Spring 5-2024

Educating Anesthesia Providers on the Physiological Effects and Anesthesia Implications of Cannabis

Carmel Loud

Executive Summary

Educating Anesthesia Providers on the Physiological Effects and Anesthesia Implications of Cannabis

Introduction of the Problem

Currently, 37 states have legalized cannabis for medicinal use prescribed by qualified medical professionals (National Conference of State Legislatures [NCSL], 2022). In 2012, the legalization of recreational cannabis began; as of 2022, 19 states have legalized the recreational use of marijuana (NCSL, 2022). The popularity of marijuana has drastically increased over the last ten years; therefore, the medical industry must take steps to ensure a proper understanding of marijuana and its impacts on anesthesia.

Literature Review

This literature review discusses the pharmacodynamics and pharmacokinetics of cannabis and how cannabis affects the cardiovascular system, special populations, pulmonary system, anesthesia, central nervous system, gastrointestinal system, pain pathways, and anesthesia implications and explores the process of interviewing cannabis users.

CB1 receptors are in the central nervous system, cardiovascular system, skin, liver, adipose tissue, and skeletal muscle. CB2 receptors are in the peripheral tissues, gastrointestinal tract, leukocytes, and immune cells (Page et al., 2020). THC and CBD are exogenous

cannabinoids that work as partial agonists on CB1R and CB2R (Latif & Garg, 2020; Laudanski & Wain, 2022; Page et al., 2020; Teitel & Bozimowski, 2020; Zhao et al., 2021). THC causes tachycardia through inhibitory effects on the parasympathetic nervous system and stimulation of the sympathetic nervous system (Latif & Garg, 2020; Laudanski & Wain, 2022; Page et al., 2020; Zhao et al., 2021). A systematic review by Richards et al. (2020) examined the cardiovascular effects of cannabis. Extensive cannabis use can lead to modulation of the autonomic nervous system, resulting in orthostatic hypotension and bradycardia due to the diminished capacity for sympathetic activity and increased parasympathetic response (Latif & Garg, 2020; Page et al., 2020). CBD can have cardioprotective qualities due to its ability to reduce heart rate, reduce blood pressure, and improve vasodilation (Latif & Garg, 2020; Page et al., 2020; Zhao et al., 2021). Due to the opposing effects of CB1 and CB2 receptors, the link between cannabis use and cardiovascular disease is controversial (Latif & Garg, 2020; Page et al., 2020; Zhao et al., 2021).

Geriatric and youth populations are the most likely to have the public perception that cannabis is safe to use (Latif & Garg, 2020; Page et al., 2020). The elderly are at increased risk of falls when under the influence of cannabis from the psychedelic effects, and if taken in large consumption, orthostatic hypotension can occur (Latif & Garg, 2020). Several national and state surveys provide evidence that the use of cannabis while pregnant is currently rising (Ryan et al., 2018). Cannabis in obstetrics has been linked to preterm labor (Horvath et al., 2019). Cannabis is the most frequently abused drug by adolescents worldwide (Page et al., 2020; Richards et al., 2020). There is a need to educate youth about the risks involved with cannabis as it may increase their risk of arrhythmias, acute coronary events, or stroke (Goyal et al., 2017).

The lack of filtration when smoking cannabis leads to increased carcinogens and irritants inhaled, making cannabis smoke more detrimental to the lungs than cigarette smoke (Huson et al., 2018). Cannabis smokers tend to inhale more deeply, increasing the volume of smoke in the lungs and maintaining each breath of smoke for a longer duration to maximize the absorption of cannabis. This increase in volume and duration of inhalation is detrimental to the lungs, resulting in carboxyhemoglobin levels five times higher than a tobacco smoker (W.U. et al., 1988). Cannabis burns at a higher temperature than tobacco smoke, making it even more of an airway irritant than tobacco smoke (Huson et al., 2018). Numerous research studies have found no correlation between marijuana smoking and lung cancer. This is believed to be due to cannabinoids' ability to minimize carcinogenic pathways (Melamede, 2005). Smoking cannabis or tobacco will lead to an inflammatory state of the airway; both produce free radicals and contain carcinogens.

Cannabis can be used in treating epilepsy; it has significant antiseizure effects (Horvath et al., 2019; Laudanski & Wain, 2022; Page et al., 2020). THC is a CNS depressant and should be used cautiously with other CNS depressants (Horvath et al., 2019). Commonly experienced subjective CNS effects caused by cannabis are euphoria and relaxation, but adverse subjective CNS effects have also been reported, including depression, anxiety, and paranoia (Laudanski & Wain, 2022; Page et al., 2020).

Cannabis has been utilized for its antinausea effects for hundreds of years (Horvath et al., 2019). The acute effects of cannabis have been found to provide antinausea and stimulate appetite (Alexander & Joshi, 2019; Latif & Garg, 2020; Page et al., 2020). The chronic effects of cannabis consumption can lead to hyperemesis (Alexander & Joshi, 2019; Page et al., 2020). THC slows gastric emptying by 30-120 minutes (Horvath et al., 2019).

Current recommendations advise postponing elective procedures when a patient is actively under the influence of marijuana until they are no longer altered (Alexander & Joshi, 2019; Horvath et al., 2019). Acute consumption of cannabis leads to adrenergic activation with parasympathetic inhibition leading to tachycardia; beta blockers can be utilized to mitigate this response (Richards et al., 2020). In chronic cannabis users, desensitization of the adrenergic system can lead to hypotension and limit sympathomimetics' effectiveness (Laudanski & Wain, 2022).

There is a negative cogitation with the term 'illicit drug use'; this terminology on an intake form may cause a patient to be untruthful when disclosing their health history. A non-judgmental, empathetic approach should be used when interviewing patients about cannabis use to establish a trusting rapport (Teitel & Bozimowski, 2020). Cannabis is complex and contains many active components. This literature review aims to increase knowledge among anesthesia providers to optimize patient care for cannabis users.

Project Methods

An evidence-based PowerPoint lecture was developed as a non-experimental design to increase anesthesia providers' knowledge about cannabis and its implications on anesthesia at the host facility, a general acute care health facility in the south-central Illinois region. This project did not include any patient data collection or interactions with patients. Evidence-based research regarding the physiological effects of cannabis and anesthesia implications of cannabis, discussed in the literature review, was included in this PowerPoint lecture. The educational presentation served as a tool for anesthesia providers to gain current knowledge about cannabis as laws and regulations concerning cannabis are changing, and the patient population using

cannabis is rapidly growing. Tangible forms of the PowerPoint presentation were available to all participants at the live presentation. Following the PowerPoint presentation, all participants were asked to complete a short survey assessing their knowledge gained. The results from the survey were evaluated to determine the success of project implementation and incorporated into the final project presentation.

Evaluation

Thirteen CRNAs completed the pre-quiz, and 12 completed the education and post-quiz. The results from the pre and post-quizzes revealed improvement in knowledge for every question that scored less than 100% on the pretest. The results of the pre-quiz identified many areas where participants lacked knowledge about cannabis. The post-quiz results demonstrated immense improvement in provider knowledge about cannabis.

Limitations of this study include a small sample size, which limits the generalizability of the results. This quality improvement implementation was limited to only evaluating the knowledge of CRNAs. Further studies should be done to evaluate the knowledge of cannabis among other anesthesia providers, including MDs, DOs, and AAs.

Impact on Practice

The results from the pre and post-quizzes showed that this QI project did improve anesthesia providers' knowledge about cannabis. Many CRNAs commented after taking the pre-quiz that they had to guess on many questions and had never learned how cannabis works. With the legalization of cannabis across the U.S., it is imperative anesthesia providers have foundational knowledge about cannabis and how it impacts anesthesia. This Q.I. project

successfully improved the knowledge of twelve CRNAs about cannabis. With the quickly growing use of cannabis across the U.S., this knowledge should be incorporated into continued education models across America to improve anesthesia provider knowledge about cannabis on a larger scale.

Conclusions

Due to the increase in cannabis consumption in the U.S., medical professionals need to understand the physiological effects of cannabis. This QI project lends evidence that anesthesia providers need further education about cannabis. The results from this QI demonstrated that implementing education for anesthesia providers can improve knowledge about cannabis. One can hypothesize that improving practicing anesthesia providers' knowledge about cannabis will lead to higher quality care for patients who consume cannabis.

Author Contact Information

Carmel Loud, SRNA, BSN, RN

cloud@siue.edu

907-388-1168