Original Research

Mandatory pharmacist-led education session for patients seeking medical cannabis

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Abstract

Objective: The primary objectives of this pre-post session study, was to evaluate the impact of a pharmacist-led education session on the perceived benefits and safety of cannabis among patients with chronic pain, as well as determine the influence of pharmacist education on the selection of safer cannabis products and dosage forms for medical use among patients.

Methods: A retrospective analysis of completed pre-post session questionnaires was conducted among chronic pain patients attending a mandatory education session led by a pharmacist, prior to being authorized cannabis in clinic. All questionnaire data was analyzed using SPSS v. 25. Demographic and sample characteristics were reviewed using univariate analyses. Chi-Square tests were employed to determine if the group-based education significantly affected knowledge, perception of efficacy and safety of cannabis.

Results: Of the 260 session participants, 203 completed pre-post session questionnaires. After the session, a majority of current cannabis users (33.8%) and cannabis naïve/past users (56.9%) reported they would use a low THC product in the future, and a majority of current users (54.5%) would use a high CBD product in the future. After education, participants were more likely to report cannabis as having the potential for addiction (chi-square =42.6, p <0.0001) and harm (chi-square =34.0, p <0.0001).

Conclusions: Pharmacist counselling and education has the potential to influence patient selection and use of cannabis, from more harmful to safer products, as well as moderate the potential perceived benefits of use.

Keywords

Patient Education as Topic; Educational Measurement; Medical Marijuana; Cannabis; Chronic Pain; Patient Preference; Pharmacists; Surveys and Questionnaires; Canada

INTRODUCTION

The use of *Cannabis sativa* for medical purposes has undergone significant change in Canada over the past two decades, culminating in legalization in October 17th 2018.[1,2] Despite its prevalence of use across the medical system, leading up to and post cannabis legalization, the role of the pharmacist is largely absent.[3,4] This is due to laws and regulations established by the federal government, that have resulted in the circumvention of cannabis from traditional drug approval processes, and establishing a non-traditional supply and distribution chain.[5]

Beginning in 2001, the Canadian government established regulations that permitted patients to grow cannabis for medical purposes, by the endorsement of a specialist physician.[6] Over the next two decades, further revisions to

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these regulations established a distribution chain away from the individual patient, to government regulated, private licensed producers of medical cannabis.[2,6,7] To access medical cannabis from a licensed producer, a patient required either a non-specialist physician or nurse practitioner to prescribe cannabis for patients pursuant to a medical document.[7-9] The medical document serves the same role as a medical prescription, in that it assigns the use of a drug product (in this case cannabis), in a prescribed amount per day (grams) to a select patient for a specified time frame.[10] However, the medical document's format is devoid strict detail as compared to a prescription for a pharmaceutical drug. The medical practitioner is unable to assign the strengths and composition of cannabinoids, as well as the route, frequency and form of administration of cannabis (Online appendix). The medical document is submitted directly to the licensed producer, who then serves as the dispenser of medical cannabis either to the patient or to the prescriber (who then may re-distribute the product to the patient).[7] Given the open nature of the document, the patient has the opportunity to select the route, composition, frequency and dosage form of cannabis for consumption.

In contrast, a medical prescription for a pharmaceutical product specifies drug product, dose, route, frequency, and duration to be dispensed by a pharmacist with appropriate counselling on safe use and storage (Online appendix). In the absence of pharmacist oversight of medical cannabis, a patchwork system of authorization, counselling and monitoring has taken hold and may be conducted by physicians or nurses, but equally involves other non-healthcare providers that serve as "counselors," involved in the education of patients regarding usage and

therapeutics.[11] The lack of strict oversight by prescribers, piecemeal counselling and education of patients, coupled with open access to product selection, dosage and route of delivery cannabis, has resulted in an increase in medical misadventures and treatment failures.[12-14]

Role of the pharmacist in overseeing medical cannabis

It has been well established elsewhere that the role of pharmacists in medication management results in improved medical outcomes and quality of life for patients over a variety of domains, including increased compliance to therapy, treating the signs and symptoms of disease, disease prevention and cures.[15-19] Given the complexities of medical cannabis, and the potential for harm, it has been put forward that pharmacists should have an increased role in the dispensation and management of medical cannabis use among patients.[20-23] In an effort to promote patient safety and an increase in therapeutic success, a pharmacist led medical cannabis education program was developed in February 2017, at the Michael G. DeGroote Pain Clinic at McMaster University Medical Centre. After the program's introduction, all patients receiving a medical authorization for medical cannabis required mandatory attendance to the group-based education session. To evaluate the impact of the pharmacist-led group-based patient medical education on cannabis on promoting safer and more effective use of medical cannabis, a survey of participants was conducted prior to and after education.

METHODS

Design

A retrospective analysis was performed on quality improvement surveys given to patients that attended cannabis education sessions. The cannabis use survey was administered prior to and after education. The pre cannabis use survey was a self-reported questionnaire designed to obtain demographic information, disability status, comorbid medical conditions, history of misuse of illicit drugs (other than cannabis) or alcohol, perceptions of cannabis use as compared to opioid use and addictive potential as well as potential for harm. The post cannabis use survey consisted of the same questions as the pre survey, with the exception of the omission of questions regarding demographics, medical comorbidities and history of drug/alcohol use.

Data collection

Upon arrival to a medical cannabis education session, participants were provided with a package of documents. The pharmacist conducting the education session described the purpose of the documents in the package, informing participants that completing the survey was optional and that the information gathered was to be used for quality improvement of the education program only. A written statement with the same information was also included on the first page of the cannabis use survey. A reminder to all participants was made verbally to complete the post class survey. All surveys with complete or partially complete information on both pre and post class surveys were entered into REDCap software version 9.1.0 by a pharmacy student.

As per article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans - Version 2, research is exempt from a formal ethics review as it contained non-identifiable information that was originally used for quality improvement as well as program evaluation.[24] Additionally, the Hamilton Institutional Research Ethics Board was consulted and they confirmed that the pre- post-test analysis was exempted from a formal ethics review.

Subjects

Patients were recruited from the Michael G. DeGroote Adult Pain Clinic in Hamilton between November 2018 and July 2019. Inclusion criteria for cannabis education included individuals aged 18 and older who were either naïve (never use) cannabis users, previous but not current cannabis users, as well as current medical and recreational cannabis users. Participants were excluded from group-based cannabis education if they had an identified diagnosis of a psychotic disorder, current use of an illicit substance, not literate in the English language, did not suffer from a chronic pain condition, were discharged from the care of a medical provider or failed to attend a scheduled session on two separate occasions.

Components of the group education

Group education was conducted in person, with a class size of 8-12 patients per session. Instruction time was approximately 100-120 minutes and was carried out by pharmacist with the use of a Microsoft PowerPoint® presentation, as well as handouts of the slide presentation. Patients were permitted to ask questions during and after the session to encourage open participation. Family members were also permitted to attend, in circumstances in which patients were under their care. Table 1 summarizes the content of group education discussed.

Data analysis

All questionnaire data was analyzed using SPSS version 25. Demographic and sample characteristics were reviewed using univariate analyses. Chi-Square tests, where a p-value of less than 0.05 was deemed to be significant, were also employed to determine if the group-based education significantly affected knowledge, perception of efficacy and safety of cannabis.

RESULTS

A total of 260 participants attended education sessions from September 2018-August 2019, with 203 completing surveys. Briefly, individuals who attended class were predominantly disabled or retired, suffered from musculoskeletal or neuropathic pain, and reported a high degree of mental health comorbidities (Table 2). Additionally, a family history of addiction, ADD/ADHD, bipolar or schizophrenia would be a relative contradiction to the use of cannabis and although individuals with these conditions would be less likely to be referred for the education session, a substantial number did report having a family history of one of these conditions (Table 2). Furthermore, despite being an absolute contradiction to referral to the education session, a small group of

Table 1. Education Session Core Components	
Core Component	**Description**
History	• History of ancient use, prohibition and legalization
Mechanism of Action	• A description of the endocannabinoid system in relation to its components, role in chronic illness, and distribution throughout the body
Plant Basics	• Defining basic plant biology and nomenclature (e.g. species, subspecies, strains)
Active Components	• A general description of THC and CBD, their known and potential therapeutic as well as harmful effects
Potential Therapeutic Benefits with Use	• A description of acute and chronic benefits of cannabis use as it pertains to chronic illness, with supporting evidence from literature
Known and Potential Risks with Use	• A description of acute and chronic harms of cannabis use as it pertains to chronic illness, with supporting evidence from literature • Examples of acute effects ○ Euphoria, dysphoria, anxiogenesis, psychosis ○ Bronchitis, COPD exacerbation ○ Appetite changes, Nausea, Vomiting ○ Hyper/hypotension, Tachycardia ○ Cognitive impairment while trying to concentrate or operate machinery • Examples of chronic adverse effects ○ Changes in cognition, memory and motor responsiveness (particularly in younger users) ○ Potential risks of COPD and Lung Cancer with inhalation ○ More severe episodes of mania, depression and cycling in pre-existing patients with bipolar disorder ○ Increased prevalence of developing bipolar disorder or psychotic disorders in younger users with a genetic predisposition to either conditions ○ Addiction to cannabis ○ Risk of worsening depression and anxiety
Dosage Forms	• A description of current forms of licit and regulated medical cannabis products (e.g. dried forms and extracts) • A description of illicit products (e.g. concentrates, edibles and topicals) • A comparison and contrast between the effects of predominantly CBD based formulations, even amounts of CBD and THC formulations, and predominantly THC based formulations
Delivery Methods	• A contrast between inhalational, oral and topical forms of cannabis, with an emphasis of the respiratory effects and acute intoxicating effects of inhalation as compared to oral cannabis use. • A simplified description of the pharmacokinetic differences (onset, duration, distribution and elimination) between inhalation and oral administration of cannabis.
Dosing	• Encouragement on the use of oral delivery methods as opposed to inhalational due to unknown risks with chronic inhalational use on COPD and Cancer • Encouragement on the selection of a predominantly CBD product among naïve users to mitigate the negative psychotropic effects attributable to THC • A start low and go slow emphasis on slow upward titration • A description of a target dose, and advice on what is considered a treatment failure with a particular product, and when to consider modifying product selection
Logistics, Cost, Travel and Possession Limits	• Advice on how to acquire cannabis legitimately through a medical practitioner • Advice on how to manage out of pocket costs associated with purchasing cannabis for medical purposes • Advice on how to navigate travel with cannabis during domestic and international travel
THC – Tetrahydrocannabinol, CBD – Cannabidiol, COPD – Chronic obstructive pulmonary disease	

participants reported current illicit drug use (other than cannabis) (Table 3).

In terms of cannabis use, a majority of individuals referred to the education session were currently using cannabis, reported using at least weekly or daily, and used amounts under 2 g per day by dried weight, or under 3-4 mL by volume if using an extract (Table 4). Participants were also more likely to report not knowing the amount of THC or CBD in the products they used, and sourcing cannabis from illicit sources (e.g. dispensaries, friends, street supply) (Table 4).

After the pharmacist-led education session on the appropriate medical use of cannabis, a significant number of current users reported they would use less cannabis overall, would favor using using either a low or medium THC concentration strength, and either use a medium or

high CBD concentration strength (Table 5). In contrast to product selection, a majority of current users reported they would not change the dosage form or route of administration of cannabis, however a sizeable number indicated they would stop inhaling cannabis and start either oral or topical dosage forms (Table 6).

In contrast to current users, after the session, naïve patient and past cannabis users preferentially indicated they would most likely select a low THC concentration strength product and a high CBD concentration strength product (Table 5). Additionally, in comparison to current users, most naïve and past users reported they would use an oral product and route of administration as opposed to an inhaled product and route of administration.

Current, past and naïve cannabis users were asked to report their opinion on the safety and efficacy of cannabis

Table 2. Participant sample demographics (n=203)	
Characteristic	**n (%)**
Age, Mean (SD)	53.1 years (16.1 years)
Age Range	18-86 years
Sex	
Male	73 (36.5)
Female	127 (63.5)
Employment Status	
Disability	88 (43.3)
Full time	32 (15.8)
Part time	15 (7.4)
Retired	67 (33.0)
Student	5 (2.5)
Unemployed	17 (8.4)
Social assistance	7 (3.4)
Types of Pain	
Abdominal pain	33 (16.3)
Arthritis	87 (42.9)
Back pain	159 (78.3)
CRPS	45 (22.2)
Diabetic neuropathy	16 (7.9)
Facial pain	16 (7.9)
Fibromyalgia	49 (24.1)
Headaches	78 (38.4)
Neck pain	95 (46.8)
Pelvic pain	35 (17.2)
Shoulder pain	97 (47.8)
Other pain	50 (24.6)
Comorbidities	
Acute coronary syndrome	5 (2.5)
ADD/ADHD	7 (3.4)
Anxiety disorder(s)	91 (44.8)
Arrhythmia	15 (7.4)
Bipolar disorder	6 (3.0)
COPD/Asthma	31 (15.3)
Depression	95 (46.8)
Diabetes	35 (17.2)
Dyslipidemia	39 (19.2)
Hypertension	58 (28.6)
PTSD	33 (16.3)
Schizophrenia	0 (0)
Stroke	4 (2)
No comorbidities	24 (11.8)
Family History	
Schizophrenia	8 (3.9)
Bipolar disorder	15 (7.4)
ADD/ADHD	21 (10.3)
Addiction to Alcohol, Street drugs or prescription drugs	35 (17.2)
No family history of these conditions	131 (64.5)
Pharmaceutical Cannabinoid Use	
Nabilone	8 (3.9)
Sativex	0 (0)
ADD – Attention deficit disorder, ADHD – Attention deficit hyperactivity disorder, COPD – Chronic obstructive pulmonary disease, PTSD – Posttraumatic stress disorder	

Table 3. Baseline substance use (n=203)	
Characteristic	**n (%)**
Tobacco	
Non Smoker	143 (70.8)
Smokes one pack per day	53 (26.2)
Smokes more than one pack per day	6 (3.0)
Alcohol – Frequency/week	
Non drinkers	79 (39.5)
1-2 drinks per month	71 (35.5)
1-2 times per week	28 (14.0)
3-4 times per week	15 (7.5)
5-6 times per week	1 (0.5)
Every day	6 (3.0)
Alcohol – Amount/day	
1 drink per day	79 (58.2)
2-3 drinks per day	25 (31.6)
4-6 drinks per day	6 (7.6)
7-9 drinks per day	2 (2.5)
Opioid Use	
Current use	83 (41.9)
Past use	65 (32.8)
Never	50 (25.3)
Other Illicit Drug Use	
Current use	5 (2.5)
Past use	30 (15.2)
Never	162 (82.2)
Cannabis Past Use	
Recreational	86 (42.4)
Medical	68 (33.5)
Current Cannabis Use	
Yes	81 (40.7)
No	118 (59.3)
Never Use Cannabis	75 (36.9)

DISCUSSION

The pharmacist-led cannabis patient education session resulted in some notable changes in potential use patterns among patients referred to the program. A main emphasis of the education program was to promote the use of products with lower percentage strengths of THC, as its relative potency in cannabis is predictor of psychoactivity, impairment, anxiety, psychosis, GI intolerance, tachycardia, hypertension/hypotension, potential for dependence as well as addiction.[25-29] In contrast, the session emphasized the use of greater percentage strengths of CBD, as the potential benefits and safety profile as compared to THC is purported to be much more favorable.[29-36] Among surveyed participants, after receiving formal education by a pharmacist, these objectives were realized among naïve patients in particular, and to a lesser extent among current users (Table 5 & 6).

Other key messages highlighted in the session was the use of oral and topical route of administration as opposed to an inhalational route, as inhaled forms of cannabis, in particular smoked forms, are more likely to result in respiratory complications such as chronic cough, bronchitis, pneumonia and potentially histopathologic changes in lung tissue. [37-40] Naïve patients overwhelmingly supported the notion to use oral and topical dosage forms as their future route of administration while using cannabis (Table 6). Despite receiving education on the risks of smoking and vaping cannabis, approximately one half of current users indicated they would not change this route of administration, with a small number indicating they would begin to use this route of administration (Table 6). As the

when compared to opioids, addiction potential and potential for harm, pre and post education. A statistically significant increase in the opinion that cannabis has the potential for addiction (chi-square=42.6, p<0.0001) and harm (chi-square=34.0, p<0.0001) was noted after receiving education. However, after receiving education, more participants, felt that cannabis may be a safer option (chi-square=53.0, p<0.0001) and more efficacious (chi-square=42.5, p<0.0001) for their chronic pain condition than opioids

Table 4. Cannabis use statistics among current users	
Characteristic	**n (%)**
Frequency per month (n=76)	
Every week	58 (76.3)
1-3 weeks per month	12 (15.7)
Less than once per month	6 (7.9)
Frequency per week (n=77)	
Every day	41 (53.2)
4-6 days per week	12 (15.6)
2-3 days per week	16 (20.8)
1 day per week	8 (10.4)
Type of cannabis used (n=77)	
Dried	52 (75.3)
Oil	36 (46.8)
Topical	9 (11.7)
Rectal	0 (0)
Dried cannabis consumption (n=52)	
<1 g	22 (42.3)
1-2 g	19 (36.5)
3-4 g	5 (9.6)
5-6 g	2 (3.8)
7-8 g	2 (3.8)
9-10 g	1 (1.9)
>10 g	1 (1.9)
Cannabis oil consumption (n=36)	
<1 mL	9 (26.5)
1-2 mL	14 (41.2)
3-4 mL	7 (20.6)
5-6 mL	1 (2.9)
7-8 mL	1 (2.9)
9-10 mL	2 (5.9)
Source of Cannabis (n=77)	
Illicit dispensary	33 (42.9)
Home grown supply	6 (7.8)
Friend	15 (19.5)
Family member	8 (10.4)
Street supply	6 (7.8)
Licensed medical producer	34 (44.2)
THC concentration used (n=70)	
>15%	23 (32.9)
6-14%	8 (11.4)
<5%	13 (18.6)
Unknown	26 (37.1)
CBD concentration used (n=77)	
>10%	24 (31.2)
6-9%	9 (11.7)
<6%	10 (13.0)
Unknown	34 (44.2)
THC – Tetrahydrocannabinol, CBD – Cannabidiol	

pharmacokinetics of inhaled cannabis, as compared to oral and topical routes, has a considerably quicker onset of action as well as shorter duration, it is probable that this route of administration is preferred amongst current users for this rationale for the treatment of pain or other medical conditions.[41-44] It is also possible that as current users may also be using cannabis for recreational purposes, that the subjective levels of euphoria and psychoactivity with THC conferred via the inhalational route is also preferred over the oral route, as such effects are more likely to be pronounced with inhaled dosage forms. In order to promote and influence a change in use characteristics, targeted intervention, such as motivational interviewing and normative feedback might be helpful.[45,46]

Although the cannabis education session's content did not encompass a comparison to opioid therapy for pain management, it is rather remarkable that an overwhelming majority of participants perceived that cannabis was a safer and more efficacious drug treatment option than opioids for pain, prior to and to a greater extent post education (p<0.0001). Opioid use among participants was commonplace, with many either currently taking opioids for chronic pain, or had either failed a trial or discontinued such treatment due to adverse effects (Table 3). Therefore, a perception that cannabis was more efficacious and safer than opioid therapy is possibly the result of previous exposure to opioids with negative outcomes. Among naïve users, past and current users, the current climate surrounding opioids is also expected to have contributed to these findings as well, as the looming opioid crisis in North America has resulted in significant morbidity and mortality, weighing in on the public consciousness as well as impacting the political sphere.[47-50]

In a similar vein, the perception of cannabis as being non-addictive and its potential for harm is overlooked amongst members of the general public. After receiving information in the cannabis education session on the potential for addiction to cannabis and harm from cannabis, a significant number of individuals changed their perception with pharmacist led education, with more participants indicating that cannabis as potentially addictive and harmful. This finding underscores the importance of the influence of the impact of healthcare professionals, in particular pharmacists in providing evidence-based findings to contextualize the potential incidence of harmful effects and addiction, which can be glossed over by unlicensed cannabis counsellors and the lay media.[51]

Although participants were screened by a prescriber prior to referral to the education program for absolute contraindications for cannabis use including a diagnosis of bipolar disorder, as well as problematic alcohol or drug use history, such individuals were referred to the session (Table 2). It is likely that such individuals either may not have disclosed such information, or such information was not obtained from the patient record or by the prescriber upon consultation. As the initial intention of the surveys were meant as a quality improvement initiative, these findings resulted in another role for the pharmacist, in which the program now involves a thorough history taking and screen by a pharmacist prior to referral for education and a cannabis prescription.

With the recent legalization of cannabis at a national level for recreational use in Canada, changes to the medical cannabis program may occur. At the time of this survey, most individuals being referred to this cannabis education session, was just prior to legalization. As observed in several states in the U.S., when both recreational cannabis and medical cannabis are legalized, patients seeking cannabis for medicinal use may find it easier to access cannabis at recreational outlets, thereby reducing the oversight of patient cannabis use by medical professionals.[52,53] Therefore, referrals to our specific cannabis education session may decline over time, and thus the impact of this pharmacist led intervention may decrease. To address this issue, a program that allows open and optional access to cannabis education by pharmacists (e.g. virtual or in person workshops, lectures and e-learning modules) funded by pharmacy chains or advocacy groups, may be able to promote safer and more effective medicinal use of cannabis to those acquiring it from a variety of sources.

Table 5. Session impact on cannabis product use		
Characteristic; n (%)	**Current Users (n=77)**	**Naïve or Past Users (n=102)**
Overall cannabis use		
More use	26 (33.8)	N/A
No change	18 (23.3)	N/A
Less use	29 (37.7)	N/A
THC use		
Use a high THC product (>15%)	12 (15.6)	0 (0)
Use a medium THC product (6-14%)	21 (27.3)	5 (4.9)
Use a low THC product (<6%)	26 (33.8)	58 (56.9)
No change	17 (22.1)	N/A
Not interested in using cannabis	0 (0)	6 (5)
Uncertain	0 (0)	33 (32.4)
CBD use		
Use a high CBD product (>15%)	42 (54.5)	34 (33.3)
Use a medium CBD product (6-14%)	14 (18.2)	11 (10.8)
Use a low CBD product (<6%)	4 (5.2)	18 (17.6)
No change	13 (16.9)	N/A
Not interested in using cannabis	0 (0)	4 (3.9)
Uncertain	0 (0)	35 (34.3)
THC – Tetrahydrocannabinol, CBD – Cannabidiol		

Several limitations were noted in this study. As demonstrated elsewhere in literature, the positive impact of pharmacist led group education allows for safer and more effective use of medications.[54,55] Unlike our study which focused on a single group session, most of these other programs involved multiple sessions or assessed patients several months after intervention.[56-58] As our program only offered one session, and our survey was administered immediately after the group-based intervention, it is likely that patient's opinions may change days to weeks after taking the course, as knowledge gained from a single education session, as compared to multiple sessions, is lost over time, and other influences may have more impact on the selection of cannabis, including cost, product availability, and counselling from others. Therefore, to demonstrate the long-term predicative value of the pharmacist-led cannabis group education session on safer usage among patients, the survey would need to be administered several months after the intervention. In addition to this limitation, participants demonstrated a lack of clarity as to what the concentration strength of THC and CBD was if they grew cannabis at home or obtained it from illicit sources. Therefore, the self-reporting of concentration strength of products would have a large degree of error contained within the survey. Moreover, the common method of estimating daily usage in grams by Health Canada is vague and impractical, as weighing cannabis prior to use is not a standard practice amongst most users that used dried dosage forms. Additionally, for liquid or topical dosage forms, each product produced in milliliters is equivalent to variable amounts of dried cannabis, in grams, which is determined by the manufacturer. Given this complexity, it is unlikely that patients are able to accurately quantify and report daily use of cannabis in grams. Lastly, it should be noted that the survey was not validated, and therefore the reliability of the survey at predicting the past and future cannabis use characteristics of participants may not be accurate.

CONCLUSIONS

The implementation of a mandatory group-based education session led by a pharmacist, resulted in greater reports among participants of choosing lower potency THC formulations, a lower likelihood of using an inhalation route of administration, and significant increases in the perception that cannabis may cause harm or addiction. As cannabis therapy is becoming a mainstream alternative to conventional therapies, it is imperative for pharmacists to become more knowledgeable on the benefits and risks associated with monotherapy and when combined with other drugs and substances. Patient counselling, in the format of group-based education or more commonly one-on-one counselling, can be used as an influential practice to promote safe and appropriate usage of cannabis for therapeutic purposes.

CONFLICT OF INTEREST

None.

FUNDING

None.

Table 6. Post class preference of administration of cannabis by dosage forms or routes					
Route / Dosage Form n (%)	**Current User (n=77)**				**Naïve or Past User (n=102)**
	Start Administration	**Stop Administration**	**No Change to Administration**	**Not Currently Administered**	**Start Administration**
Oral / Edible	20 (25.9)	3 (3.9)	33 (42.9)	15 (19.4)	33 (32.3)
Oral / Pill or Oil	19 (26.4)	0 (0)	34 (44.2)	19 (24.7)	73 (70.9)
Inhalation / Smoke or Vaporize	0 (0)	19 (24.7)	33 (42.9)	14 (18.2)	12 (11.7)
Topical	12 (15.6)	2 (2.6)	14 (18.2)	43 (55.8)	16 (15.9)
Sublingual	16 (20.8)	2 (2.6)	11 (14.3)	39 (50.6)	12 (11.7)
Rectal	1 (1.3)	0 (0)	1 (1.3)	65 (84.4)	0 (0)

References

1. Hill KP, George TP. Cannabis legalisation in Canada: a crucial trial balloon. Lancet Psychiatry. 2019;6(1):5-6. https://doi.org/10.1016/s2215-0366(18)30460-7

2. Cox C. The Canadian Cannabis Act legalizes and regulates recreational cannabis use in 2018. Health Policy. 2018;122(3):205-209. https://doi.org/10.1016/j.healthpol.2018.01.009

3. Statistics Canada. Data on cannabis for medical purposes. Available at: https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/research-data/medical-purpose.html (accessed Jun 2, 2020).

4. Canadian Pharmacists Association. Available at: Pharmacists disappointed with proposed cannabis regulations, concerned with impact to medical cannabis patients. https://www.pharmacists.ca/news-events/news/pharmacists-disappointed-with-proposed-cannabis-regulations-concerned-with-impact-to-medical-cannabis-patients/ (accessed Jun 2, 2020).

5. Minister of Justice. Cannabis Act (S.C. 2018, c. 16). Available at: https://laws-lois.justice.gc.ca/eng/acts/c-24.5/ (accessed Jun 2, 2020).

6. Fearon J. Reasonable Doubt: the history of marijuana law in Canada. Now Magazine. Available at: https://nowtoronto.com/news/history-of-marijuana-law-in-canada-from-opium-dens-to-shoppe/ (accessed Jun 2, 2020).

7. Minister of Justice. Marihuana for medical purposes regulations, SOR/2013-119. Available at: https://laws-lois.justice.gc.ca/eng/regulations/sor-2013-119/20130607/P1TT3xt3.html (accessed Jun 2, 2020).

8. Balneaves LG, Alraja A, Ziemianski D, McCuaig F, Ware M. A National Needs Assessment of Canadian Nurse Practitioners Regarding Cannabis for Therapeutic Purposes. Cannabis Cannabinoid Res. 2018;3(1):66-73. https://doi.org/10.1089/can.2018.0002

9. Minister of Justice. Access to cannabis for medical purposes regulations. Available at: https://laws.justice.gc.ca/eng/regulations/sor-2016-230/20160805/P1TT3xt3.html (accessed Jun 2, 2020).

10. Health Canada. Medical document supporting the use of cannabis for medical purposes under the cannabis regulations. Available at: https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/dhp-mps/alt_formats/pdf/marihuana/info/Medical-Document-EN.pdf (accessed Jun 2, 2020).

11. Lough S. Private cannabis clinics offer clients access. CMAJ. 2015;187(12):865-866. https://doi.org/10.1503/cmaj.109-5119

12. Grewal JK, Loh LC. Health considerations of the legalization of cannabis edibles. CMAJ. 2020;192(1):E1-E2. https://doi.org/10.1503/cmaj.191217

13. Mudan A, DeRoos F, Perrone J. Medical Marijuana Miscalculation. N Engl J Med. 2019;381(11):1086-1087. https://doi.org/10.1056/nejmc1907013

14. Institute of Safe Medical Practices. Labeling problems have led to errors. https://www.ismp.org/news/ismp-warns-medical-marijuana-product-labeling-problems-have-led-errors (accessed Jun 22, 2020).

15. Ward KE, Cohen LB. Promoting Safe Use of Medications: Providing Medication Education to Seniors Receiving Meals on Wheels. Consult Pharm. 2015;30(10):616-622. https://doi.org/10.4140/tcp.n.2015.616

16. El-Ibiary SY, Raney EC, Moos MK. The pharmacist's role in promoting preconception health. J Am Pharm Assoc (2003). 2014;54(5):e288-e303. https://doi.org/10.1331/japha.2014.14536

17. Koren DE, Zuckerman A, Teply R, Nabulsi NA, Lee TA, Martin MT. Expanding Hepatitis C Virus Care and Cure: National Experience Using a Clinical Pharmacist-Driven Model. Open Forum Infect Dis. 2019;6(7):ofz316. https://doi.org/10.1093/ofid/ofz316

18. Hyoguchi N, Kobayashi D, Kubota T, Shimazoe T. Effects on Deaf Patients of Medication Education by Pharmacists. J Deaf Stud Deaf Educ. 2016;21(4):416-421. https://doi.org/10.1093/deafed/enw037

19. Dunn SP, Birtcher KK, Beavers CJ, et al. The role of the clinical pharmacist in the care of patients with cardiovascular disease. J Am Coll Cardiol. 2015;66(19):2129-2139. https://doi.org/10.1016/j.jacc.2015.09.025

20. Dattani S, Mohr H. Pharmacists' role in cannabis dispensing and counselling. Can Pharm J (Ott). 2018;152(1):14-15. https://doi.org/10.1177/1715163518813314

21. Opitz BJ, Ostroff ML, Whitman AC. The Potential Clinical Implications and Importance of Drug Interactions Between Anticancer Agents and Cannabidiol in Patients With Cancer. J Pharm Pract. 2020;33(4):506-512. https://doi.org/10.1177/0897190019828920

22. Seamon MJ, Fass JA, Maniscalco-Feichtl M, Abu-Shraie NA. Medical marijuana and the developing role of the pharmacist. Am J Health Syst Pharm. 2007;64(10):1037-1044. https://doi.org/10.2146/ajhp060471

23. Parmar JR, Forrest BD, Freeman RA. Medical marijuana patient counseling points for health care professionals based on trends in the medical uses, efficacy, and adverse effects of cannabis-based pharmaceutical drugs. Res Social Adm Pharm. 2016;12(4):638-654. https://doi.org/10.1016/j.sapharm.2015.09.002

24. Canadian Institutes of Health Research; Natural Sciences and Engineering Research Council of Canada; Social Sciences and Humanities Research Council. Tri-council policy statement: ethical conduct for research involving humans. Available at: https://ethics.gc.ca/eng/policy-politique_tcps2-eptc2_2018.html (accessed May 11, 2020).

25. Ravi D, Ghasemiesfe M, Korenstein D, Cascino T, Keyhani S. Associations Between Marijuana Use and Cardiovascular Risk Factors and Outcomes: A Systematic Review. Ann Intern Med. 2018;168(3):187-194. https://doi.org/10.7326/m17-1548

26. Richards JR. Cannabinoid Hyperemesis Syndrome: Pathophysiology and Treatment in the Emergency Department. J Emerg Med. 2018;54(3):354-363. https://doi.org/10.1016/j.jemermed.2017.12.010

27. Zehra A, Burns J, Liu CK, Manza P, Wiers CE, Volkow ND, Wang GJ. Cannabis Addiction and the Brain: a Review. J Neuroimmune Pharmacol. 2018;13(4):438-452. https://doi.org/10.1007/s11481-018-9782-9

28. Hines LA, Freeman TP, Gage SH, Zammit S, Hickman M, Cannon M, Munafo M, MacLeod J, Heron J. Association of High-Potency Cannabis Use With Mental Health and Substance Use in Adolescence. JAMA Psychiatry. 2020;77(10):1044-1051. https://doi.org/10.1001/jamapsychiatry.2020.1035

29. Bhattacharyya S, Morrison PD, Fusar-Poli P, Martin-Santos R, Borgwardt S, Winton-Brown T, Nosarti C, O' Carroll CM, Seal M, Allen P, Mehta MA, Stone JM, Tunstall N, Giampietro V, Kapur S, Murray RM, Zuardi AW, Crippa JA, Atakan Z, McGuire PK. Opposite effects of delta-9-tetrahydrocannabinol and cannabidiol on human brain function and psychopathology. Neuropsychopharmacology. 2010;35(3):764-774. https://doi.org/10.1038/npp.2009.184

30. Carlini EA, Cunha JM. Hypnotic and antiepileptic effects of cannabidiol. J Clin Pharmacol. 1981;21(S1):417S-427S. https://doi.org/10.1002/j.1552-4604.1981.tb02622.x

31. Broyd SJ, van Hell HH, Beale C, Yücel M, Solowij N. Acute and Chronic Effects of Cannabinoids on Human Cognition-A Systematic Review. Biol Psychiatry. 2016;79(7):557-567. https://doi.org/10.1016/j.biopsych.2015.12.002

32. Russo EB. Taming THC: potential cannabis synergy and phytocannabinoid-terpenoid entourage effects. Br J Pharmacol. 2011;163(7):1344-1364. https://doi.org/10.1111/j.1476-5381.2011.01238.x

33. Crippa JA, Derenusson GN, Ferrari TB, Wichert-Ana L, Duran FL, Martin-Santos R, Simões MV, Bhattacharyya S, Fusar-Poli P, Atakan Z, Santos Filho A, Freitas-Ferrari MC, McGuire PK, Zuardi AW, Busatto GF, Hallak JE. Neural basis of anxiolytic effects of cannabidiol (CBD) in generalized social anxiety disorder: a preliminary report. J Psychopharmacol. 2011;25(1):121-130. https://doi.org/10.1177/0269881110379283

34. Naftali T, Mechulam R, Marii A, Gabay G, Stein A, Bronshtain M, Laish I, Benjaminov F, Konikoff FM. Low-Dose Cannabidiol Is Safe but Not Effective in the Treatment for Crohn's Disease, a Randomized Controlled Trial. Dig Dis Sci. 2017;62(6):1615-1620. https://doi.org/10.1007/s10620-017-4540-z

35. Zuardi AW, Crippa JA, Hallak JE, et al. Cannabidiol for the treatment of psychosis in Parkinson's disease. J Psychopharmacol. 2009;23(8):979-983. https://doi.org/10.1177/0269881108096519

36. Russo EB. Cannabidiol Claims and Misconceptions [published correction appears in Trends Pharmacol Sci. 2017 May;38(5):499]. Trends Pharmacol Sci. 2017;38(3):198-201. https://doi.org/10.1016/j.tips.2016.12.004

37. Wu TC, Tashkin DP, Djahed B, Rose JE. Pulmonary hazards of smoking marijuana as compared with tobacco. N Engl J Med. 1988;318(6):347-351. https://doi.org/10.1056/nejm198802113180603

38. Joshi M, Joshi A, Bartter T. Marijuana and lung diseases. Curr Opin Pulm Med. 2014;20(2):173-179. https://doi.org/10.1097/mcp.0000000000000026

39. Kempker JA, Honig EG, Martin GS. The effects of marijuana exposure on expiratory airflow. A study of adults who participated in the U.S. National Health and Nutrition Examination Study. Ann Am Thorac Soc. 2015;12(2):135-141. https://doi.org/10.1513/annalsats.201407-333oc

40. Zhang LR, Morgenstern H, Greenland S, Chang SC, Lazarus P, Teare MD, Woll PJ, Orlow I, Cox B; Cannabis and Respiratory Disease Research Group of New Zealand, Brhane Y, Liu G, Hung RJ. Cannabis smoking and lung cancer risk: Pooled analysis in the International Lung Cancer Consortium. Int J Cancer. 2015;136(4):894-903. https://doi.org/10.1002/ijc.29036

41. Grotenhermen F. Pharmacokinetics and pharmacodynamics of cannabinoids. Clin Pharmacokinet. 2003;42(4):327-360. https://doi.org/10.2165/00003088-200342040-00003

42. Hunault CC, van Eijkeren JC, Mensinga TT, de Vries I, Leenders ME, Meulenbelt J. Disposition of smoked cannabis with high Δ(9)-tetrahydrocannabinol content: a kinetic model. Toxicol Appl Pharmacol. 2010;246(3):148-153. https://doi.org/10.1016/j.taap.2010.04.019

43. Vandrey R, Herrmann ES, Mitchell JM, Bigelow GE, Flegel R, LoDico C, Cone EJ. Pharmacokinetic Profile of Oral Cannabis in Humans: Blood and Oral Fluid Disposition and Relation to Pharmacodynamic Outcomes. J Anal Toxicol. 2017;41(2):83-99. https://doi.org/10.1093/jat/bkx012

44. Hartman RL, Brown TL, Milavetz G, Spurgin A, Gorelick DA, Gaffney G, Huestis MA. Controlled Cannabis Vaporizer Administration: Blood and Plasma Cannabinoids with and without Alcohol. Clin Chem. 2015;61(6):850-869. https://doi.org/10.1373/clinchem.2015.238287

45. Heckman CJ, Egleston BL, Hofmann MT. Efficacy of motivational interviewing for smoking cessation: a systematic review and meta-analysis. Tob Control. 2010;19(5):410-416. https://doi.org/10.1136/tc.2009.033175

46. Blevins CE, Walker DD, Stephens RS, Banes KE, Roffman RA. Changing social norms: The impact of normative feedback included in motivational enhancement therapy on cannabis outcomes among heavy-using adolescents. Addict Behav. 2018;76:270-274. https://doi.org/10.1016/j.addbeh.2017.08.030

47. Kolodny A, Courtwright DT, Hwang CS, Kreiner P, Eadie JL, Clark TW, Alexander GC.The prescription opioid and heroin crisis: a public health approach to an epidemic of addiction. Annu Rev Public Health. 2015;36:559-574. https://doi.org/10.1146/annurev-publhealth-031914-122957

48. Lucas P. Rationale for cannabis-based interventions in the opioid overdose crisis. Harm Reduct J. 2017;14(1):58. https://doi.org/10.1186/s12954-017-0183-9

49. Vyas MB, LeBaron VT, Gilson AM. The use of cannabis in response to the opioid crisis: A review of the literature. Nurs Outlook. 2018;66(1):56-65. https://doi.org/10.1016/j.outlook.2017.08.012

50. Piper BJ, DeKeuster RM, Beals ML, Cobb CM, Burchman CA, Perkinson L, Lynn ST, Nichols SD, Abess AT. Substitution of medical cannabis for pharmaceutical agents for pain, anxiety, and sleep. J Psychopharmacol. 2017;31(5):569-575. https://doi.org/10.1177/0269881117699616

51. Fitzcharles MA, Shir Y, Häuser W. Medical cannabis: strengthening evidence in the face of hype and public pressure. CMAJ. 2019;191(33):E907-E908. https://doi.org/10.1503/cmaj.190509

52. Zvonarev V, Fatuki TA, Tregubenko P. The Public Health Concerns of Marijuana Legalization: An Overview of Current Trends. Cureus. 2019;11(9):e5806. https://doi.org/10.7759/cureus.5806

53. Hawley P, Gobbo M, Afghari N. The impact of legalization of access to recreational Cannabis on Canadian medical users with Cancer. BMC Health Serv Res. 2020;20(1):977. https://doi.org/10.1186/s12913-020-05756-8

54. Walus AN, Woloschuk DMM. Impact of Pharmacists in a Community-Based Home Care Service: A Pilot Program. Can J Hosp Pharm. 2017;70(6):435-442. https://doi.org/10.4212/cjhp.v70i6.1718

55. Goldstone LW, Saldaña SN, Werremeyer A. Pharmacist provision of patient medication education groups. Am J Health Syst Pharm. 2015;72(6):487-492. https://doi.org/10.2146/ajhp140182

56. Kritikos V, Armour CL, Bosnic-Anticevich SZ. Interactive small-group asthma education in the community pharmacy setting: a pilot study. J Asthma. 2007;44(1):57-64. https://doi.org/10.1080/02770900601125755

57. Sarkadi A, Rosenqvist U. Experience-based group education in Type 2 diabetes: a randomised controlled trial. Patient Educ Couns. 2004;53(3):291-298. https://doi.org/10.1016/j.pec.2003.10.009

58. Sarkadi A, Vég A, Rosenqvist U. The influence of participant's self-perceived role on metabolic outcomes in a diabetes group education program. Patient Educ Couns. 2005;58(2):137-145. https://doi.org/10.1016/j.pec.2004.08.002