Cannabis Use in Older Adults: A Brief Overview

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Article

Abstract

Since 2006, cannabis use in older adults has increased more than any other age group in the United States. Yet there remains little research on its effects in older adults. Healthcare providers are often undereducated about cannabis and the function of the endocannabinoid system, where cannabis exerts its effects. This article discusses the prevalence of the use of medicinal and recreational cannabis in older adults, the mechanism of action of cannabis in the ECS, the risk of adverse drug reactions associated with cannabis use in older adults. Also included are guidelines for safe medication administration, knowledge about cannabis for safe nursing care and discussion of legal implications related to the administration of cannabis in clinical practice.

Key Words: Agonist, antagonist, Older Adult 50 years and older, cannabis, endocannabinoid system, cannabinoid receptor 1, cannabinoid receptor 2, lipophilic, polypharmacy, adverse drug reactions, cytochrome P450 system

Since 2006, cannabis use in older adults has increased more than any other age group in the United States. (Institute for Healthcare Policy and Innovation [IHPI], 2024) Yet there remains little research on its effects in older adults. Additionally, healthcare providers are often undereducated about cannabis and the function of the endocannabinoid system (ECS) where cannabis exerts its effects. This article discusses the prevalence of the use of medicinal and recreational cannabis in older adults over age 50, the mechanism of action of cannabis in the ECS, the risk of adverse drug reactions (ADRs) associated with cannabis use in older adults, and the legal implications with the administration of cannabis in clinical practice.

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Endocannabinoid System

The endocannabinoid system (ECS) is a widespread neuromodulatory network that is a complex cell-signaling system. The ECS is located throughout the body, brain, organs, connective tissue, secretory glands, immune and nervous system. This system is involved in many cognitive and psychological processes, which is where cannabis exerts its effects (Agroin, 2021; Ahamed et al., 2020; Han et al., 2016; Prevention Action Alliance, 2020; Ryan et al., 2021; Salas-Wright et al., 2017; Zhao et al., 2021). Endogenous cannabinoids are lipids that occupy cannabinoid receptors type 1 (CB1) and type 2 (CB2). Stimulation of cannabinoid receptors, CB1 and CB2 affect appetite, mood, memory, regulation of movement, pain, and nausea and vomiting (Hillard, 2018; Joy et al., 1999).

Cannabis and the Endocannabinoid System

Cannabis, a plant known as cannabis sativa, is believed to have originated in Central Asia and India. The cannabis sativa plant contains approximately 540 chemical substances which are known as cannabinoids. Cannabinoids are highly lipophilic and are responsible for the psychological and physiological effects experienced with the inhalation or ingestion of cannabis. Lipophilicity is a crucial physicochemical property which determines a drugs ability to bind to receptors. Although one

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hundred cannabinoids have been identified, the most well-known cannabinoids are tetrahydrocannabinol (THC) and cannabidiol (CBD) both of which are highly lipophilic and readily bind to the CB1 and CB2 receptors in the ECS and throughout the body (Arnott & Planey, 2012; Hillard, 2018: Joy et al., 1999).

Physiological Response of Cannabinoid Receptors in the ECS

Cannabinoid type 1 receptors (CB1) are located primarily in the brain and central nervous system (CNS). Because CB1 receptors are in the CNS, activation of the CB1 receptors accounts for changes in mood, memory, and the psychotropic effects experienced after the ingestion or inhalation of cannabis. Cannabinoid type 2 receptors (CB2) are located outside the CNS, in the immune system, and other organs. CB2 receptor activation can suppress the pain stimulus (Anthony et al., 2020). Table 1 provides additional information about the physiological targets of these receptors.

Table 1. ***Physiological Targets of CB1 and CB2 Receptor Activation***

CB1 Receptor Activation	
Appetite	CB1 receptors regulate appetite. Stimulation of the CB1 receptor signaling increases appetite while blockade of CB1 receptor signaling suppresses hunger (Tarragon & Moreno, 2019).
Mood and Memory	Large concentrations of CB1 receptors are in the hippocampus, amygdala, and prefrontal cortex, areas of the brain which are involved in executive function. Ingestion or inhalation of cannabis can impair memory, effect behavioral inhibition, impulsivity, and can produce psychosis-like effects (Testai et al., 2022).
Regulation of Movement	Current findings suggest that CB1 receptor activation can antagonize the effects of dopamine receptor agonists. Dopamine plays an important role in both normal and pathological motor function. Blockade of dopamine results in impaired motor movements. For example, dopamine cell loss underlies the motor deficits in Parkinson's disease (Wang et al., 2022).
Nausea/Vomiting	CB-1 receptors are also located in the brainstem's dorsal vagal complex (DVC). The region of the brain that initiates the vomiting reflex. Binding of the CB1 receptor desensitizes the CB1 receptors which have antiemetic effects (Sharkey et al., 2014).
CB-2 Receptor Activation	
Pain	CB2 receptors are located outside the CNS in the immune system and other organs. Activation of the CB2 receptors reduces neuropathic pain by inhibiting inflammatory hypersensitivity, thereby reducing inflammation. This can be therapeutic in inflammatory pain, such as osteoarthritis. Additionally, CB2 receptors have been shown to reduce pain by altering cytokines. Cytokines are inflammatory mediators that potentiate pain signals. Diminishing the effect of cytokines may reduce the pain signals (Anthony et al., 2020).

Pathophysiology of Aging

There are multiple theories on the pathophysiology of aging. However, a universal tenant underlying aging theories is that aging is multifactorial and systemic. Because the pathophysiology of the aging process is systemic, virtually every organ system is involved. Research has found that new cell proliferation decreases as we age until cells eventually become senescent or no longer proliferate. As the number of senescent cells outnumber proliferative cells the result is an absence of new cells to replace damaged cells (Flint & Tadi, 2023).

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As the number of damaged cells increases, organ function declines. Multi-system organ decline can result in chronic medical conditions such as hearing loss, cataracts, refractory disorders, osteoarthritis, cardiac and pulmonary disorders, diabetes, depression, dementia, and generalized organ dysfunction (Flint & Tadi, 2023). Throughout the aging process, chronic medical conditions that result from this decline often require the use of one or more prescribed drugs (National Institute of Aging, 2021).

Prescribed and over the counter (OTC) drugs are primarily metabolized by the liver and excreted through the kidneys. Organ function decline in either the liver or the kidneys can result in the accumulation of drugs or their metabolites. This accumulation results in toxic concentrations of the drugs (National Institute of Aging, 2021).

Increased Adverse Drug Reactions and Cannabis

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The risk of adverse drug reactions (ADRs) significantly increases when drugs that share the same metabolic pathway are used concurrently. This can result in increased serum concentration secondary to decreased hepatic clearance and renal excretion and/or cause unintended drug interactions between drugs (Agroin, 2021; Ahamed et al., 2020; Han et al., 2016; National Institute of Aging, 2021; Salas-Wright et al., 2017).

The Liver and The Cytochrome (CYP) P450 System

The liver enzymatically converts lipid-soluble drug compounds to water-soluble compounds to facilitate the excretion of drugs and their metabolites via the CYP450 system. The CYP450 system is composed of 57 enzymes. However, CYPs 1,2, and 3 are responsible for the metabolism of 80% of clinical drugs.

Cannabinoids and their major THC metabolites are lipophilic, hence they are metabolized in the liver. However, cannabinoids have been shown to inhibit several CYP450 enzymes, specifically CYP3A4, CYP2C9; CYP2C19, and CYP1A. Inhibition of a CYP-450 metabolizing enzyme prevents the drug from breaking down (i.e., being metabolized) and excreted. This increases the risk of drug toxicity and drug-to-drug interactions. Consequently, concurrent use of cannabinoids with drugs that share the same metabolic pathway of drugs increases the risk of ADRs and the risk of unintended drug reactions (Bijl et al., 2009; CDC, 2019; Garcia-Compean et al., 2015; Nasrin et al., 2021; Neuvonen et al., 2006; Sadovsky, 2002). An example of this is lipid lowering drugs, which are one of the most frequently prescribed agents in older adults. When simvastatin is used with a CYA4 inhibitor such as cannabis, the risk of rhabdomyolysis increases sixfold (Rowan, et al., 2009).

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Most Prescribed Drugs in the USA in Older Adults

Five of the most prescribed classifications of drugs in older adults are lipid lowering agents (45%), anti-diabetic agents (23.6%), beta blockers (22.3%), angio-tension converting enzymes (ACE) inhibitors (21.3%), and proton pump inhibitors (PPI) (16.9%). Lipid lowering agents such as simvastatin, lovastatin and atorvastatin are metabolized in the liver via CYP3A4. Cannabis inhibits CYP3A4. Inhibition of CYP3A4 during the administration of these medications increases the risk of drug toxicity and the potential for increased drug-drug interactions.

Anti-diabetic agents thiazolidinediones and pioglitazone are also metabolized in the liver via CYP1C81 and CYP3A4. Cannabis inhibits CYP3A4. Inhibition of CYP3A4 during the administration of these drugs increases the risk of drug toxicity and the potential for increased drug-drug interactions. Multiple beta blockers are metabolized in the liver via CYP2D6. Cannabis does not inhibit CYP2D6. Therefore, there is no impact to the metabolism or excretion of these drugs with the concurrent use of cannabis.

ACE inhibitors are partially metabolized by CYP34A. Cannabis inhibits CYP3A4. Inhibition of CYP3A4 during the administration of these drug increases the risk of drug toxicity and the potential for increased drug-drug interactions. PPI are partially metabolized by CYP2C19 and CYP3A4. Cannabis inhibits CYP2C19 andCYP3A4. Inhibition of CYP3A4 and CYP2C19 during the administration of these drugs increases the risk of drug toxicity and the potential for increased drug-drug interactions (Bijl et al., 2009; CDC, 2019; Garcia-Compean et al., 2015; Nasrin et al., 2021; Neuvonen et al., 2006; Sadovsky, 2002).

Nurses have a critical role in maintaining patient safety in all phases of patient care. This is particularly true with medication administration. Nurses interact at each phase of medication administration, from the initial healthcare providers order to the monitoring prior to, during and after medication administration. The following section discusses strategies to support patient safety during the administration of medications.

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Strategies to Maintain Patient Safety During Medication Administration

Strategies that nurses employ to reduce the risk of untended side effects and ADRs during medication administration are particularly important when considered in the population of older adults. Because of the normal physiological effects of aging, older adults often have chronic illnesses. Thus, they often take at least one or more prescribed medication(s) (Flint & Tadi, 2023; National Institute of Aging, 2021).

The general decline in organ function in older adults, coupled with the daily use of one or more medications, significantly increases the risk of drug toxicity and drug to drug interactions. The greater the number of medications used, the greater the potential of one or more of the medications sharing the same metabolic pathway of one or more CYP-450 drug

metabolizing enzymes. Thus, there is an increased risk for potential drug toxicity and drug to drug interactions (Flint & Tadi, 2023; National Institute of Aging, 2021). To enhance patient safety during medication administration the Joint Commission (JC) and the Agency for Healthcare Research and Quality (AHRQ) have developed guidelines to assist nurses.

General Guidelines for Safe Medication Administration

Medication Reconciliation. Whether in the clinical arena or in an outpatient setting nurses must conduct a thorough medication reconciliation (AHRQ, 2023; Chayasirisobhon, 2020; JC, 2023; Susa et al., 2019; Taylor et al., 2023). Additionally, it is important that the medication reconciliation includes not only prescribed medications but also the use of OTC medication(s), nutritional and/or herbal supplements, and recreational substances.

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In 2021 a national survey was sent to practicing pharmacists who were knowledgeable about OTC medication use in the elderly. Survey respondents indicated that elderly consumers used symptom relief (78%), brand name (54%), and price (47%) when making OTC medication purchasing decisions. Supporting evidence found by McNeil Consumer Health (2015) which indicated few consumers read the OTC medication labels. Furthermore, there is a misconception that easy access often leads to the mistaken belief that OTC drugs are safer than prescribed drugs because they do not require a prescription (Terrie, 2025). Additionally, many people do not regularly inform their health care providers about their OTC use, leading to a lack of awareness about possible risk (National Institute of Drug Abuse, 2017). For this reason, it is imperative nurses take a detailed history of the use of OTC and nutritional and/or herbal supplements, including the use of recreational agents (AHRQ, 2023; Chayasirisobhon, 2020; JC, 2023; Susa et al., 2019; Taylor et al., 2023)

Prior to Administration. Nurses must possess a thorough knowledge of all medications(s), prescribed, OTC as well as recreational agents reported during the medication reconciliation. It is imperative nurses know the mechanism of action, the pharmacodynamics, and pharmacokinetics of all drugs reported. It is also essential for nurses to know the indication for drug use, drug dosages, strengths and routes of administration. Finally, prior to administration they must also check drug warnings, precautions, contraindications for drug(s) use in specific populations, specific pathophysiological conditions and if there are contradictions for use with specific drugs.

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Nurses are patient educators. Medication education is vital for safe outcomes. For each medication administered, nurses must evaluate the individual's understanding of the medication(s) being administered, dosage(s), timing, route of administration, whether the medication can be taken with meals, and potential side effects, including known side effects versus adverse events.

Nurses must tailor teaching strategies to a satisfactory level of comprehension for any patient. This may involve simplifying medical jargon, using visual aids, or providing written materials at an appropriate reading level. Strategies for effective teaching include:

- Assess the patient's baseline understanding of the health condition.
- Include significant others in patient teaching.
- Utilize teach-back methods to confirm comprehension.
- Offer resources in multiple languages if needed.
- Follow up learning and address any questions.

Assessment of Organ Function. As described above, organ dysfunction can significantly impact how drugs are metabolized, absorbed, distributed, and eliminated. This can lead to unpredictable levels and effects of drugs in the body, which can increase the risk of drug interactions and adverse events. Nurses must review prior to the administration, during administration, and post administration of a medication(s) the diagnostic laboratory values required to assess and monitor the status of the target organ where the medication(s) will be metabolized. While metabolism of medication(s) primarily occurs in the liver, metabolic enzymes are found throughout the body. Hence, it is imperative that the primary organ of where the medication is metabolized is identified.

Additionally, the target organ(s) of drug excretion must also be monitored to assess organ function. While the kidneys are primary responsible for drug excretion, this process does occur in other sites in the body. Again, be certain that the primary organ of excretion is identified prior to administration. Regardless of whether a drug is hepatically metabolized or renally eliminated, impairment in either of these organs can cause significant issues. These issues potentially include altered dosing, dose intervals, and/or therapeutic effects (AHRQ, 2023; Chayasirisobhon, 2020; JC, 2023; Susa et al., 2019; Taylor et al., 2023).

Cannabis: Essential Knowledge for Nursing Care

Because CB1 and CB2 receptors are located within the CNS, as well as at multiple sites outside of the CNS, ingestion and/or inhalation of cannabis has a widespread impact psychologically as well as physiologically. This section describes areas of knowledge is essential to promote safe nursing care.

Falls Risk Assessment

Cannabis activation of the CB1 receptors antagonizes the effects of dopamine receptor agonists. Blockade of dopamine impairs motor movement (Wang et al., 2022). Hence, cannabis use in older adults can increase the risk of falls. If cannabis is initiated during hospitalization the falls risk score needs to be adjusted. If cannabis is initiated in an outpatient primary care setting education regarding the potential impact of cannabis on motor function needs to be included in medication education.

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Psychological Effects

Large concentrations of CB1 receptors are in the hippocampus, amygdala, and prefrontal cortex areas of the brain. Therefore, ingestion and/or inhalation of cannabis can impair memory, effect behavioral inhibition, impulsivity, and can produce paranoia, anxiety and psychosis-like effects. Furthermore, cannabis use has the potential to increase the risk of depression and/or suicidal ideation especially in those with a history of depression and/or suicide (Testai et al., 2022). Educate individuals and families about these potential adverse effects and advise them to call their primary healthcare provider immediately should these symptoms arise.

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Increased Appetite

CB1 receptors regulate appetite. Stimulation of the CB1 receptor signaling increases appetite (Tarragon & Moreno, 2019). In addition, with age comes a significant increase for the risk of developing diabetes. Diabetes is a highly prevalent health condition in the aging population. Over one quarter of people over the age of 65 years have diabetes and one-half of older adults have prediabetes (American Diabetes Association Professional Practice Committee, 2024). An increase in appetite may increase serum glucose levels. Sustained elevated serum glucose has the potential to damage the eyes, kidneys, nerves, heart, and peripheral vascular system. Thus, it is essential to educate individuals about signs and symptoms of hyperglycemia (Mouri & Badireddy, 2023).

Legal Implications for Nurses

Nurses are accountable for their own practice and their actions. They must adhere to state practice acts, regulations, standards of care and the American Nurses Association Code of Ethics ([ANA], 2015). Because cannabis is considered Schedule I drug it is incumbent upon nurses to know the laws specific to their state of practice as these laws vary from state to state (American Bar Association, 2021; Hanson & Haddad, 2023; National Council State Board of Nursing, 2018; Ryan et al., 2021).

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A limited list of resources of laws related to cannabis is included in Table 2 below. Please note that this list is not exhaustive, but may be useful as a starting point for nurses seeking additional information about this topic.

Table 2. ***Select Resources Related to Use of Cannabis***

National Council of State Legislatures	
State Medical Cannabis Laws (ncsl.org)	This database covers topics related to cannabis policy, including state regulations for medical and adult-use (recreational) cannabis programs, driving under the influence of cannabis, public health related, research, taxes and more.
State Cannabis Policy Enactment Database (ncsl.org)	This database covers topics such as the medical uses of cannabis, state vs federal perspective, non-medical/adult use and state regulated cannabis programs.
ANA Position Statement on the Use of Medical Marijuana	
https://www.nursingworld.org/globalassets/practiceandpolicy/nursing-excellence/ana-position-statements/therapeutic-use-of-marijuana-and-related-cannabinoids-position-statement-final-2021.pdf (nursingworld.org)	This document is the American Nurses Association Position Statement on the Therapeutic use of Marijuana and Related Cannabinoids effective 2021. The positions statement discusses the roles and responsibilities of nurses related to the use of cannabinoids.
National Council of the State Board of Nursing	

National Council State Board of Nursing. (2018). NCSBN Guidelines for the Nursing Care of Patient Using Marijuana. *Journal of Nursing Regulation*, 9(2S), S23-S27).	This article provides nurses with guidelines, principles of practice and knowledgeable to practice and foster patient safety when caring for patients using medical marijuana.

Conclusion

Patient safety and nursing care are explicitly linked. To administer a medication prior to having thorough knowledge about it not only places the nurse at risk for medical liability, it places the individual in that nurse's care at risk of serious harm or even death (ANA, 2009; 2023; Bijl et al., 2009; CDC, 2019; CNA/NSO, 2020; Garcia-Compean et al., 2023; Joint Commission, 2020;Neuvonen et al.,2006; Sadovsky, 2002). For this reason, it is important that nurses are educated with current, accurate knowledge about newer medications, and those less commonly administered.

Since the legalization of cannabis, the media is replete with advertisements of the therapeutic benefits of cannabis. However, there remains a scarcity of research on the benefits of cannabis or on the therapeutic benefits and the potential side effects associated with its use. Therefore, well-controlled studies examining safety and efficacy need to be conducted (FDA, 2024).

Medication administration in older adults, even with medication that has undergone rigorous testing, often poses unique challenges because of the decline of organ function due to the normal pathophysiology of aging. Medications that have not undergone rigorous testing exponentially and increase the risk of ADRs and subsequent untoward events.

A large part of the practice of clinical nursing involves medication administration. Nurses are often the final healthcare provider to check medication(s) prior to administration. In addition, it is often the nurse who is the main source of education to the populations they serve. Given the current availability of cannabis, it is important for all nurses to become knowledgeable about its use, both medically and socially, by older adults over age 50 and how to safely care for this patient population.

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After 25 years in full-time academics, I have retired. I remain active in clinical practice, have been a CCNE reviewer since 2011 and remain active as a legal nurse consultant.

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