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.

Methods
Examination of grey 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
Legitimization 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.

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 correctly in cannabis 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).

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)

2. Exogenous cannabinoids: THC and CBD

Figure 2.

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, psychoses, dependence, and motor inhibition (Nursink and van Laar, 2013).

Figure 3. Effect of smoked versus eaten cannabinoids

(Taylor et al., 2016)

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 vaporization of cannabis occurs anywhere between 180-230 degrees Celsius; heating above 235 degrees Celsius potentiates combustion (Lanz et al, 2016).

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 psychoactive stronger in potency than THC and persists in the body longer when ingested than inhaled (Lanz et al. 2016) (Romero-Sanvito et al, 2017).

Figure 4. Endocannabinoid signaling induces synaptic depression at excitatory synapses

(Kluger et al., 2015)

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 (Grehnhermen and 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)

- Alternatively, CBD acts as a positive allosteric modulator of GABA receptors and acts at cannabinoid receptor (CB1 and CB2). CBD decrease psychoactivity, inflammatory, anti convulsant, anti anxiety, and possible anti-neoplastic effects while providing protection against psychosis and dependence through negative allosteric modulation of cannabinoid 1 receptors and inhibition of anandamide breakdown (CBD PROJECT, 2018).

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

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.

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 pharmacological effects such as incordination and lethargy from CNS depressants administered with cannabis.

References:


