops a tolerance for the drug over time because of the changes it causes in nerve receptors when used; after using opioids for a time, a person’s body may
require increasing amounts of the drug with each use to reach the same effect. Additionally, after a certain amount of tolerance has developed for the drug, the individual experiences withdrawal when the drug is excreted from the body.

The process of detoxification involves stopping use of the drug and going through a period of withdrawal, in which the body reacts to the drug missing from its system. In most cases, detoxification is done under medically supervised conditions because the effects of withdrawal are not only unpleasant, they can be dangerous for the patient. The patient may physically crave the drug and the withdrawal symptoms can be so uncomfortable that detoxification requires patient monitoring to prevent the patient from using more of the drug. Some common symptoms of withdrawal include agitation, anxiety, tremor, hot flashes, nausea, vomiting, and diarrhea.24

Methadone maintenance may be administered in an inpatient rehabilitation facility or on an outpatient basis. Because a patient could develop an addiction to methadone, its use is carefully controlled and may be regulated only to those with a substance use disorder who have not responded to other forms of substance use treatment. When administered as part of inpatient treatment, a physician and a psychiatrist throughout the process will most likely monitor the patient. Healthcare providers and nurses who work at these centers are available to help patients going through symptoms of withdrawal by providing medications and comfort measures for symptoms, as well as administering methadone doses and monitoring for side effects and responses to the drug.
An example of an inpatient stay at a methadone clinic would be two or more days of daily doses of methadone for the patient recovering from opioid addiction. The dose is closely supervised and the healthcare provider monitors the patient’s cravings to determine if the methadone dose is effective. If the patient needs more time as an inpatient to receive treatment, his or her stay may be extended. Over time, the dose of methadone may be reduced at a calculated level that allows it to continue to provide the effects the patient needs but at a slightly smaller dose.

The initial time of detoxification involves getting the patient through the time of excreting the original opioid from his or her system while taking methadone. The patient may attend counseling or group therapy after the initial detoxification process is over. These sessions discuss the effects of addiction and help the patient to work through other issues that may be present while simultaneously learning how to manage emotions and thoughts in order to eventually succeed after rehabilitation.

A patient may also undergo outpatient methadone maintenance after going through detoxification from narcotic addiction and after reaching a maintenance level dose of methadone. If the patient is prescribed methadone to take on an outpatient basis as part of drug rehabilitation, a family member or close friend may administer the drug to the patient to better help with regulating dosages and to prevent the patient from taking too much or otherwise misusing the drug. In some cases, the patient may also need to return to the clinic every day to receive a dose of the drug. Regular urine testing may also be required to check for the presence of other drugs in the patient’s system beyond the prescribed methadone. Outpatient programs may also require that patients attend individual or group counseling sessions as part of being in the program and the patient may
need to document attendance at these sessions to demonstrate cooperation and willingness to be in the program.

Prior to discharge from the methadone clinic, the patient and significant other or support person should learn about the process of using methadone for management of drug withdrawal and should understand the importance of monitoring intake of this drug. The patient and his or her family may also need to keep track of how much of the drug is taken and the total dosages taken over certain periods of time. This is to monitor treatment parameters closely to ensure that the patient is not taking too much of the drug; tracking also monitors whether anyone else in the household may be inappropriately using methadone as well.

Some methadone maintenance clinics, whether inpatient rehabilitation facilities or outpatient centers, offer other services for patients and families. Clinics may have services such as individual or family counseling for ongoing support for patients struggling with substance use and addiction. Other services that also may be offered include vocational training and medical care or referrals for medical services.

Contrary to popular belief, a patient who has reached a stable methadone dose for treatment of drug addiction is typically able to function in a normal capacity; the stable dose allows the patient to continue to perform duties at work and attend to normal responsibilities. A patient who is on a stable dose of methadone is not experiencing euphoria or withdrawal associated with opioid effects, nor is he or she sedated and lethargic. The maintenance dose of methadone, once reached after careful monitoring through detoxification and rehabilitation, keeps the patient in a stable place to function in a normal capacity.
Delivery Methods

There are several methods in which methadone may be administered to patients; the delivery method and dose depends on the patient’s background and the situation in which the drug is being used. Within the treatment setting, methadone is typically administered in either liquid or tablet form. Methadone may also be available as subcutaneous or intravenous injection, particularly in cases when it is used as part of palliative care. Patients who cannot swallow tablets or liquids may have methadone formulations created as suppositories for administration of the drug.

When used as an illicit substance, methadone is sometimes injected intravenously, which obviously requires a syringe and needle. An individual may inject methadone by injecting the liquid form of the medication that is prescribed for oral use. Other intravenous users may dissolve tablets of methadone in a small amount of liquid, draw up the amount in a syringe, and then inject the dose intravenously. Either of these methods is extremely dangerous and can lead to methadone toxicity, overdose, and death. Intravenous injection of methadone is not legally approved, nor is it the method used when utilizing methadone for treatment of addiction. Injectable methadone, when used as an illicit drug, carries many of the same risks as injecting other drugs, such as heroin, and the drug user is at risk of health consequences, including infection with hepatitis B or HIV.

Liquid

The most common type of administration of methadone is in liquid form. Liquid methadone is beneficial because pouring the right amount of the drug can strictly control the dose; this compares with tablets, which come in one dose per tablet and require the patient to take only the amount available through each pill. With liquid, a patient’s dose can be adjusted up or down
based on total milligrams and at small increments, if needed, depending on the patient’s response to the methadone and the cravings experienced.

Liquid methadone is usually made from powder that comes from the pharmacy dispensing the product; it is then mixed with water for dilution. The powder may also be mixed with other liquids, such as juice, or flavoring may be added to the water, to make it more palatable. When dispensing the liquid preparation, the nurse shakes the bottle before use to emulsify any powder that has separated from the liquid. Pouring the amount into a medicine cup or drawing up the exact amount with a syringe allows it to be dispensed in an accurate amount. The amount of the dose of the liquid form varies between products and may be more if the liquid is in concentrated syrup. Typical doses provided in liquid form vary between 1 mg per mL to up to 10 mg per mL.

If a patient is using liquid methadone at home, he or she should have a system of taking the exact amount of the liquid for each dose, such as with a graduated medicine cup that is marked for specific doses or a syringe that will allow the patient to draw up the exact amount. If the patient does not have one of these items to properly measure the medicine, he or she should ask for one from the pharmacist where the medication was received; and the patient should not try to measure the dose using kitchen spoons or cups in the home.

Whether or not liquid methadone is prescribed depends on the patient’s condition and background for using the drug. Some facilities that offer methadone maintenance only use liquid methadone because of the ability to titrate the drug. Liquid methadone may also be more cost efficient when compared to other methods of administration. As with any other type of
drug delivery method, facilities must weigh the benefits against the disadvantages of administering methadone in liquid form or choosing another method.

*Tablets*

Oral tablets of methadone can be administered to patients on an inpatient or outpatient basis. Each dose varies slightly between patients, depending on their medical background and whether the methadone is causing a change in opioid cravings. The standard dose with oral tablets is between 80 and 100 mg per day, with the effects of each dose lasting approximately 24 hours.\textsuperscript{12} Because the effects of a tablet of methadone lasts for so long, the patient requires much fewer doses overall and should theoretically take 1 to 2 tablets only once a day, instead of continuing to dose by taking oral pills throughout the day.

A form of methadone tablet is sometimes called a disket; each disket contains approximately 40 mg of the drug, so the patient may take 1 to 2 diskets at a time, depending on the prescribed dose. This method of administration differs from other types of oral methadone tablets, in which the patient swallows the tablet whole with a glass of water. The disket is designed to be dissolved in water; upon administration, the patient places the disket in a glass of water, allows it to dissolve, and then drinks the solution. When dissolving one of the tablets, the patient may use water, juice, or other non-alcoholic beverage; it must be at least 4 ounces to dissolve the full tablet and the patient should wait until the disket has dissolved before drinking the medication, however, in many cases, the medication does not dissolve completely, which means that the patient may need to add more liquid to the glass to get the entire dose of the medicine.
The forms of methadone that may be administered differ based on the need for the drug. For instance, methadone tablets may be used for the management of opioid addiction but not necessarily for pain control. As an example, a 40 mg tablet of methadone may be a regular part of a patient’s drug regimen when treating opioid addiction, but this dose and the formulation are not approved by the U. S. FDA for pain management. Instead, the oral tablet form of methadone at this dose may only be used in healthcare centers or rehabilitation facilities designed for the treatment of narcotic addiction.

When taken for pain, methadone tablets are typically administered starting between 2.5 mg and 10 mg, given every 8 hours; the starting dose for the patient depends on whether opioids had been taken in the past, or the patient is opioid naïve. When taken for drug withdrawal during detoxification, methadone is administered in higher doses, but given less frequently. A typical dose of methadone during this regimen would be an initial dose between 15 mg and 40 mg, taken one time a day. The disket typically contains between 20 mg and 30 mg of the medication at once, although the patient should not receive more than 30 mg to 40 mg at a time when first starting to use diskets. Because the diskets only come in specific doses, they are not an appropriate option for patients who need doses that fall outside of their availability. For example, if a patient requires 35 mg of methadone but the diskets are only supplied in 10 mg doses, the patient should not use diskets and should instead be prescribed methadone in liquid form where the dose can be closely regulated.

Oral tablets of methadone offer advantages and disadvantages, as with any other medication. Compared to diskets, tablets could be cut in half if they are scored or cut by a pharmacy, providing a concentration of the drug that
is much closer to the prescribed amount. Alternatively, when a patient requires an amount that is the same as the formulation, diskets or tablets can be easily administered. The prescribing provider must always compare the benefits of using this type of methadone with its risks of administration.

**Contraindications**

Administration of methadone requires close monitoring of the patient for factors present that are contraindications to its use. A patient with certain health conditions, such as asthma or breathing problems, allergy to the drug, or certain gastrointestinal conditions should not take methadone at all. There may be some situations in which a patient takes methadone and later develops side effects or complications from the drug, but the healthcare provider must then manage these as they occur if they are unforeseen.

Although methadone is usually administered within a controlled setting and has specific purposes, the user can still develop some side effects that should be monitored closely to prevent serious consequences. Side effects of methadone include nausea and vomiting, restlessness, itching, sweating, and constipation. Long-term side effects have caused breathing problems and chronic respiratory conditions. Among women, methadone has been shown to cause side effects of menstrual irregularities, and complications with pregnancy if the patient is pregnant while taking the drug.12

Although there are side effects associated with methadone use, they may be well controlled if they are monitored closely by a healthcare provider; in some cases, other medications may be given to combat the side effects, such as with administration of medication to control nausea if the patient develops nausea and vomiting as a methadone side effect. At other times, the methadone dose may need to be adjusted, depending on the severity of
the effects. While side effects may complicate methadone administration, the patient may still receive the drug, even if they are present. When contraindications are present, the patient should not receive methadone at all. The patient should be evaluated for the presence of these contraindications before starting methadone and should stop taking the drug if these conditions develop during drug administration.

Allergy

Any patient who has an allergy to methadone should not be given this drug and another type of drug should be administered instead. If the patient already knows that he or she has an allergy to methadone, the provider should refrain from administering the drug at all. An allergic reaction to methadone can cause hives, difficulty breathing, or swelling in the face, including in the lips, the tongue, or the throat. Some hypersensitivity reactions have been reported in patients who have taken methadone and who developed these symptoms. The healthcare provider should educate the patient about signs of allergic reaction to methadone and instruct on what to do if these symptoms develop.

In some cases, a patient may not be aware that he or she has an allergy to methadone and may begin to take the drug, which ultimately causes an allergic reaction. When this occurs, the healthcare provider must then treat the condition as it has developed and manage the patient’s symptoms to prevent additional complications. There should be no further administration of methadone after symptoms of an allergic reaction have developed.

An allergy to methadone is considered whether the patient understands that an allergy to the actual drug or to one of the components of the drug actually exists. For example, a patient may tell the nurse that no allergy to
methadone exists, but that he or she has had an allergic reaction when taking other types of opioids. If this occurs, the provider should further investigate the patient’s allergy before administering methadone.

Additionally, trade names differ from generic drug names and the patient may be familiar with only one form. For instance, a patient may inform the nurse that he or she has an allergy to Dolophine, but may not understand that this drug is the same as methadone. It is the responsibility of the healthcare provider to educate the patient in these and other situations where potential allergy exists to keep the patient safe and prevent severe complications.

Breathing Problems or Asthma

Respiratory depression is one of the major risks associated with use of methadone; respiratory and cardiac deaths have occurred when patients have started taking methadone as a new drug or when converting to methadone from using another opioid drug. There are several factors that can increase the risk of respiratory depression developing in the patient who takes methadone, which should be considered before prescribing this drug. Patients who have a history of substance use with more than one drug, older adults, are immunocompromised, and those who have either never used opioid medications before (called opioid naïve patients), or those who have used excessively high doses of opioid drugs in the past, are all at higher risk of developing respiratory depression when using methadone.21

Because of the potential for respiratory depression when taking methadone, it is important to avoid use of this drug in any patient with a history of respiratory illnesses, chronic lung disease, or asthma, as methadone could further complicate the course of these illnesses. The effects of respiratory
depression tend to develop after the drug’s analgesic effects set in, and the respiratory effects can last much longer than the analgesic effects, which makes dosing this drug very difficult. A patient could receive a dose of methadone for pain and, after an hour, complain of little to no pain relief with the drug. If the nurse administers another dose of methadone to counter the patient’s pain, he or she may eventually experience pain relief from the analgesic effects but could also develop respiratory depression much later from the cumulative administration of the drug. The respiratory depression happens late enough that the provider may not be aware of its effects until the patient has received more than one dose of methadone.

Patients with conditions such as asthma, chronic obstructive pulmonary disease, cor pulmonale, cystic fibrosis, or any other respiratory condition that already makes breathing difficult should not be given methadone or it should be administered with extreme caution. Any patient who takes methadone for pain control should be monitored closely for respiratory depression, particularly while sleeping. A patient with a respiratory condition should be monitored while sleeping regardless of his or her level of tolerance for opioid medications while taking methadone. Further, the provider should monitor the total amount the patient receives daily when a respiratory condition is present to prevent toxic levels from accumulating; the provider should not increase the dose of methadone for pain medication more often than every 7 days and at no more than 25 to 50 percent of the original dose if using it for pain control in a patient with asthma or chronic lung disease.21
A patient who experiences respiratory depression and who is taking methadone may develop symptoms of slow or shallow breathing, difficulty taking in enough air with each breath, fatigue, sleepiness, confusion, and dizziness or lightheadedness. Methadone use can also affect a patient’s ability to breathe while sleeping, which can be particularly dangerous if the patient takes the drug before going to bed. Methadone could cause slow or irregular breathing during sleep, or even periods of apnea.

A case report in the *Journal of Clinical Sleep Medicine* discussed the effects of opioid use on breathing and sleep, stating that patients who take methadone and other opioid medications are at higher risk of developing central sleep apnea with regular medication use. Central sleep apnea develops when there is interference when the brain sends signals to the body to continue breathing while asleep. Because of the increased risk of respiratory depression among patients who take opioid analgesics, a drug such as methadone can increase the risk of central sleep apnea. The case study further elaborated that when eliminating opioid therapy in a patient with central sleep apnea, the patient no longer experienced periods of apnea while sleeping.\textsuperscript{22} This does not necessarily mean that any patient with breathing difficulties who discontinues taking methadone will have resolution of breathing problems, but it does point out the relationship between some breathing disorders and opioid medications such as methadone.

The patient with a respiratory issue such as asthma may also experience difficulty breathing and a slowed breathing rate when taking methadone. A person with asthma already struggles with chronic and periodic inflammation of the airways that can cause them to constrict, leading to wheezing and shortness of breath. The respiratory depression caused by methadone could potentially worsen symptoms of asthma and result in decreased respiratory
drive and increased airway resistance, making it very difficult for the patient to breathe and potentially leading to apnea and respiratory failure.

**Paralytic Ileus**

Ileus is the term used for an intestinal obstruction that is not caused by a blockage in the gut. A paralytic ileus refers to a condition in which the intestine is not working properly and this paralysis is what causes the obstruction, preventing movement of food through the digestive tract. Paralytic ileus is a common cause of obstruction in children, although it can develop in anyone of any age. It most commonly develops as a complication following abdominal surgery or from gastroenteritis because of a bacterial or viral infection. Other potential causes of paralytic ileus include chronic use of opioid analgesics, electrolyte imbalances, and mesenteric ischemia.

A patient with paralytic ileus typically experiences nausea, constipation, and feelings of abdominal fullness or bloating. Diarrhea, excess gas, and cramping may also be present. It typically requires treatment by placing the patient on NPO status and inserting a nasogastric tube for stomach decompression. This relieves the abdominal bloating and excess gas buildup in the intestinal tract and allows for bowel rest, which can help to resolve the condition over time or with treating causative factors.¹⁹

One of the side effects of methadone use, as with many other opioid medications, is constipation. Opioids such as methadone can cause constipation when they cause an increase in water and electrolyte absorption from the intestine and when intestinal peristalsis is slowed to the point that stools become hard and dry and are difficult to pass. Some of the M₅ receptors affected by methadone are found on the smooth muscle of the intestine and play a role in maintaining appropriate intestinal motility. This
may better explain how an opioid such as methadone could cause a slowing of intestinal motility when it affects these receptors, potentially leading to severe constipation or complete cessation of motility through paralytic ileus.  

A patient who already has a diagnosis of paralytic ileus should not be given methadone to avoid exacerbating the condition. The provider should consider whether administration of any kind of opioid analgesic is valid for a patient with paralytic ileus, as opioid analgesic medications share the common complication of causing constipation. If a patient has a history of paralytic ileus, the provider should consider other forms of analgesia for treatment and should avoid methadone.

**Methadone and Addiction**

Despite its success as a form of treatment for those suffering from opioid addiction, methadone can and does lead to a substance use disorder among some patients. The problem with using methadone to treat certain addictions is that sometimes the patient transfers addiction for a substance to the methadone. For example, a patient addicted to heroin may go through detoxification using methadone and may overcome heroin addiction only to become addicted to the methadone and then might fear stopping the drug. When this occurs, the person may develop enough of a methadone substance use disorder that withdrawal symptoms are experienced when attempting to stop using it.

The effects of methadone can vary depending on its purpose. Methadone given for pain relief provides an analgesic effect for up to 8 hours, but when given to avert narcotic withdrawal symptoms, its effects may last much longer. People who take methadone may be at higher risk of developing a
substance use disorder and addiction because it lasts such a long time. Even after discontinuing the drug, small amounts of the drug are still found in the body.

Because methadone is often used to treat an existing substance use disorder and addiction, the patient may or may not address the addictive aspects of his or her personality or the reasons for developing a substance use disorder and addiction in the first place. This creates problems if the patient then transfers his or her addiction to methadone without actually addressing any underlying needs. Patients who become addicted to methadone while undergoing substance use treatment have used the drug while in treatment or have used it in other inappropriate ways. For example, some patients may take extra methadone and sell some of it outside of the treatment facility, in a process known as diversion. Patients enrolled in methadone programs take advantage of their access to methadone for treatment and end up getting it and selling it to opioid drug users who are willing to pay for it. This results in further danger when the person buys the methadone to feed an addiction and ends up taking too much and overdosing. The number of overdose deaths due to methadone administration has been increasing in the past decade.

Although methadone treatment can lead to addiction, the patient who uses methadone under close supervision of a healthcare provider is less likely to become addicted and may use it successfully. When the patient is given methadone regularly to combat cravings for other drugs, he or she may develop a tolerance for methadone and may require more of the drug to get the same effect. Persons at greater risk of developing a methadone use disorder and addiction are those who have a history of opioid drug or alcohol addiction, especially those with addiction to more than one substance. The
risk of overdose and death from methadone use is much higher among individuals who struggle with substance abuse.

Methadone is also misused outside of the healthcare environment; because of its opioid effects, methadone is classified as a Schedule II controlled substance, which gives it a high potential for abuse. In 2012, over 2.46 million people in the U. S. reported using methadone outside of its intended purpose at least once during their lifetime.\textsuperscript{14} The potential for addiction and overdose on this drug is very high, which makes it dangerous as an illicit substance.

\textit{Withdrawal Symptoms}

Misusing methadone can have serious consequences for the person who becomes addicted to this drug. A patient may begin taking methadone as part of a detoxification program for another type of drug addiction but may then end up abusing methadone instead. Although methadone does not cause the same effects as some other drugs such as heroin, the person who uses methadone may initially experience a high when using it.\textsuperscript{11} Over time, the high that first came with using methadone is diminished because the person has developed a tolerance for the drug. Instead of feeling euphoric and high, the person may just feel tired and drugged.

If the patient is taking methadone in an outpatient setting, he or she may be at risk of addiction and overdose if administration of the drug is not well controlled. The person may develop a tolerance for methadone over time and in order to experience the high again, he or she may start taking more of the methadone doses than is prescribed. This can greatly increase the risk of toxicity, overdose, and even death.
An individual who is abusing methadone may have signs or symptoms that are similar to a substance use disorder and addiction to other opioid drugs. Signs or symptoms of methadone use include difficulties with sleeping, confusion, lethargy, drowsiness, nausea and vomiting, and chronic constipation. The person may complain of itchy skin or may have difficulties with carrying on a normal conversation, often losing track of the subject or talking about irrelevant topics. A patient who ingests too much methadone may experience severe bradycardia, somnolence, hypotension, cool skin, and slowed respiratory rate leading to periods of apnea.

High doses of methadone have been shown to cause cardiac changes of prolonged Q-T intervals as seen on ECG, resulting in the dysrhythmia *torsades de pointes*. Patients who are more likely to develop this potentially life-threatening cardiac condition are those who already have a history of heart disease or cardiac arrhythmias, those who take cardiac medications, and people who have electrolyte imbalances. For various reasons, this cardiac outcome also seems to affect women more often than men and may be more likely to develop among patients who have pre-existing liver disease, and among patients who already take higher dosages of methadone. The patient who takes too much methadone can eventually develop pulmonary edema, lapse into a coma, or die from respiratory failure.

Methadone side effects and withdrawal symptoms are much less likely to occur if the patient is closely monitored while receiving the treatment. If the person develops a methadone substance use disorder and addiction, and starts developing withdrawal symptoms, the symptoms are typically not as severe as with heroin or other types of opioid withdrawal; however, they are still uncomfortable for the patient and could lead to severe complications if
they are not well managed. As stated above, one option for dealing with methadone withdrawal is medical marijuana.

**Medical Marijuana**

Marijuana, also called cannabis, is a flowering plant that is used for a variety of purposes. The main plant used for medical marijuana comes from the hemp plant *Cannabis sativa*. Its leaves and stalks have been used for such items as paper, clothing, or rope, but most people think of marijuana as being used for ingestion, which produces mind-altering effects. Because of these effects, the growth, sale, and consumption of marijuana is regulated and is considered illegal; however, marijuana is becoming more popular when used for medicinal purposes.

There are many varieties of marijuana, although the central image often associated with it is a picture of a plant with 5 broad leaves. Marijuana may be grown on a stalk or as a type of bush; it is cultivated and grown under careful conditions, but it may also grow in the wild. Most forms of the plant develop flowers if allowed to multiply and grow on their own without being cut; these flowers can also be used for medicinal purposes and they produce the effects of the drug. The dried flowers that grow on the plant are often referred to as buds.

The main ingredient in marijuana that causes mind-altering effects is delta-9-tetrahydrocannabinol (THC); the effects of THC can vary, depending on the strain of cannabis. People who use marijuana for recreational purposes often say that it makes them feel energized, focused, creative, and calm,
coupled with a better overall sense of well being. The effects of the drug are different from what can be gained from ingestion of almost any other legal substance, which is why marijuana is so commonly sold and used as an illicit drug. THC is classified as a cannabinoid, which is a chemical compound found within the cannabis plant. The amount of THC actually varies from plant to plant. In addition to THC, marijuana contains over 100 other types of cannabinoids that act on the release of neurotransmitters and can affect feelings of pleasure, pain, awareness, and appetite. The body also produces some cannabinoids that have these same effects.

Delta-9-tetrahydrocannabinol has been shown to be effective in controlling nausea and improving appetite, which is why medical marijuana can be useful for patients who suffer from intractable nausea due to medical treatments, such as with chemotherapy for cancer. The effects of THC are also beneficial in preventing malnutrition, dehydration, and possible hypovolemia for those who suffer from severe nausea and vomiting because of the effects of illness. Medical marijuana may also help those who are malnourished because of disease and who need to gain weight, such as those who are suffering from wasting disease during the later stages of AIDS. THC has also been shown to be effective in controlling pain, particularly neuropathic pain such as that seen with post-herpetic neuralgia, as well as the control of inflammation when used among some people, including those who suffer from arthritis.

Marijuana also contains another type of cannabinoid, known as cannabidiol (CBD), which may be useful in the management of some medical conditions as well. Researchers have been developing forms of CBD to administer as treatment for seizures; CBD may also be useful in managing pain, inflammation, and some types of mental illness or addictions. Unlike THC,
CBD does not produce the mind-altering affects associated with marijuana use; it can provide many of the same benefits as THC but without the psychoactive effects. This may reduce the likelihood that medications created with CBD will be abused. Other cannabinoids found in marijuana have been shown to control intraocular pressure associated with glaucoma, to act as mild sedatives, to have antimicrobial properties, and possibly to reduce some of the negative effects of type 2 diabetes.  

The National Institute on Drug Abuse defines medical marijuana as “use of the whole, unprocessed marijuana plant or its basic extracts to treat a disease or symptom.” Most marijuana that is used for medicinal purposes is the same that is sold and used as the illicit drug. Medical marijuana also has some of the same health risks as the street drug. In the past, patients who suffered from illnesses or chronic diseases that did not respond to traditional forms of treatment or medications may have found relief by using marijuana. Unfortunately, because of marijuana’s legal status, patients using marijuana had to break the law to be able to achieve relief from their symptoms.

Before 1937, marijuana was routinely used as medical intervention and for control of various symptoms, including anxiety and pain. In fact, people have been harvesting marijuana for use for physical ailments, pain, and other illness symptoms for hundreds of years. However, legislation began during the early 20th century that changed the use of marijuana, starting the process of making its use for medicinal purposes illegal. Initial legislation known as The Marihuana Tax Act of 1937 placed restrictions on the medicinal use of marijuana, but it was not until 1970 that marijuana was completely prohibited for use for medicinal purposes with the passage of the Controlled Substances Act of 1970. Since that time, there have been some
marijuana-based pharmaceuticals on the market, but these types of drugs have been classified as controlled substances. An example is dronabinol (Marinol®), which is used to treat nausea and vomiting among some patients with cancer or to support weight gain among some patients with the wasting disease of AIDS.

Dronabinol is considered to be a cannabinoid medication and is classified as a Schedule III controlled substance. The herbal form of marijuana is considered a Schedule I substance according to the Schedule of Controlled Substances; the drugs classified in this category are those that are seen as having a high potential for dependencies and not having medical use. Examples include other narcotics such as heroin or lysergic acid diethylamide (LSD).

The Schedule of Controlled Substances is a federal-level classification of drug and opioid use, and although herbal marijuana remains classified in this category, there have been changes in legislation that have allowed its use for medicinal purposes, but these changes have occurred at the state level. In other words, the federal government still classifies marijuana as a controlled substance with no medicinal purpose, but individual states are changing their laws to legalize marijuana for medical purposes. Since 1996, 23 states and the District of Columbia have approved public medical marijuana programs. Each state has their own specifications about its use and most patients who use medical marijuana must carry an identification card that designates their ability to have marijuana for medicinal purposes.

When a patient would benefit from medical marijuana, a physician can make a recommendation for its use as part of treatment. This recommendation differs from an actual prescription for marijuana. Healthcare providers
cannot actually prescribe marijuana because it is a Schedule I controlled substance, but they can make recommendations based on the laws of their state. If medical marijuana is allowed within a specific state, the healthcare provider’s recommendation would then allow a patient to get an ID card, which allows the patient to buy marijuana for medicinal use. The ID card places the patient on a registry that also protects him or her by stating the purpose of possessing marijuana to avoid penalty.

Medical marijuana is not available at a pharmacy as with other medications. A patient with a recommendation for medical marijuana receives what is needed from a dispensary or, in some cases, what can be grown. The amount of marijuana to grow and the growing conditions used for medical marijuana varies between states. Marijuana grown in a dispensary is controlled in terms of growing conditions, drying, curing, and preparation. In these facilities, cannabis is grown and harvested with attention to soil conditions, appropriate heat and air circulation, and properly controlled light. Companies that grow cannabis that will be used for medical purposes have controls and requirements related to pesticide use on the plants, as well as other chemicals used to control growth or prevent disease. Because some patients who later use the cannabis for medical purposes may be immunocompromised, use of these chemicals is strictly controlled and enforced.

Alternatively, a patient may also be able to grow his or her own marijuana for use, which may or may not be up to the same standards of quality as that be grown in medical dispensaries. Those who want to grow marijuana
may use areas of their own homes, and can grow the plants using grow lights or natural sunlight. However, there are a multitude of laws and regulations surrounding the process and not just anyone can legally start to grow their own. To be able to legally grow medical-grade marijuana, the grower must adhere to the guidelines, zoning regulations, and laws of his state and area of residence.

**Uses of Medical Marijuana**

As stated, medical marijuana can be used for a variety of medical conditions. Proponents of the drug say that legislation prevents people who really need help for their symptoms and illnesses from getting the medication they need that can alleviate symptoms. Those who are advocates of medical marijuana legalization state that people suffer needlessly when they could actually be helped or even cured by using marijuana if it were made legal everywhere. Alternatively, those who are not in favor of its legislation remind others that it is still a controlled substance that must be carefully regulated, and legalization of the drug may only support its misuse.

Regardless of its legal status, research and anecdotal evidence have shown that it is beneficial as treatment for a number of conditions. Such conditions include intraocular pressure associated with glaucoma, management of spasticity due to some neurological diseases, treatment of mental health conditions such as depression or anxiety, and multiple other conditions that cause pain, inflammation, memory problems, nausea, weight loss, and fatigue.
**Delivery Methods**

Marijuana may be ingested in a number of methods, but there are basically four main ways that the drug is consumed; orally, through inhalation, sublingually, and topically. Each method of consumption varies in the way the drug is delivered and the method each patient chooses to ingest medical marijuana will depend on several factors, including personal preference, the conditions for use of medical marijuana, and the availability of the drug. The majority of consumers choose inhalation, or smoking, as the method of choice for ingestion of marijuana, but patients do have other options available, and those who choose not to smoke or who are seeking other methods of ingesting the drug may consider alternative delivery methods.

*Inhalation*

Inhalation of medical marijuana is one of the most common forms of ingestion. The effects of the drug, when used with inhalation methods, are felt much more quickly when compared to other forms of ingesting marijuana. This can be beneficial for a patient who is in severe pain or who suffers from significant nausea and who needs relief quickly. Smoking also averts the need for the patient to take oral pills and medication, which the patient may or may not be able to keep down if nauseated. Inhalation is also beneficial in that the user has some amount of control over how much is taken in by choosing how much to smoke; in this method, the risks of overdose and overconsumption are much less when compared to some other methods of ingestion.

Inhalation of marijuana is typically done by either smoking or through the use of a vaporizer. There are several methods that allow a person to smoke marijuana. Some are inexpensive and easy to do, while others require equipment and practice. Inhalation may use different parts of the marijuana
plant as well, and some activities, such as smoking, use cut up pieces of the plant, while pipe smoking or vaporization may use oil of extractions. Extractions contain the active ingredient of the marijuana plant without any of the plant material. Extractions are available in various forms and include such types as cold water extraction, dry tumbling extraction, or direct contact.

**Smoking**

One of the most well known methods of smoking marijuana is with a cigarette or cigar. Sometimes referred to as a “joint” or a “smoke”, this method of inhalation is cheap and easy for the user. Marijuana is typically provided as cut leaves and a small amount is placed within a square of paper for rolling. These papers are inexpensive and the process of rolling a marijuana cigarette is relatively easy and does not require further equipment. After rolling and securing the cigarette, the individual lights the end of the cigarette to produce smoke and uses it in much the same manner as when smoking a tobacco cigarette.

Marijuana may also be inhaled through pipe smoking. There are various forms of pipes used for smoking marijuana and they vary between small, handheld devices that hold only a small amount at a time to large pipes that can be used for long periods or shared between users. Small pipes typically have a bowl on the top, in which the marijuana is placed; after lighting, the individual can then smoke what is in the bowl of the pipe. A pipe that holds a very small amount might be known as a “one-hitter,’’ meaning it is designed to hold enough for one dose of the drug. Pipes can be made out of a variety of materials, including glass, acrylic, stone, or metal.
The water pipe is another type of pipe that can deliver marijuana smoke for inhalation. These pipes also act as filters and require a small amount of water placed in the base. As with standard pipes, they can be very large in size or quite small. A water pipe has a stem that exits the system; marijuana is placed in this stem, which leads down to the bottom of the pipe where there is water. The person smoking inhales from the top of the pipe, which pulls the smoke down the stem and into the water; the chamber above the water that leads up to the smoker’s mouth then fills with smoke, which is then inhaled. The water acts as a type of filter so that when the smoke passes through the water chamber, it removes some of the toxins in the smoke before the person inhales it. Water pipes are often called “bongs” or “bubblers.”

Hashish is a form of concentrated marijuana that is inhaled through a pipe, although it can be added to food as well. Hashish contains compressed resin glands of the marijuana plant, which comes in the form of a paste. It typically has a higher concentration of cannabinoids, but the range of THC present varies within the concentration as it does in a standard plant. Hash oil is extracted from a mature marijuana plant and contains a high concentration of cannabinoids; in some cases, up to 90 percent THC by content.\(^6\) Hash oil can be smoked through a special type of pipe or inhaled through a vaporizer.

Smoking marijuana for medicinal purposes causes a rapid response because the THC quickly enters the system. Many patients prefer smoking marijuana because they experience the effects quickly, which can be favorable when experiencing very negative symptoms such as pain or nausea, which could be resolved quickly with smoking. When smoked, the THC in marijuana is absorbed within only a few minutes, and studies have shown that this rapid
absorption and distribution of THC is almost equal to the rate at which the chemical would enter the system if it were injected intravenously.\footnote{28}

As with smoking other substances, inhalation of marijuana can cause negative effects and damage to lung tissue. Marijuana does not contain as many toxic substances when compared to smoking tobacco, however, smoking marijuana still produces smoke that is irritating to lung tissue and can cause coughing, increased mucous production, and can alter effective gas exchange. Experts recommend that patients who smoke marijuana for medicinal purposes inhale as little of the drug as possible to reduce the effects of smoking on the body. A patient who inhales marijuana for medicinal use may notice results so quickly that he or she does not need to smoke for very long and may only need to inhale a few times. Following this practice could lessen damage to the lung tissue that would otherwise develop from chronic smoking.

Vaporization

Inhalation of vapors is considered to be a much safer form of marijuana ingestion when compared to smoking because the vapors created do not contain tar or other chemicals found in marijuana smoke and are less irritating to the lung tissue. Vaporization is one of the most efficient methods of inhaling marijuana. The process involves heating the marijuana to the point of turning the cannabinoids to vapor, which is not at as high of a temperature when compared to smoking marijuana. The person who wants to use marijuana through vaporization typically must buy the equipment, and there are many varieties of tools available for vaporizing.

Inhaling marijuana vapors, also known as \textit{vaping}, is similar to using an electronic cigarette. This device contains a filter that has liquid flavoring and
the substance within it; when the person inhales on the end of the vaporizer, the filter heats up and turns the liquid to vapor. This vapor is not smoke, although it may be similar in appearance; instead it is a collection of tiny particles of the cannabinoids that have been changed from a liquid state to a gas state, which can then be inhaled into the lungs. The vapor contains the chemicals in marijuana that are used for treating symptoms and illness but it does not contain harsh chemicals such as tar, which would be found in smoke when marijuana is burned.

The downside of vaping marijuana is that there is little information about the continuing effects of its use. While the effects of long-term smoking of marijuana have been studied, inhalation through vaporizing is a newer phenomenon in the U. S. and has fewer outcome results that have studied people who have used this method of marijuana consumption for long periods. This is partly because the parts of the marijuana plant used for vaporizing are the extracts, as opposed to the flower, which is more commonly burned when smoking marijuana.

Vaporizers for marijuana inhalation may be small and about the size of an e-cigarette; these devices are hand held and may be referred to as “pens,” which are battery powered. Vaporizers can also range in size and can be quite large or designed to sit on a counter or desktop. Vaping has not only been shown to be safer than smoking marijuana because of decreased lung irritation, but it also has been said to taste better and it avoids the characteristic smell of the drug. However, although vaping may reduce lung irritation and exposure to some toxic chemicals that occurs with smoking marijuana, the person who uses vaporized marijuana for medical treatment is still exposed to its psychoactive effects, which could be harmful.
Sublingual preparations of marijuana are prepared and administered into the mouth and under the tongue, where they are quickly absorbed into the bloodstream through the sublingual mucous membranes. The blood vessels in the mouth, particularly those found under the tongue, are able to readily absorb cannabinoids found in the sublingual forms of marijuana. Types of sublingual products may be delivered via lozenges, sublingual spray, or medicated strips that are placed under the tongue to dissolve. Sativex®, described later in this course, is a type of sublingual spray used for the management of spasticity associated with multiple sclerosis. The patient sprays the dose of the drug under the tongue and then closes his mouth while the drug is being absorbed. When administered in sublingual form, the effects occur rapidly as the drug quickly enters the bloodstream.

Sublingual doses can be effectively regulated, which prevents the patient from overdosing by taking on too much. In fact, some companies who make and market cannabis sublingual products offer a variety of concentrations in their products, with each product containing different amounts of THC and cannabidiol. Patients can choose and adjust the amount of THC and CBD that they would like when choosing a product, which is then delivered with each dose.

Sublingual products, like oral forms of marijuana ingestion, are discreet and patients who need them can easily use them. A patient who uses a sublingual product can simply place a lozenge or medicated strip under the tongue where it is hidden from others. A sublingual spray can also be easily administered and appears similar to breath spray. The sublingual method is most rapidly absorbed when compared to absorption through other blood vessels in the mouth, including those vessels lining the buccal cavity. The
patient should typically feel the effects of the sublingual medication within 15 to 60 minutes.

Patients who use sublingual preparations have reported that the effects of the drug often cause uplifting and energizing feelings, as opposed to the sedative effects that sometimes occur with marijuana use, but responses do vary between patients. The patient should be taught that when using a sublingual preparation, if it requires placement of a tablet or lozenge under the tongue to dissolve, he or she should let the medication dissolve completely to gain the full effects of the drug, rather than trying to swallow any part of it. When used correctly and for appropriate reasons, sublingual marijuana preparations are a very effective choice for drug administration.

**Oral**

Oral forms of marijuana are available with many variations; while cannabis is typically ingested orally through food, known as edibles, or when drunk in liquid form, such as with tea, there are also other methods of oral ingestion, including tinctures, capsules, or oils. One of the most common methods of oral ingestion is through mixing elements of marijuana with certain foods to create desserts or products that the patient can eat and can then derive the benefits of the drug.

**Marijuana Edibles**

Edible forms of marijuana found in foods are often available through baked goods, sweets, and cooked items in which the cannabis has been added as part of the food preparation process. The THC in cannabis is not active unless it is heated first, which converts the cannabinoid into the active form of THC. There is a large amount of variety when it comes to edible products that contain cannabis that can be taken for medicinal purposes. Some
dispensaries or locations that sell edible marijuana products provide a variety of products for purchase, all of which contain varying amounts of marijuana within the food recipe. These edibles may be packaged and marketed as not only providing medical marijuana to treat diagnosed health conditions, but also as being tasty, sweet, delicious, or otherwise appealing to entice the consumer into purchasing these products as a method of ingesting the marijuana.

Edible marijuana takes longer to absorb when consumed orally through edible products, but the effects of it can last longer when compared to other methods of ingestion, such as through smoking. Because of how the cannabinoids are metabolized after ingestion, a different form of THC is formed in the liver during digestion, which can cause varying effects between individuals. A person who ingests edible cannabis will not feel the effects as quickly as if he were to smoke marijuana, and it may take at least 20 minutes to feel the full effects. However, when they do develop, the effects of ingesting marijuana in this method are much stronger when compared to smoking and they last longer.7

The method of adding cannabis to the particular edible also varies, depending on the food in which it is found and how the cannabis is available. Most edibles are some type of baked goods, such as brownies, cookies, sweet breads, or bars. The cannabis is added through a special type of butter that has been infused with marijuana. Cannabinoids can be dissolved into solutions that contain fats, such as butter or oil, which can then be easily added to products during the cooking process. Cannabis oil is also added to foods, including baked products or almost any other food that requires oil as one of the ingredients. The oil known as cannaoil is created by mixing and heating the cannabis and oil together; the plant material is then
strained out of the mixture but the medication is otherwise infused into the oil where it can be included in cooking.

Hashish, hash oil, and hash-infused butter may also be added to baked goods to create edibles. Because of the higher concentration of cannabinoids found in a smaller amount of hash, less needs to be added to the food to create the same effect. Alternatively, the addition of hash may create an even stronger or longer-lasting effect when compared to the addition of standard amounts of cannabis. Depending on the amount of cannabis added and the method in which it is infused into the product, the patient may or may not be able to taste the marijuana when they eat it. Many people who can taste the cannabis while eating edible products say that they do not like the taste and that it is not as enjoyable as when smoking or inhaling marijuana.

Patients who use edible products to consume medical marijuana typically access these items through the dispensaries where they would obtain other forms of cannabis. Some growers of medical marijuana plants have jumped on the chance to increase income by creating and providing edible marijuana in addition to other forms in which it can be ingested. By providing a line of products, such as baked goods and snacks that contain cannabis for medicinal use, they provide medical marijuana for patients who need it but also earn extra money by including a service for some patients without access to marijuana. Many patients who have a recommendation for and use medical marijuana could make their own foods to consume the drug. As with other foods on the market, though, people often opt to buy the food pre-made to where they can eat it, rather than preparing it themselves ahead of time.
Edible marijuana products can be risky for some patients, particularly those with less experience in using them. The amount of marijuana in each item may impact the person consuming it differently when compared to someone else who takes the same amount. A patient may have heard that someone he or she knows used a particular type of edible marijuana and had good results for an illness, but the patient may have a higher tolerance when using the same item and may not achieve the same results. Furthermore, because edible marijuana takes longer to digest, and for the patient to start to feel its effects when compared to smoking marijuana, the patient may reason that the edible marijuana is not effective and more should be eaten, which could lead to ingesting unsafe amounts of the drug.

And, because edible marijuana products are often made up of sweets and desserts — which can be difficult to refuse even when they do not contain cannabis — some people may have trouble eating only one. Because these items often contain butter and oil, intake of too much can lead to poor health outcomes, including higher cholesterol and weight gain in excess of the potential overconsumption of marijuana when eating too much. A person who wants to use edible marijuana, particularly when it is provided in the form of baked goods or sweets, would most likely respond best by eating small amounts and going slowly, waiting for the effects to develop, rather than eating more.

A patient who decides to use edible marijuana to treat a condition may find that this method of ingesting the drug works very well. Edible products can be more discreet when compared to smoking cannabis and many people enjoy the taste, which can make taking the drug easier. For those who cannot smoke or who use oxygen where it would not be safe to smoke, edible marijuana provides an alternative method of ingesting the drug. And
for those who use marijuana to gain weight, edible products provide not only appetite stimulation, but also extra calories or nutrients that could be included with the food. Alternatively, in addition to the potential health problems associated with eating too much, some edibles are very expensive and could add up quickly in cost if oral products are the only method of ingestion. The patient would need to weigh the benefits and disadvantages of using this type of system when compared to consuming marijuana in another manner.

**Capsules and Tablets**

Cannabis capsules may be available for some patients. These products provide the medicinal outcomes of marijuana use while delivering the drug to the patient in a more traditional and familiar manner - through a pill or tablet. Because of the restrictions on smoking in some areas, people who use medical marijuana may benefit from using the edible form, such as with edible foods or with capsules, instead of trying to smoke when consuming the medication in public.

As with marijuana found in baked goods and edibles, medical cannabis ingested through capsules can take longer to produce the same effects as when a person ingests marijuana through inhalation. A patient who takes a capsule of the drug must first absorb the medication and utilize its properties through the principles of pharmacokinetics before the actual effects of the drug may develop. For example, two patients may ingest medical marijuana for appetite stimulation; one patient chooses oral capsules as a method of ingesting the drug while the other chooses to smoke marijuana to stimulate appetite. The patient who smokes marijuana may be more likely to feel the effects of the drug and may be encouraged to eat more at a faster rate because the effects of the drug occur much more rapidly when compared to
the patient who uses oral capsules and who must wait while the drug is absorbed and metabolized in the bloodstream. Alternatively, oral preparations may last longer than when marijuana is ingested through other forms, so these two same patients may experience the effects of the drug at different rates; but, the patient who opted for oral capsules instead of smoking may experience the effects of the marijuana for a longer period when compared to the patient who chose to smoke the drug.

The peak effects of marijuana, when ingested orally, typically occur after about 2 hours and may last as long as 6 hours.\textsuperscript{46} The capsules available as forms of marijuana may vary between the prescription pharmaceuticals available for treatment of certain conditions to actual cannabis preparations available in tablet form. One example of this drug is Idrasil\textsuperscript{TM}, which is considered a natural neutraceutical, which is a combination of “nutrition” and “pharmaceutical,” and that describes a food or similar item that contains medicinal benefits. Idrasil is referred to as a “naturally consistent cannabis pill” that provides the benefits of using medical marijuana without the social stigma involved with its use.\textsuperscript{46}

Idrasil compares itself to other types of pharmaceutical marijuana preparations, which are synthetic formulations of the plant. Alternatively, Idrasil states that it contains all natural components of marijuana plant extract so that users can derive the full benefits of cannabis in pill form when it is prescribed. Idrasil is available as a 25 mg tablet that contains the same, consistent amount of drug with each capsule, rather than the potential for unreliable dosage amounts found in other methods of marijuana ingestion, such as through edibles. For instance, Idrasil claims that when a person chooses to use medical marijuana for treatment, he or she can be assured that the same, standard amount of the drug is being received with
each dose when taking these capsules, but the same cannot be relied upon when ingesting marijuana through other methods, such as through baked goods that contain the drug.

Medical marijuana capsules are relatively easy to use and they are discreet in that they appear similar to other types of medications. The patient may take the capsules as prescribed and in the same methods as with other drugs, by swallowing with medicine with a glass of water. Whether or not a patient chooses this method of ingesting medical marijuana, capsules or tablets provide easy access to the benefits of cannabis use in a familiar form that mimics taking many other oral medications.

**Oil**

Cannabis oil is yet another form of ingesting medical marijuana orally. This type of oil consists of distilled cannabis, in which most of the plant material is removed through a solvent. The distillation process breaks down the marijuana into its base form of active cannabinoids. Solvents used to break down the plant into oil include alcohol-based products, including isopropyl alcohol or even spirits used for alcoholic beverages.

Cannabis oil often contains a high concentration of THC, which can be very potent for the user and that may be too much for a novice patient who has little to no tolerance for the drug. The concentration is similar to that described for hash oil. The oil also contains a certain amount of cannabidiol, which does not produce psychotropic effects, but that does seem to have anti-inflammatory properties.

Unfortunately, there are few scientific studies that support the claims that cannabis oil is the miracle drug that many purport it to be. Anecdotally,
cannabis oil has been known to shrink cancerous tumors or send people with late-stage cancers into periods of relapse when their prognoses were otherwise grim.\(^{60}\) Because of the lack of scientific evidence about the healing properties of cannabis oil, though, this product is still considered to be an alternative form of treatment that may or may not be legal, depending on the area where it is consumed.

**Topical**

Beyond smoking or oral ingestion of medical marijuana, there are other methods of taking in the drug for its medicinal benefits. Topical applications of medical marijuana are available for the treatment of some skin conditions and when a patient is experiencing pain. Topical applications are available in creams, lotions, salves, bath salts, transdermal patches, and various tinctures through a number of companies that provide testimonies and stories about the effectiveness of marijuana when applied in this manner.

Topical marijuana preparations are created when cannabis is infused into topical lotion or cream where it can then be applied to the skin. Topical cannabis preparations are most commonly used for skin conditions that cause inflammation, pain, swelling, or rash. Historically, topical cannabis was used in the Middle East and in parts of Africa to act as an antiseptic, and was applied to areas of the skin to kill germs and to prevent infection.\(^{47}\)

These products work because marijuana dissolves in fatty substances. It can then be absorbed through the skin and enter through cell membranes. Furthermore, recent studies have shown that some of the cells in the skin contain cannabinoid receptors, which would respond to topical application of THC through the medication, potentially having a positive effect on skin conditions.\(^{47}\) The seeds of the marijuana plant are made up of protein and
essential fatty acids, including linoleic acid, which may be helpful in the treatment of some types of skin diseases, including psoriasis. Other parts of the plant that may also be used as part of topical preparations include the buds and leaves of the marijuana plant.

Some other conditions that may be helped through treatment with topical marijuana include severe itching, osteoporosis, eczema, rheumatoid arthritis, and other inflammatory diseases. Unlike eating or inhaling marijuana, topical cannabis does not produce mind-altering effects and it is less likely to be abused as a product. Consumers who use topical preparations may prefer this method of using medical marijuana when compared to other modes of administration, as topical preparations provide relatively rapid relief of symptoms, such as with pain relief, and the patient does not experience psychoactive effects.

Studies are just starting to be published about the positive effects of medical cannabis when applied topically. Many patients offer anecdotal evidence that topical cannabis has healed any number of skin conditions or painful symptoms, but the actual scientific results of the drug administered in this method continue to be investigated.

**Pharmaceuticals**

Marijuana pharmaceuticals are drugs that have been developed that contain some amount of marijuana within their formulations. The amount of marijuana present and the parts of the plant used vary between products. Pharmaceuticals differ from neutraceuticals, such as Idrasil, in that pharmaceuticals typically contain other combinations of drugs and are not classified as being entirely natural. Marijuana pharmaceutical preparations undergo a similar process as other drugs that are developed for the
pharmaceutical industry. They undergo clinical trials, are marketed to consumers, and require FDA approval for use in the U. S. While there are a variety of marijuana pharmaceuticals available, some are FDA approved at this time, while others are pending or have not been approved.

Several of these cannabis-based drugs have been approved for use in the United States to treat patient symptoms that are often associated with certain health conditions. These cannabis pharmaceuticals are developed and based on the premise that the marijuana within their formulations provides many of the effects of the drugs. While many have been developed and have undergone clinical trials for the treatment or management of conditions such as obesity, memory loss, anti-tumor properties, hypertension, and bladder control, there are currently only two marijuana pharmaceuticals that have been approved for use in the United States. A third drug is pending approval in the U. S. and is still being investigated, but it has been approved in other countries.

Approved Pharmaceuticals

Dronabinol is a Schedule III narcotic that was approved by the U. S. FDA in 1985 for the treatment of nausea and vomiting associated with chemotherapy administered for the treatment of cancer. The drug is accepted for use after patients with nausea and vomiting have failed to respond to treatment with other medications designed to control these symptoms. Dronabinol was later approved in 1992 for use among patients suffering from anorexia and weight loss during the later stages of HIV infection and AIDS.

Dronabinol (Marinol®) is a cannabinoid drug that has been produced as a synthetic form of THC. It works by impacting the medulla oblongata in the
brain, which controls nausea and vomiting. It is available in oral tablets with a range of doses between 2.5 mg and 10 mg. When taken to control nausea, dronabinol is effective for approximately 4 - 6 hours after each dose, which typically requires repeated doses for the patient, depending on the amount of nausea the patient experiences. When taken for appetite stimulation, dronabinol is effective for a much longer period and may continue for 24 hours at a time, requiring much less frequent administration.

A study by Andries, et al., in the International Journal of Eating Disorders demonstrated that dronabinol is effective in weight gain by stimulating appetite not only in patients diagnosed with AIDS, but also in those who have suffered significant weight loss because of anorexia nervosa. The study showed that participants diagnosed with anorexia who took part in the study had a greater amount of weight gain when compared to those who took placebo.³⁷ Since dronabinol contains synthetic cannabis, patients should be advised to take it carefully to avoid misuse and the development of side effects. Patients with a history of a substance use disorder should be monitored while taking dronabinol because of an increased risk of abuse of the drug, and it should not be administered while taking medications that cause sedative effects, such as benzodiazepines.³⁸ Clinical trials have also shown that use of dronabinol can cause a “high” feeling as a side effect, in which the patient experiences elation and heightened awareness to surroundings. While this effect does not occur in all patients who take dronabinol, it has been shown to develop in some people whether they have taken the drug for control of nausea or for appetite stimulation.

Nabilone (Cesamet®) is a Schedule II narcotic that is a synthetic form of cannabis. As with dronabinal, the U. S. FDA approved nabilone in 1985 and it is also used for nausea and vomiting. It is most commonly used for
management of nausea and vomiting associated with chemotherapy, particularly when other antiemetic drugs have been unsuccessful. Nabilone works by interacting with cannabinoid receptors in the body that affect the central nervous system. The nerve cells that can cause nausea and vomiting are typically located in the brain and the stomach. Nabilone sends messages to the brain that prevent the start of nausea and vomiting. This method differs from the action of traditional antiemetics, which is why it may be prescribed when other drugs have been unsuccessful.

Nabilone is available as an oral tablet. The patient typically takes a dose before starting chemotherapy, then the patient takes the drug throughout the time he or she is receiving chemotherapy, and continues to take nabilone for a prescribed period of time after chemotherapy is completed. While effective in the treatment of nausea and vomiting, nabilone can still cause psychogenic effects and can lead to changes in mental status. Patients who take the drug should only do so in a controlled environment when another person is near to provide care if they need it. A patient who takes nabilone must also be careful not to drive or engage in activities that require concentration just after taking the drug, as it can cause drowsiness or dizziness.

Under Investigation

Nabiximols (Sativex®) is a marijuana pharmaceutical created from an extract of the cannabis plant. It is manufactured in the United Kingdom, where marijuana use is illegal for recreational purposes, but it can be used for medicinal purposes in certain situations. Nabiximols is most commonly used to manage spasticity associated with multiple sclerosis (MS); a person with MS who experiences increased muscle contractions, stiffness and
rigidity, and uncontrolled muscle movements may respond to nabiximols because the drug affects the nerve impulses that cause spasticity.\textsuperscript{35}

Although nabiximols has been approved in some countries, it is still considered to be an investigational drug and has not been approved by the FDA in the U. S. During clinical research trials, nabiximols was studied as a potential adjunct medication to be used alongside some opioids for the treatment of severe, intractable cancer pain. Whether nabiximols will eventually be approved as a valid form of medical treatment for cancer pain remains to be seen, but further research is still needed to prove its value and to gain approval and acceptance in the U. S.

**Contraindications**

Regardless of the method of ingesting marijuana, patients should use the drug carefully, particularly because its effects may differ between people. Because not everyone responds to marijuana in exactly the same way, improper use could be harmful for some people. There is a risk of taking too much or engaging in dangerous activities after using medical marijuana. For instance, although marijuana is said to be energizing for some, it may also cause sedation and sleepiness for others. It may cause problems if a person needs to focus or concentrate on a task. The person who uses marijuana for medicinal purposes should use marijuana safely and in a well-controlled setting, and should not drive or engage in any other activities in which harm could occur until the effects of the marijuana have worn off.

*Low Blood Pressure*

Marijuana has been shown to affect almost every body system, including the circulatory system and blood pressure. Because of these effects, cannabis can cause a patient to suffer from symptoms of low blood pressure;
hypotension can develop in a person who uses medical marijuana, even if he or she has not previously been diagnosed with low blood pressure. For an individual who already suffers from hypotension and who has symptoms of dizziness or episodes of fainting or lightheadedness, medical marijuana would not necessarily be a first-line form of treatment of a health condition, as the drug may only worsen hypotensive symptoms.

There is not one specific number that defines low blood pressure, but a blood pressure level that is below the normal systolic and diastolic levels of 120/80 mmHg and that causes symptoms for the patient would be considered hypotension. Symptoms of hypotension include dizziness, lightheadedness, syncope, clammy skin, poor concentration, fatigue, blurred vision, and thirst.

A study in the *Journal of Addiction Medicine* showed that patients who used cannabis on a routine basis and then who abruptly stopped its use developed a clinically significant rise in blood pressure, with a rise of over 22 mmHg systolic and 12 mmHg diastolic levels noted. Marijuana acts as a smooth muscle relaxant; when used, it lessens constriction in the blood vessels and can cause vasodilation, ultimately leading to a lowering of blood pressure levels. The results of this study demonstrated that these hypotensive circulatory effects of marijuana are resolved with cessation of the drug, meaning that a patient who uses marijuana could suffer from low blood pressure during the time of use, which then resolves after stopping the drug.

The research about marijuana use contributing to changes in blood pressure has led to mixed results, with some studies stating that medical marijuana causes low blood pressure, while other results have demonstrated that routine use causes an increase in blood pressure. Still other reports have
shown increases in diastolic levels but not systolic levels after exposure to THC. While there may have been differences, there is much research and personal anecdotes by those who have used marijuana and who have experienced some change in blood pressure levels. However, the direction of the blood pressure change and the extent to which increases or decreases in levels occur most likely varies between individuals.

Some people complain of feeling dizzy when using marijuana. When combined with hypotension, dizziness and lightheadedness may be intensified with these people. Patients who have used pharmaceutical marijuana, such as dronabinol, have experienced changes in blood pressure levels and have suffered from feelings of dizziness, orthostatic hypotension, and syncope upon standing when using the prescribed drug. These symptoms could be related to a drop in diastolic blood pressure or they could be related to changes in cerebral blood flow. If a patient has been prescribed medical marijuana and is experiencing these symptoms, it is best to check the drug’s effects on the patient’s blood pressure, determine the severity of the patient’s symptoms and their impact on daily life, and consider other options for treatment, if possible.

*Ischemic Heart Disease*

Ischemic heart disease describes a condition in which blood flow is affected in circulation because of the narrowing of the lumens of the coronary arteries, typically because of atherosclerosis. The heart, the body’s tissues, and other vital organs do not receive as much oxygenated blood because the blood vessels develop plaque, which narrows the interior lumen of the vessel; ultimately, the blood vessels are smaller in diameter and blood flow is slowed. If the lumen of a vessel becomes so small that blood cannot flow through properly, the patient can develop ischemia, which occurs with lack
of blood flow to the tissues distal to the site of occlusion. Ischemic heart disease can cause a patient to have a myocardial infarction, in which part of the tissue of the heart becomes necrotic and stops working properly because of lack of blood flow.

Ischemic heart disease is a common form of chronic illness in the U. S, causing death and disability for thousands of Americans every year. It is the leading cause of death in the U. S. The Centers for Disease Control and Prevention report that over 370,000 people die every year due to coronary heart disease. There are many factors that contribute to worsening of the condition, including a sedentary lifestyle and poor dietary intake, but studies have also shown that use of marijuana may also contribute to ischemic heart disease as well. With this in mind, clinicians who consider medical marijuana as a form of treatment must assess for a history of ischemic heart disease in their patients because the condition is so prominent within the population. The healthcare provider should only prescribe medical marijuana for a patient known to have ischemic heart disease with careful consideration.

Cannabinoid receptors that are targeted by endocannabinoids or by THC in marijuana are found throughout the body at various points, including within the cardiovascular system. When a person uses medical marijuana, the THC in the drug activates these cannabinoid receptors and can cause changes in the integrity of the blood vessel walls, potentially worsening atherosclerosis, if present. Cannabinoid receptors, most often CB2 receptors, are also often found on cells of immune function, including macrophages and T cells. Cannabinoids play an important role in the regulation of immune system function; because chronic inflammation contributes to atherosclerosis, cannabinoids are important for modifying the immune system in response to this chronic inflammation.
Another contributing factor toward atherosclerosis development is damage to the endothelial lining of the vessel. When damage occurs to the endothelial layer of the blood vessel, there is a greater risk of clot and plaque formation, which can contribute to narrowing of the vessel and turbulent blood flow. A study in *Clinical Cardiology* by Rajesh, *et al.*, demonstrated that stimulation of CB1 cannabinoid receptors in the endothelial cells of coronary arteries contributed to endothelial cell injury, which could further potentiate development of plaque formation.\(^{41}\)

Furthermore, smoking marijuana has been associated with an increase in episodes of angina among patients who have diagnosed ischemic heart disease. The effects of marijuana cause changes in heart rate, cardiac output, and in some cases, blood pressure, and it may be linked to triggering development of acute coronary syndrome (ACS).\(^{40}\)

Because of these potential effects, medical marijuana should be used carefully in patients who have diagnosed heart disease. A person with pre-existing ischemic heart disease should already be on a regimen to control diet and lifestyle factors to prevent other complications, such as a heart attack or stroke. Even the effects that marijuana has on blood pressure and heart rate can cause enough of a concern for patients who may be susceptible to cardiac complications with using cannabis.

When responding to questions related to patient concerns about marijuana use and its cardiovascular effects, many cardiovascular physicians have mixed views.\(^{42}\) Some believe that there is not enough evidence to state definitively that marijuana use should be banned completely because of its cardiovascular effects; others have real concerns about marijuana’s effects on the cardiovascular system and are seeing more patients with cardiac problems because of the rise of medical marijuana use. Marijuana may or
may not have the same detrimental effects on the body as smoking tobacco. Despite the mixed opinions of clinicians regarding this type of drug use, it remains clear that more research is needed to discover the long-term effects of medical marijuana use on the cardiovascular system.

**Pregnancy**

As with other drugs and medications, marijuana use during pregnancy continues to be studied for its effects on both the mother and the developing fetus. While many pregnant mothers are aware of the risks associated with substance use, there are still thousands of pregnant women who use marijuana, whether for recreation or for medicinal purposes. The full effects of this practice remain to be seen for the mothers involved and their children.

Marijuana use has not been shown to affect the physical outcomes of pregnancy in terms of development of complications during pregnancy or during labor and delivery. Women who use cannabis during pregnancy are not at higher risk of complications such as pre-term labor, placental insufficiency, or fetal growth retardation. Alternatively, marijuana has been shown to cause problems with fetal brain development, ultimately causing issues with the child’s learning methods and behaviors. This is referred to as disturbances in a child’s executive functioning, which means that if a mother uses cannabis during pregnancy, the child is at higher risk of later problems with executive functioning, including decision-making, focus and concentration, and recognizing cause and effect.

The chemicals in marijuana can cross the placental barrier and elevated serum levels of marijuana have been found in the cord blood of infants of mothers who use the drug. Newborn infants of mothers who use marijuana
may have positive urine tests of the drug. Marijuana may also be present in meconium stool of newborn infants of mothers who use the drug, which indicates use during the second and third trimesters, as these are the months when stool forms in the fetal digestive tract. Based on these facts, it is clear that when a pregnant mother uses marijuana, at least some of the drug crosses the placental barrier to affect the infant. Marijuana may also be found in breast milk, although to a much smaller extent when compared to in utero exposure. A breastfeeding mother who uses marijuana may excrete cannabis because it binds to the proteins in breast milk with recent use of the drug.\textsuperscript{30}

Cannabinoid receptors are found throughout the human body, including within uterine tissue. With ingestion of marijuana, the fetus is exposed to the drug when THC binds to these receptors. Regular exposure to THC in marijuana and binding of these receptors places the growing fetus at risk of deleterious effects on physical growth and development of synaptic nerve responses in the brain that promote plasticity.\textsuperscript{31} The effects of cannabis on neurotransmitters in the brain may further perpetuate problems in the growing fetus and later in the developing child with growth and maturation of the brain, impacting cognitive function, moods, and behavior.

Data from 2 longitudinal studies, the Ottawa Prenatal Prospective Study (OPPS) and the Maternal Health Practice and Child Development Study (MHPCD), reported in \textit{Clinical Perinatology}, showed that children exposed to marijuana before birth were more likely to demonstrate problems with memory and language, decreased attentiveness, increased impulsivity, poor visual problem solving, and increased hyperactivity when measured in children between 3 and 10 years of age.\textsuperscript{31} Despite these results, overall evidence about the exact effects of marijuana use during pregnancy is
inconclusive, as there are also many studies that have reported no adverse fetal effects or negative childhood effects with marijuana use during pregnancy. Regardless of the differences in study outcomes, medical marijuana use remains an important factor to consider during pregnancy and should be closely monitored if used at all, as with any other substance or medication used during this time.

Because of the rising use of medical marijuana and its growing acceptance as a valid form of medical treatment, more women who are pregnant are using the drug. Some patients may compare marijuana to other harmful substances used during pregnancy, such as tobacco or alcohol, and reason that medical marijuana is not as harmful and is considered relatively safe when compared to the effects of these substances and other illicit drugs. Unfortunately, the public opinion of marijuana use is not necessarily backed by truth about what can happen to the mother or her baby with regular marijuana use during pregnancy.

Marijuana use during pregnancy also can impact the health of the mother over time. Women with higher estrogen levels are more likely to be sensitive to the effects of cannabis. Because a pregnant woman typically has greater amounts of estrogen in her body during pregnancy, she may be more susceptible to the effects of marijuana. Long-term exposure to medical cannabis has also been shown to cause a drop in levels of certain hormones, including luteinizing hormone, follicle stimulating hormone, prolactin, and growth hormone; a pregnant woman who uses marijuana for a long period of time may have more difficulties maintaining a healthy pregnancy.

Despite the fact that recreational use of marijuana has only been legalized in two states and medical marijuana is not legal in all states, there are
significant numbers of pregnant women who use cannabis on a regular basis. Individuals who regularly use marijuana have been shown to demonstrate a decreased cognitive ability and problems with decision-making, which are characteristics of the acute effects of marijuana use. However, with heavy use, these effects may last for several weeks or months after stopping.\textsuperscript{30} A pregnant mother who uses marijuana, particularly with heavy use, may still demonstrate changes in cognition that can last further into her pregnancy, even if she stops using marijuana at some point.

A woman who is pregnant and who uses marijuana for recreational purposes could face criminal charges of child abuse if the situation is reported by a healthcare provider, depending on the patient’s state of residence.\textsuperscript{30} Because recreational use of marijuana during pregnancy is associated with problems for both the mother and the child, medicinal use of marijuana during this period should be recognized for its potential effects on the patient as well, requiring strong and careful consideration before prescribing the drug.

Although it is not always performed, healthcare providers who make recommendations for patients to use medical marijuana should consider performing a pregnancy test on any patient who could be pregnant before making the recommendation. Because medical marijuana has been shown to be helpful in controlling nausea and vomiting, pregnant women may be more likely to seek the comfort it can provide by controlling these symptoms as well as other discomforts of pregnancy. However, prescribing and dispensing medical marijuana to pregnant women can be dangerous and harmful to both the mother and the child, which means that providers must consider the effects of marijuana and weigh the benefits against the disadvantages when it comes to these special situations.
**History of Psychosis**

Marijuana consists of a multitude of chemical compounds, including the various cannabinoids present that cause many of the psychoactive effects experienced by the user. Some patients with a history of mental illness should not use medical marijuana because of its psychoactive effects. The use of marijuana in some people who suffer from mental illness has been shown to cause an increase in psychotic episodes, particularly when the drug is used on a frequent basis.

The body already produces a certain amount of cannabinoids internally, which are referred to as endogenous or endocannabinoids and which differ from those taken in through cannabis ingestion. These endocannabinoids bind to receptor sites throughout the body. This internal system of endocannabinoids contains two types of receptors; some are more prominent in the brain, while others are found in various areas, including on some of the immune cells. Those receptors found in the brain are in concentrated areas in such regions as the hippocampus, the prefrontal cortex, the basal ganglia, and the cerebellum. The elevated areas of these receptors are associated with the supposed neural system related to cognitive function and psychosis.\(^{23}\)

Endocannabinoids have similar actions as neurotransmitters in the brain in that they regulate certain sensations, such as pain, mood, appetite, and memory. However, unlike neurotransmitters, they also have the ability to travel backward across nerve synapses and activate cannabinoid receptor sites in previous pathways. This action can potentially affect the body’s ability to regulate and release neurotransmitters.\(^{23}\) When a person ingests marijuana, THC stimulates the cannabinoid receptor sites, also impacting neurotransmitter release and causing overstimulation of the cannabinoid
receptors. This could be related to the psychotic effects that occur with the drug’s use. Patients who have used marijuana for medicinal purposes have claimed that it causes feelings of anxiety, being overwhelmed, a sense of panic, or being paranoid. Because of the variations in the amount of cannabinoids present in different preparations of marijuana, a patient who uses medical marijuana could take in different amounts with each dose, leading to different psychoactive effects with each use. Some forms of marijuana, such as hashish, are much more concentrated and may contain more cannabinoids in smaller amounts, resulting in potentially significant mind-altering effects.

According to Lynch, et al., in the Psychiatric Times, up to 25 percent of patients with schizophrenia suffer from comorbid cannabis use disorder. There is also an increased risk of developing psychosis later in life when cannabis use occurs at a younger age. Marijuana’s association with psychosis can worsen conditions such as schizophrenia in which the patient suffers from psychotic episodes. It can be difficult to establish an exact cause of psychotic episodes when multiple factors are present, including use of marijuana. For instance, a person experiencing psychotic episodes may have several factors present that increase risk of psychosis, including marijuana use, a genetic vulnerability to mental illness, and a diagnosed condition of another mental illness such as depression or severe anxiety. Symptoms of schizophrenia, in particular, have been linked with worsening manifestations of the condition when cannabis is used. Individuals with schizophrenia who use marijuana have been shown to have increased periods of psychotic symptoms, rates of relapse, probability of being hospitalized, and, decreased response to anti-psychotic medications when compared to those who do not use marijuana.
There is enough evidence that demonstrates the use of medical marijuana may worsen symptoms of mental illness that cause psychotic episodes, but there is not enough information available to determine if using marijuana will trigger a psychotic episode in a patient with a previously undiagnosed condition. Because of this, prescribing healthcare providers should consider and assess for whether the patient has a pre-existing condition that causes periods of psychosis, such as schizophrenia, before recommending medical marijuana as a form of treatment.

Medical Marijuana As A Methadone Withdrawal Treatment

Drug addiction is an illness that can be very difficult to treat; drug addiction develops not only from the choices of the patient to use certain substances inappropriately, but also from environmental and genetic factors that contribute to the substance use disorder and addiction that develops. Drug treatment programs and rehabilitation facilities are typically comprehensive in their approach to helping patients manage and overcome a substance use disorder because addiction to a drug affects so many aspects of an individual’s life.

When providing treatment of methadone withdrawal, there are many factors that must be considered. Treatment and inpatient rehabilitation will not work for everyone. There will be some patients who do not respond to standard forms of therapy or who need modifications in their treatment in order to be successful. Relapse rates are often high and many people who undergo detoxification and rehabilitation end up going through more than one treatment cycle. The treatment provider must recognize the complexities involved in drug treatment in order to provide a successful program. Furthermore, any drug treatment program must focus on more than the addiction; instead, it should be comprehensive enough that it considers and
manages the various factors affected by the patient’s drug use, including emotional health, relationships with others, and vocational or educational needs.

For some patients going through opiate withdrawal, such as with methadone addiction, marijuana may be an option for alleviating some of the symptoms.

A study in the *American Journal of Addictions* showed that patients who used marijuana while undergoing opiate withdrawal suffered less severe symptoms of withdrawal. Methadone withdrawal symptoms can be particularly uncomfortable for a patient who has developed an addiction to the drug. Many people experience such symptoms as muscle aches, back pain, restless legs, nausea and vomiting, and tremors. Use of cannabis during this time may help to relieve some of the physical symptoms that occur during the initial period of withdrawal.

Since cannabis has been used effectively to treat other medical conditions, including those that cause pain, nausea, and vomiting, it is expected that the drug would also be effective in managing symptoms of methadone withdrawal. Some experts have argued that using marijuana for treatment of opioid addiction is simply substituting one drug for another; however, marijuana and opioids such as methadone do not affect the body in a similar manner, and the extent to which a person becomes addicted to narcotics is not the same as developing a marijuana substance use disorder. A news release in the *JAMA Network* showed that states that have passed laws for use of medical marijuana have lower death rates from opioid overdose when compared to those states that do not legally allow medical marijuana. Further studies have shown that those who use cannabis as part of the
withdrawal process either decrease or eliminate their cannabis use when withdrawal is complete.\textsuperscript{45}

As with any type of recovery program that deals with a substance use disorder and addiction, medical marijuana will not work for everyone, nor is it an appropriate treatment for everyone. However, because of studies associated with its use, it has been shown to be an effective form of symptom management. Persons who have used marijuana as part of methadone addiction treatment have stated that marijuana has helped to provide a calming feeling while undergoing the uncomfortable symptoms and that many of their physical symptoms were lessened, although not entirely resolved. It may be that the THC found in medical marijuana has the same positive effects on the physical withdrawal symptoms of methadone addiction as it does when it is used for the treatment of other medical conditions, such as with pain or inflammation.

For those who are proponents of medical marijuana use, its value in managing withdrawal symptoms is yet another reason to consider legalization of marijuana. If it can be used as part of the rehabilitation process, many patients who are recovering from methadone addiction could successfully make the transition to overcome their substance use and addictions and go on to live drug-free lives.

**Summary**

Marijuana and methadone use are both controversial subjects in the medical community. Methadone, while having been shown to be successful in helping people to overcome opioid addictions, is still a topic of debate in some circles as to its measure of success when used during detoxification. Some experts believe that its use during withdrawal is simply substituting one drug for
another, and that people are at greater risk of becoming addicted to methadone instead of being helped by it. Alternatively, thousands of people have benefited from methadone use during drug withdrawal and are living drug free because of it.

Marijuana also remains controversial, despite approved pharmaceutical preparations and legislation approving its use for medicinal purposes. Further research and long-term study is needed to determine whether marijuana is helpful for those overcoming methadone addiction and to determine the benefits and disadvantages of this method. Still, there are many patients who have overcome their addictions by using marijuana to combat uncomfortable symptoms. The process of substituting one drug for another during the rehabilitation process is an option that is controversial, but that also seems to work for many.

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1. **Use of cannabis may be able to help patients who struggle with addiction to the synthetic opioid _______________.**
   a. heroin  
   b. methadone  
   c. oxycodone  
   d. morphine

2. **True or False: Methadone prescriptions can be filled at any licensed pharmacy ONLY if the drug is being used for pain relief and is not being prescribed for addiction withdrawal.**
   a. True  
   b. False

3. **Methadone may be used as an analgesic medication because**
   a. of methadone’s use in detoxification.  
   b. methadone helps patients experience fewer side effects of withdrawal.  
   c. methadone is a powerful pain reliever.  
   d. methadone manages the effects of withdrawal from some very strong narcotics.

4. **Some studies have determined that marijuana use may**
   a. cause problems with fetal brain development.  
   b. lower or raise blood pressure.
   c. contribute to ischemic heart disease.  
   d. All of the above.
5. A patient who has asthma or breathing problems (i.e., chronic lung disease) –
   a. may take methadone but only intravenously.
   b. may take methadone safely.
   c. should not take methadone at all.
   d. may take methadone so long as there are no other side effects.

6. True or False: Methadone use can also affect a patient’s ability to breathe while sleeping, which can be particularly dangerous if the patient takes the drug before going to bed.
   a. True
   b. False

7. Marijuana can be useful for patients receiving chemotherapy for cancer because
   a. marijuana gives the patient a better, overall sense of well-being.
   b. marijuana has been shown to be effective in controlling nausea.
   c. the body does NOT produce cannabinoids that could help cancer patients.
   d. marijuana helps control inflammation.

8. In a State where medicinal marijuana is legal, if a patient can benefit from medical marijuana,
   a. a physician may write a prescription for medicinal marijuana use.
   b. a physician may recommend marijuana use but only if the drug is a marijuana-based pharmaceutical.
   c. then the use of marijuana would be legal under federal law as well.
   d. a physician can make a recommendation for its use as part of treatment.
9. The most common method for the administration of methadone is _______________.
   a. pill form
   b. intravenous injection
   c. suppository form
   d. liquid form

10. For some patients with methadone addiction, marijuana may be an option for alleviating some of the withdrawal symptoms because
   a. the patient is substituting one drug (marijuana) for another drug (methadone).
   b. of marijuana’s recreational nature.
   c. marijuana is effective in controlling nausea and improving appetite.
   d. marijuana and methadone affect the body in a similar manner.

Correct Answers:
1. b
2. a
3. c
4. d
5. c
6. a
7. b
8. d
9. d
10. c
REFERENCE SECTION

The reference section of in-text citations include published works intended as helpful material for further reading. Unpublished works and personal communications are not included in this section, although may appear within the study text.


52. Stills, S. (2013, Jul.). *Bong photo.* Retrieved from https://www.flickr.com/photos/98667298@N03/9252459602


63. Shore, R. (2012, Mar.). *Heroin more cost-effective than methadone to treat relapsed users: Study.* Retrieved from


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