Medicinal Cannabis: A Growing Health Care Landscape

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Introduction

The legalization of recreational marijuana in Canada, raises many questions in relation to the expected impact on the healthcare system. Although medicinal cannabis has been legally regulated in Canada since 2001, the approaching legalization of recreational marijuana as well as increasingly greater freedom for cannabis in medical research, has yielded elevated patient request for symptom relief with medicinal cannabis.

The purpose of this research is to enable nursing students to guide patients with greater knowledge, confidence and authority regarding cannabis as a therapeutic agent. The research gathered is being assembled in an online interactive module for nursing students to impart essential knowledge in seven areas; including cannabis profile and the endocannabinoid system, THC and CBD therapeutics, pharmacokinetics, pharmacotherapeutics, adverse effects of use, access to medicinal cannabis, and nursing considerations.

(Blaze, 2013)

Recreational marijuana will be legalized in Canada under the *Cannabis Act* on October 17th, 2018. When legal, people aged nineteen and over will be able to purchase cannabis online through the Ontario Cannabis Store. The government will also be introducing legislation that, if passed, would open regulated private retail cannabis stores launched by April 1, 2019 (Government of Ontario, 2018). Medicinal cannabis will continue to be regulated according to the *Access to Cannabis for Medical Purposes Regulations* (Health Canada, 2018)

(Wyld, 2015)

Methods

Examination of gray literature informed the findings of this research, and it is acknowledged that health care providers (HCPs) must consult their workplace policy regarding considerations of hospital storage, preparation, administration, and documentation.

Implications for Registered Nursing Practice

Legalities around cannabis use have always been controversial, but as health care professionals who recognize social determinism in predicting health outcomes, decriminalization represents an effort to not only reduce judicial burden, but health inequities

(TCPA, 2018)

With recreational marijuana legalization, increasing research validating therapeutic effects, and elevated patient request, nurses in the community and acute care settings will require the knowledge and competence to educate patients regarding adverse effects of use and/or alternative options

Being front-line health care providers also requires nurses to monitor and recognize the acute adverse events associated with cannabis use; including cardiovascular stimulation, psychosis, reduced psychomotor and cognitive performance, as well as additive pharmaceutical effects such as incoordination and lethargy from synergy of CNS depressants administered with cannabis

Results

The online learning module is demarcated into seven sections, each of which are elucidated in greater detail below with corresponding information pertinent to the work of health care providers:

1. Cannabis profile and the endocannabinoid system (ECS)

Cannabis sativa and Cannabis indica are two of three recognized species within the genus Cannabis. Cannabis sativa is more concentrated in cannabinoid delta-9-tetrahydrocannabinol or THC and elicits a mind-high from binding properties within the central nervous system (CNS). The cannabinoid, cannabidiol or CBD dominates in Cannabis indica and produces a body-high suitable for night use and/or the treatment of pain, inflammation, epilepsy, and spasticity where psychoactivity is not therapeutic (McPartland & Guy, 2017)
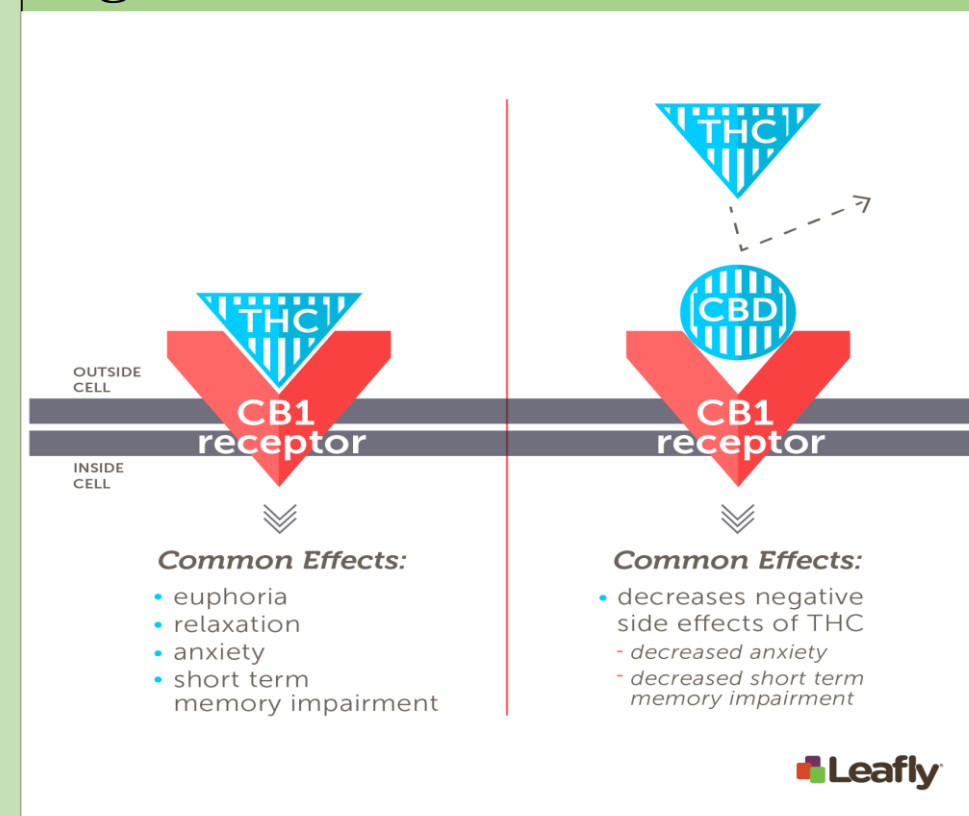
Figure 1.

The endocannabinoid system is found throughout the body; comprised of endocannabinoids (anandamide and 2-AG), their receptors (CB1, CB2), and the enzymes that synthesize and degrade them (FAAH and MAGL) (Kluger et al, 2015)

See Figure 1. CB1 receptor activation on pre-synaptic GABAergic and glutamatergic neurons results in an inhibition of these neurotransmitter's release, and thus modulates post-synaptic neurotransmitter release; including dopamine, acetylcholine, serotonin, and norepinephrine (Grotenhermen & Müller-Vahl, 2016)

Endocannabinoid signaling induces synaptic depression at excitatory synapses
(Hill and Patel, 2013)

CB2 receptor activation reduces neuroinflammation, reactive oxygen species production, and oxidative stress (Tanveer et al, 2012)

2. Exogenous cannabinoids: THC and CBD

Figure 2.

(Phung/Leafly, 2018)

THC is a partial agonist of CB1 and CB2 receptors, and unlike anandamide and 2-AG, THC acts at cannabinoid receptors throughout the CNS simultaneously and is not destroyed quickly by degrading enzymes, potentiating hallucinations, anxiety, paranoia, psychosis, dependence, and motor inhibition (Niesink and van Laar, 2013)

See Figure 2. Alternatively, CBD acts as a positive allosteric modulator of GABA receptors and interacts with GPR55, 5HT serotonin, TRPV1, and PPAR receptors, yielding anti-inflammatory, analgesic, anti-convulsant, anti-anxiety, and possible anti-neoplastic effects while providing protection against psychosis and dependence through negative allosteric modulation of CB1 receptors and inhibition of anandamide breakdown (CBD PROJECT, 2018)

3. Pharmacokinetics

Cannabis smoke yields a cannabinoid bioavailability of 25-30%. Onset of action occurs within minutes, the peak concentration at thirty minutes, and a steady state is maintained for two-four hours. Smoking cannabis yields many of the same carcinogens and free radicals that tobacco smoke creates; including tar, polycyclic aromatic hydrocarbons, ammonia, benzene and hydrogen cyanide, which promote bronchial hyperreactivity and carcinogenesis (Lanz et al, 2016) (Budney et al, 2015)

Vapourization has the same onset, peak and duration of smoked cannabis, while avoiding the formation of hazardous combustion products. Optimal vapourization of cannabis occurs anywhere between 180-230 degrees Celsius; heating above 235 degrees Celsius potentiates combustion (Lanz et al, 2016)

Figure 3. Effect of smoked versus eaten cannabis
Intensity of effects over time. An edible dosage of THC may take 30 to 90 minutes to take effect.

(Staggs, 2018)

See Figure 3. Oral ingestion of edibles results in slow, erratic absorption with a low cannabinoid bioavailability of 6-20% due to the sensitivity of THC to stomach acid and extensive first pass metabolism in the gut and liver. The onset of action for ingested cannabis is 30-90 minutes, the peak occurs at two-four hours, and effects can last up to 12 hours. Furthermore, edible THC yields the metabolite 11-hydroxy-THC which is psychoactively stronger in potency than THC and persists in the body longer when ingested than inhaled (Lanz et al, 2016) (Romero-Sandoval et al, 2017)

4. Pharmacotherapeutics

Well-supported indications for cannabinoid therapy include chemotherapy and radiation-induced nausea and vomiting, appetite loss and cachexia in cancer and HIV patients, neuropathic and chronic pain, and spasticity in multiple sclerosis (Grotenhermen and Müller-Vahl, 2016)

5. Adverse effects of use

Acute effects of cannabis include sedation, dizziness, dry mouth, tachycardia, orthostatic hypotension, reduced lacrimation, muscle relaxation, increased appetite, and psychoactivity (Hall and Degenhardt, 2014) (Volkow et al, 2014)

Cannabis intoxication can elicit tachycardia, increasing the oxygen demand of the heart. In addition, THC is pro-atherogenic and contributes to plaque formation, while CB1 receptor activation promotes lipogenesis in the liver and adipose tissue (Kattoor and Mehta, 2016). Smoking cannabis is associated with symptoms of chronic bronchitis, endoscopy illuminates loss of ciliated epithelium and replacement by mucus-secreting goblet cells, and mild airflow obstruction in the heaviest cannabis smokers (Tashkin, 2014)

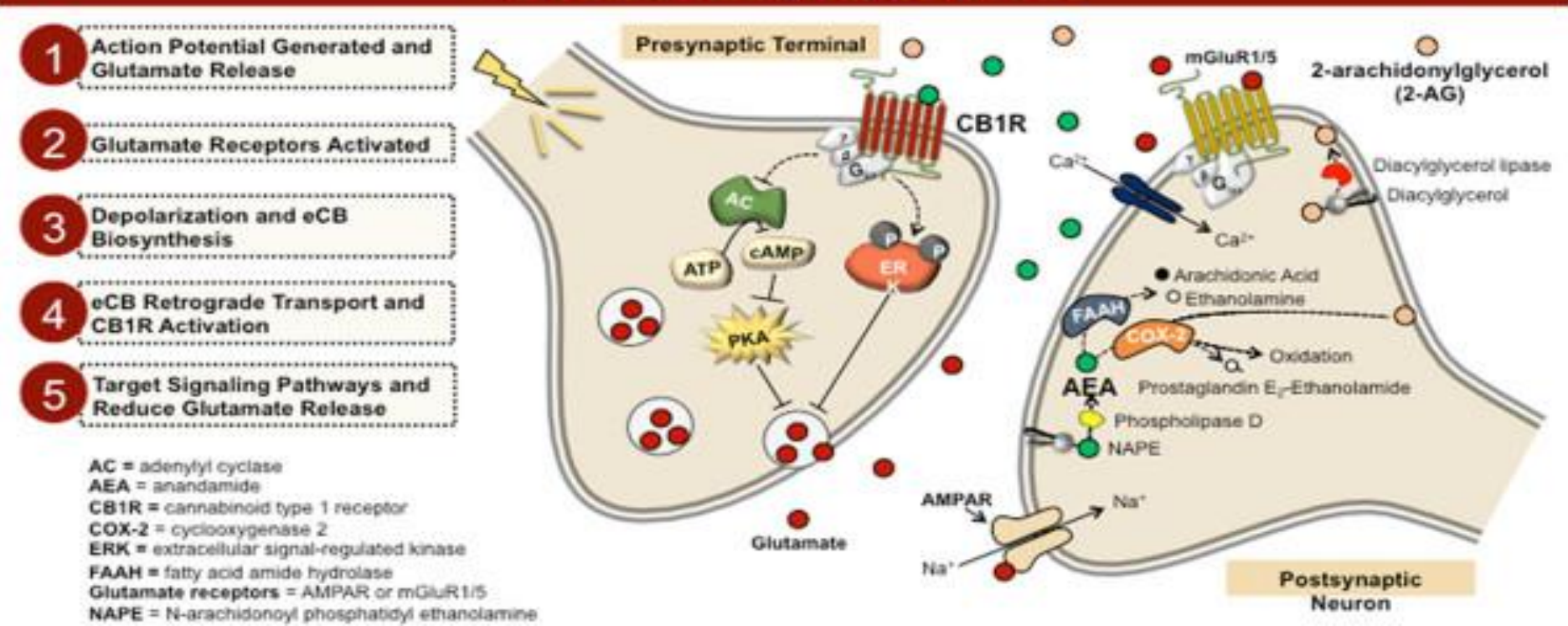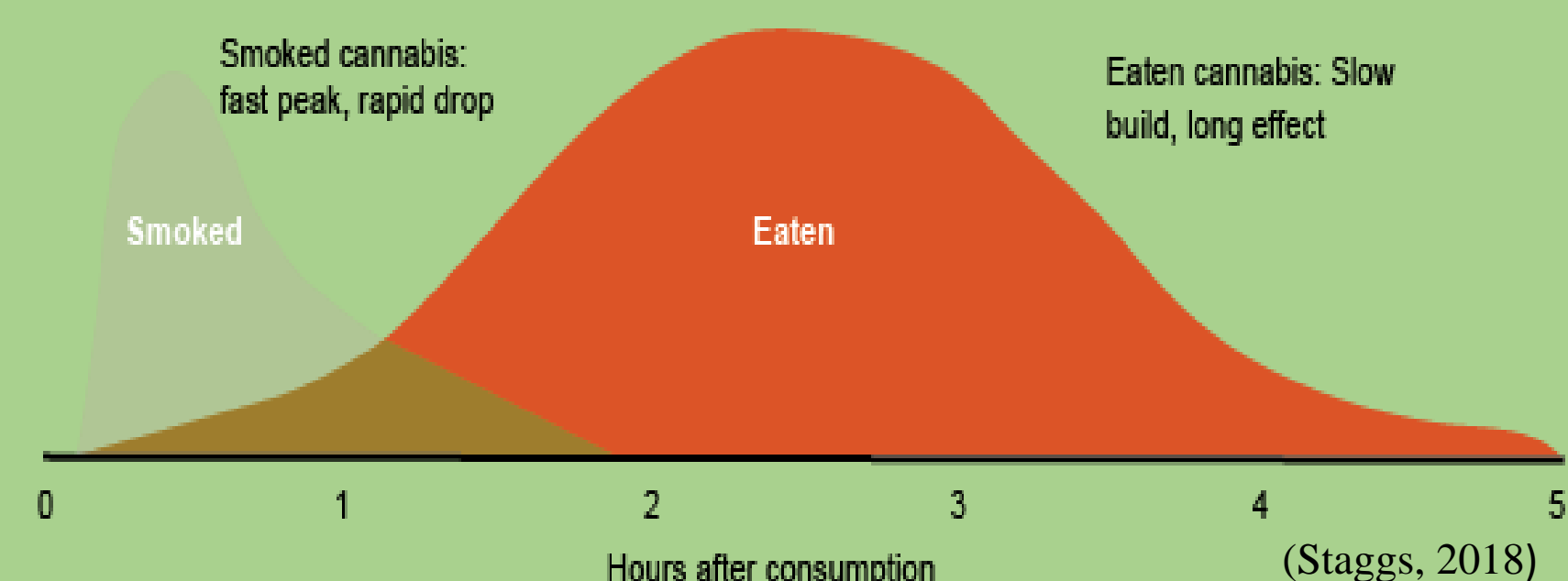**6. Access to Cannabis for Medical Purposes Regulations (ACMPR)**

The procedure for accessing medicinal cannabis is outlined in four steps on Health Canada (2018); 1) Consult with a HCP, 2) obtain a medical document completed by an HCP, 3) register and order with a licensed producer, and 4) shipment of cannabis

7. Nursing considerations

Transference of medicinal cannabis from the community into acute care settings poses challenges; including physician discontinuance of cannabis therapy, policies surrounding route of administration, as well as lack of unit doses. Cannabis is a Schedule II drug in Canada, thus requiring special consideration for storage and documentation of amount remaining and amount removed when administered.

The delivery of medicinal cannabis to community clients diverts from ordering by hospital pharmacy and medication reconciliation in the acute setting. Medicinal cannabis is delivered to the door of clients; and supposedly when in hospital, would be delivered to the patient by family. Furthermore, if medicinal cannabis were to be prepared in edibles, it would be difficult for HCPs to administer and document the exact dosage administered in mg or percentage of THC and other cannabinoids.

Discussion

Contemplating the introduction of medicinal cannabis into acute care settings prompts much inquiry as to where cannabis will be stored, whether the patient or the nurse will administer it, and what forms of preparation will be allowed in the hospital or on property. As of now, the role of nurses in the preparation and administration of medicinal cannabis is largely unknown.

The upcoming legalization of recreational marijuana informed the urgency and relevancy for creating an online learning module tailored to prepare nursing students in understanding both currently available knowledge---endocannabinoid system, therapeutic indications, acute and/or adverse effects of use---as well as the unknowns regarding long-term cannabis use.

Nurses are in a unique position to advocate for patient autonomy as well as eliminate stigma in situations where benefits and risks are considered and accounted for in ways that aim to limit adverse effects and confer symptom relief.

Summary

Faculty and student worked with staff from the Teaching and Learning Centre at University of Ontario Institute of Technology to envision and develop an online interactive learning module using Adobe Captivate software. Seven learning objectives were collectively identified to guide the research recruitment process, development of the module, as well as evaluation of student learning;

Identify the main therapeutic components of the Cannabis plant and the function of the endocannabinoid system

Compare the therapeutics of THC versus CBD within the ECS

Compare the pharmacokinetic action and health effects of smoke and vapour inhalation versus oral ingestion

Identify some of the therapeutic indications for which medicinal cannabis has been recommended and researched

Identify the acute and chronic adverse effects of cannabis use

Identify the four steps in the regulated process for patient access to medicinal cannabis

Explore considerations unique to registered nursing practice and hospital handling of medicinal cannabis

References

Blaze, S. (2013). Centre Block-Parliament Hill [image]. Retrieved from https://commons.wikimedia.org/
Budney, A.J., Sargent, J.D., and Lee, D.C. (2015). Vaping cannabis (marijuana): parallel concerns to e-cigs? *Addiction, 110*(11), 1699-1704. doi: 10.1111/add.13036
Government of Ontario. (2018). *Cannabis legalization*. Retrieved from https://www.ontario.ca/
Grotenhermen, F, and Müller-Vahl, K. (2016). Medicinal uses of marijuana and cannabinoids. *Critical Reviews in Plant Sciences, 35*(5), 378-405. doi: 10.1080/07352689.2016.1265360
Hall, W., and Degenhardt, L. (2014). The adverse health effects of chronic cannabis use. *Drug Testing and Analysis, 6*(1-2), 39-45. doi: 10.1002/dta.1506
Health Canada. (2018). *Access to Cannabis for Medical Purposes Regulations*. Retrieved from https://www.canada.ca/en/
Hill, M.N, and Patel, S. (2013). Translational evidence for the involvement of the endocannabinoid system in stress-related psychiatric illnesses. *Biology of Mood and Anxiety Disorders, 3*(19). doi: 10.1186/2045-5380-3-19.
Icons made by Freepik from www.flaticon.com
Kattoor, A., and Mehta, J.L. (2016). *Marijuana and Coronary Heart Disease*. Retrieved from https://www.acc.org/
Kluger, B., Triolo, P., Jones, W., and Jankovic, J. (2015). The therapeutic potential for cannabis and its major constituents for movement disorders. *Movement Disorders, 30*(3), 313-327. doi:10.1002/mds.26142
McPartland, J.M., and Guy, G.W. (2017). Models of Cannabis taxonomy, cultural bias, and conflicts between scientific and vernacular names. *The Botanical View, 83*(4), 327-381. doi: 10.1007/s12229-017-9187-0
Niesink, R.J.M., and van Laar, M.W. (2013). Does cannabidiol protect against adverse psychological effects of THC? *Frontiers in Psychiatry, 4*(130). doi: 10.3389/fpsyt.2013.00130
Phung, A. (2018). Predicting Cannabis Strain Effects from THC and CBD Levels [image]. Retrieved from https://www.leafly.com/news
PROJECT CBD. (2018). *How CBD Works*. Retrieved from https://www.projectcbd.org/
Romero-Sandoval, E.A., Kolano, A.L., and Alvarado-Vázquez, P.A. (2017). Cannabis and cannabinoids for chronic pain. *Current Rheumatology Reports, 19*(11). doi: 10.1007/s11926-017-0693-1
Staggs, A. (2018). How to safely try edibles: A guide for beginners [image]. Retrieved from https://www.thecannifornian.com/
Tanveer, R., McGuinness, N., Daniel, S., Gowran, A., and Campbell, V.A. (2012). Cannabinoid receptors and neurodegenerative diseases. *Membrane Transport and Signalling, 1*, 633-639. doi:10.1002/wmts.64
Tashkin, D.P. (2014). Increasing cannabis use: What we still need to know about its effects on the lung. *Respirology, 19*, 619-620. doi: 10.1111/resp.12308
Transitional Care Physicians of America. (2018). Our Work [image]. Retrieved from https://www.tcpamd.org/
Volkow, N.D., Baler, R.D., Compton, W.M., and Weiss, S. (2014). Adverse health effects of marijuana use. *The New England Journal of Medicine, 370*(23), 2219-2227. doi:
Wyld, A. (2015). Pot shots: The long war over marijuana legalization [image]. Retrieved from https://ottawacitizen.com/