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Cannabis is a new and novel subject in pharmacy schools. This research was pursued to evaluate the opinions among pharmacy degree candidates regarding the controversy around legalization, regulation and the impact of cannabis on individual pharmacists' practice and patient-related therapeutic outcomes.

Le cannabis est un sujet nouveau et novateur dans les écoles de pharmacie. Cette recherche a été menée afin d'évaluer les opinions des candidats au diplôme en pharmacie concernant la controverse autour de la légalisation, de la réglementation et de l'impact du cannabis sur la pratique individuelle des pharmaciens et les résultats thérapeutiques liés aux patients.

Assessing the impact of a cannabis course on pharmacy students' understanding, beliefs and preparedness regarding medical and recreational cannabis

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ABSTRACT



Background: With the legalization of cannabis in Canada in 2018, pharmacists are increasingly likely to encounter patients using this substance. The primary objective of this pre-post questionnaire study was to evaluate the impact of an accredited cannabis course on the understanding, beliefs, perceptions and knowledge of undergraduate PharmD students.

Methods: A 38-question, web-based survey generated in REDCap was administered to third-year PharmD students at the University of Waterloo, prior to and right after taking an accredited cannabis course. The pre- and postsurvey data were analyzed using SPSS version 25. Pearson chi-square tests were performed on questions in which answers consisted of qualitative categorical

data. Two-sided *t* tests were performed to test the significance of mean differences of questions measuring continuous variables.

Results: In a class of 120 students, 110 completed the presurvey and 79 students completed the postsurvey. After the course, students were more likely to report being knowledgeable and prepared for patient encounters dealing with medical and recreational cannabis, understanding that medical cannabis should be prescribed for select (vs all) medical conditions, rating the quality of evidence as poor to moderate for medical use of cannabis, understanding that medical documents should be more prescriptive and understanding that cannabis should not be sold in pharmacies ($p < 0.05$).

Interpretation: With cannabis education a part of their curriculum, pharmacy students felt more prepared to engage patients using cannabis both medically and recreationally. Furthermore, students were more cautious regarding the potential use of cannabis therapeutically and indicated that more oversight should be in place. *Can Pharm J (Ott)* 2022;155:50-59.

KNOWLEDGE INTO PRACTICE



- Prior to and after legalization, pharmacists have had increased patient encounters involving medical and recreational cannabis use and have been called upon to provide treatment and recommendations to patients.
- To ensure optimal patient outcomes with cannabis use, pharmacists and pharmacy learners have been mandated in Ontario to undertake accredited pharmacy education to be knowledgeable on cannabis as a recreational and medical product.
- Accredited undergraduate pharmacy education on cannabis was able to reduce a positive bias among pharmacy students on the therapeutic value and safety potential of cannabis as a medical and recreational product when used in patients.
- Research regarding the benefits and harms of cannabis continues, and as this evolves, education and the role of the pharmacist may change so as to ensure optimal patient care.

Introduction

Cannabis is a plant in the Cannabaceae family that has a long history of cultivation in Asia and Europe, extending back several thousand years.^{1,2} In the early 21st century, attitudes towards cannabis have changed and a reversal in policies has taken place.³ In North America, general views among the public hold that as a recreational substance, cannabis is a milder drug compared to other illicit substances, with approximately 45% of North Americans having tried the substance in their lifetime and approximately 10% to 15% using it within the past 1 to 3 months.⁴⁻⁶ In a medical context, cannabis is being explored for its potential benefit in such conditions as chronic pain, anxiety disorders, posttraumatic stress disorder, epilepsy and many other intractable conditions in which other therapies either have failed or are not tolerated.⁷⁻¹²

In 2018, Canada became the second country in the world to legalize cannabis—a process that has evolved over the past 2 decades.¹³ The first set of medical cannabis regulations was enacted in 2001, allowing patients endorsed by a specialist physician to grow cannabis for medical purposes, for personal use.¹⁴⁻¹⁶ These regulations were refined in 2006 to limit production of cannabis away from individuals to a sole government supplier.¹⁶ In 2013, sole-source government production was abolished and replaced with government-regulated private growers, referred to as Licensed Producers (LPs), to distribute cannabis directly to patients pursuant to a medical authorization.^{14,15,17} Under this revised system, patients could receive an authorization from any physician, not just a specialist, and for any medical condition.^{14,17} Last, in 2016, further relaxing of regulation took place to accommodate both purchasing

MISE EN PRATIQUE DES CONNAISSANCES



- Avant et après la légalisation, les pharmaciens ont rencontré de plus en plus de patients qui consommaient du cannabis à des fins médicales et récréatives, et ont été appelés à fournir des traitements et des recommandations à ces patients.
- Afin d'assurer des résultats optimaux pour les patients qui consomment du cannabis, les pharmaciens et les apprenants en pharmacie ont été mandatés en Ontario pour suivre une formation accréditée pour les pharmaciens afin d'acquérir des connaissances sur le cannabis en tant que produit récréatif et médical.
- La formation accréditée de premier cycle pour les pharmaciens sur le cannabis a permis de réduire un biais positif chez les étudiants en pharmacie sur la valeur thérapeutique et le potentiel de sécurité du cannabis en tant que produit médical et récréatif lorsqu'il est utilisé chez les patients.
- La recherche sur les avantages et les inconvénients de l'utilisation du cannabis se poursuit et, à mesure qu'elle progresse, l'éducation et le rôle du pharmacien pourraient changer afin d'assurer la prestation de soins optimaux pour les patients.

cannabis from an LP or growth of up to 4 cannabis plants for medical purposes.^{14,15,18,19} As a result of these modifications in the regulations to cannabis in 2013 and 2016, medical cannabis authorizations increased almost 50-fold, from 7914 in early 2014 to 369,614 by the last quarter of 2019.^{20,21}

In Canada, as of October 2018, individuals can acquire cannabis from LPs at recreational outlets, which consist of stores or online distributors, in addition to cultivating cannabis themselves for personal recreational use.^{22,23} At the time of legalization, dosage forms were limited to dried bud and oil-based extracts. In October 2019, final regulations were implemented to allow the sale and distribution of edibles, topicals, vape cartridges and concentrates.²⁴

Despite its use and growing acceptance over the past 20 years in Canada, the pharmacy profession has largely been left out of each set of regulations and laws.²⁵ Under the law, distribution of medical cannabis can only occur directly from the LP to the patient or from an LP to an intermediary prescriber-run clinic and then to the patient.²⁶ The LP or prescriber-run clinic typically employs counsellors, many of whom are non-health care professionals, who provide administration instructions and patient counselling on how to select the appropriate strain, strength and dosage form.²⁷

With destigmatization and the prevalence of cannabis use among the general public, pharmacists are more likely to

TABLE 1 Undergraduate pharmacy student curriculum on cannabis

Topic	Description
History and epidemiology	<ul style="list-style-type: none"> • A summary of the historical use of cannabis as a recreational and medicinal product prior to the 21st century • A discussion of the prevalence of medical and recreational use in Canada
Cannabis regulation	<ul style="list-style-type: none"> • An outline of the federal and provincial regulatory frameworks for medical and recreational cannabis
Pharmacology	<ul style="list-style-type: none"> • Identification of the main active compounds in cannabis (e.g., CBD and THC) and pharmacological activity of each compound
Pharmacokinetics	<ul style="list-style-type: none"> • Explanation of the absorption, distribution, metabolism and elimination of CBD and THC
Reasons for use	<ul style="list-style-type: none"> • Potential recreational and therapeutic roles of cannabis, including scientific evidence for use therapeutic use
Ethics and professionalism	<ul style="list-style-type: none"> • Application of the 4 ethical principles: beneficence, nonmaleficence, respect for persons and fidelity in relation to patients using cannabis
Plants, extracts and concentrates	<ul style="list-style-type: none"> • Identification of plant-based characteristics that may influence therapeutic effects • Comparison and contrast of various products derived from cannabis • A description of the issues pertaining to purity and product standardization
Routes of administration	<ul style="list-style-type: none"> • Identification of the various routes of administration and devices used to deliver cannabis products
Adverse effects	<ul style="list-style-type: none"> • A summary of the adverse effects associated with active compounds (e.g., THC, CBD), cumulative exposure to these compounds (e.g., acute vs chronic) and prevalence by route of administration
Drug interactions	<ul style="list-style-type: none"> • A description of the influence of THC and CBD on cytochrome P450 enzymes, as well as theoretical drug-drug and drug-food interactions
Special populations	<ul style="list-style-type: none"> • An analysis of the potential risks associated with use in children, adolescents, the elderly and pregnant individuals
Substance use disorder	<ul style="list-style-type: none"> • A definition of cannabis use disorder and a description of the management of the condition • A comparison of dependence vs addiction with cannabis
Prevention and harm reduction	<ul style="list-style-type: none"> • An explanation of safer use of cannabis (e.g., CBD, topical or oral routes vs inhalational) for medical or recreational purposes

CBD, cannabidiol; THC, tetrahydrocannabinol.

encounter patients who use this substance for both medical and recreational purposes.²⁸ Although cannabis has fallen out of the purview of the pharmacy profession in Canada in terms of distribution, colleges and regulatory bodies have encouraged competency with this substance for both medical and recreational use. The Ontario College of Pharmacists mandated that by February 2020, all registered pharmacists were required to have received certification for taking an accredited cannabis education course.²⁸ As a result, several accredited cannabis continuing education (CE) programs became available in Ontario. At the University of Waterloo School of Pharmacy (UW Pharmacy), an accredited program was embedded within the undergraduate curriculum (Table 1).

In an effort to identify the attitudes, knowledge and perception of cannabis as a medicine and recreational product, as well as whether regulatory changes should be made to promote safer distribution and a role for pharmacy, a web-based survey was completed by third-year UW Pharmacy students before and after completing an accredited cannabis module, embedded within a mental health and addictions course.

Methods

A web-based survey was developed by research and academic pharmacists at McMaster University and the University of Waterloo, School of Pharmacy, consisting of 38 questions. The survey was structured into 4 domains, including questions

regarding participant demographics, medical cannabis, recreational cannabis and knowledge-based questions. The survey included a variety of question formats, including 13 Likert-scale questions and 6 numeric rating scale questions to assess attitudes and perception of cannabis, in addition to 4 multiple-choice questions to assess cannabis knowledge. The survey was generated in REDCap v9.1.0, and a survey link was sent to 120 third-year pharmacy students several weeks prior to taking the cannabis course in November 2019. Several weeks after the course was completed, a follow-up survey link populated with the same questions was sent to students, closing in the last week of December 2019. To increase response rate, students were eligible to receive 1 of 10 gift cards (worth \$10) if they had completed the pre- and postcourse surveys.

After contacting the Hamilton Institutional Research Ethics Board, the pre-post test study and analysis was exempted from a formal ethics review as it contained nonidentifiable information that was originally used for quality improvement as well as program evaluation, as per article 2.5 of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans—Version 2.²⁹

Data analysis

The pre- and postsurvey data were analyzed using SPSS version 25 (SPSS, Inc., Chicago, IL, USA). Pearson chi-square tests were performed on questions in which answers consisted of qualitative categorical data. Two-sided *t* tests were performed to test the significance of mean differences of questions measuring continuous variables.

Results

Demographics

Out of the total class of 120 third-year PharmD students, 110 students completed the survey prior to course delivery and 79 afterwards. The respondents of the initial survey were predominantly female (68.2%), and all were between the ages of 20 and 29 years. When asked what source of cannabis education the class had obtained their information from prior to taking the accredited cannabis course, most indicated they received education from non-industry-sponsored sources (45.5%), a friend or family (39.1%), the lay media (36.4%) and/or a student colleague (31.8%), with a lower percentage of respondents indicating they obtained information from an industry-sponsored educational event (21.8%), the peer-reviewed literature (20.9%) or no information from another source (10.9%).

Medical cannabis

The first series of questions pertained to medical cannabis (Table 2). After receiving formal education on medical cannabis, students were significantly more likely to indicate that they felt “somewhat” or “very” prepared to care for patients using medical cannabis and felt that they had “some” or “adequate”

knowledge of medical cannabis. With regards to evidence, after taking the course, more students believed that the quality of evidence for medical cannabis was of poor quality and indicated that medical cannabis should only be authorized for select medical conditions (as opposed to any medical condition). After the course, students were also more likely to indicate that medical cannabis is only safe and effective for “select” patients/cases and that the current medical document should be more prescriptive (Table 2).

Recreational cannabis

A similar set of questions pertaining to recreational cannabis was given to students before and after course completion. After the course, students were significantly more likely to indicate that recreational cannabis should have been legalized for recreational use, felt more prepared when caring for patients using recreational cannabis and believed that recreational cannabis should not be sold in pharmacies and the age limit for recreational cannabis should be age 25 (from all other age limits) (Table 3). Students also reported having more knowledge of recreational cannabis after taking the course, but this result did not reach statistical significance ($p = 0.222$).

Knowledge questions

Students were asked a series of 4 knowledge questions before and after the course. Students were more likely to select the correct response after the cannabis course, but these differences were not statistically significant (Appendix 1, available online at www.cpjjournal.ca), as many of the participants selected the correct response prior to taking the course, with more selecting the correct response afterwards.

Numeric rating scale questions

In addition to the categorical questions surveyed among students, a series of 6 questions designed to assess responses along a continuous range were asked of students before and after course completion. After course completion, students were significantly more likely to report being more familiar with cannabis laws, being comfortable in their competency level regarding cannabis therapy and having concerns with the psychoactive effects of cannabis use (Appendix 2, available online). A small nonsignificant change in the mean response, with respect to questions regarding concerns about the quality of medical cannabis products and limited evidence supporting the use of medical cannabis, was observed. Last, when asked about having any safety concerns with medical or recreational cannabis use, no change was observed in the mean response prior to and after taking the course ($p = 1$).

Discussion

Given the rise of both medical and recreational use of cannabis among the general public, this study’s findings highlight the importance of including cannabis education in pharmacy

TABLE 2 Attitudes and beliefs of pharmacy students on medical cannabis, pre- and postcurriculum

Question	Answer options						Chi-square test (<i>p</i> -value)
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
What is your opinion regarding the legality of cannabis for medical use?	Should be legal for <i>all</i> medical conditions		Should be legal for <i>select</i> medical conditions		Should <i>not</i> be legal for medical use		$\chi^2(4, N = 79) = 17.497, p = 0.002$
	40.5	27.8	58.2	70.9	1.3	1.3	
How prepared do you feel when caring for patients who are using cannabis for medical purposes?	Very prepared		Somewhat prepared		Do not feel prepared		$\chi^2(4, N = 79) = 10.755, p = 0.029$
	2.5	19.0	35.4	75.9	62.0	5.1	
Do you feel you have the adequate knowledge to care for patients who use cannabis medically?	Appropriate amount of knowledge		Some knowledge		Require more knowledge		$\chi^2(4, N = 79) = 14.567, p = 0.006$
	2.5	38.0	30.4	54.4	67.1	7.6	
What quality of evidence do you believe supports the use of cannabis for medical purposes?	Good quality		Moderate quality		Poor quality		$\chi^2(4, N = 79) = 23.665, p < 0.001$
	6.3	3.8	55.7	39.2	38.0	57.0	
What is your opinion on the safety of medical cannabis use?	Safe for a <i>majority</i> of conditions and/or cases		Safe for <i>select</i> conditions and/or cases		Cannabis is <i>not safe</i> for any condition and/or case		$\chi^2(4, N = 78) = 57.765, p < 0.001$
	11.5	7.7	85.9	91	2.6	1.3	

(continued)

TABLE 2 (continued)

Question	Answer options						Chi-square test (p-value)
What is your opinion on the efficacy of medical cannabis?	Efficacious for a majority of conditions and/or cases		Efficacious for <i>select</i> conditions and/or cases		Cannabis is <i>not</i> effective for any condition and/or case		
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
	6.4	2.6	89.7	93.6	3.8	3.8	$\chi^2(4, N = 78) = 39.752, p < 0.001$
What is your opinion of the medical authorization document regarding cannabis?	It should be more prescriptive		No changes should be made		It should be less prescriptive		
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
	83.3	88.5	16.7	11.5	0	0	$\chi^2(1, N = 78) = 5.652, p = 0.017$

school curricula, as most students lack knowledge, preparation and confidence in this domain. Prior to the cannabis course, most students reported “not feeling prepared” and “requiring more knowledge” to deal with patients using medical or recreational cannabis. After course completion, the majority of respondents perceived themselves as being “somewhat prepared” and having “some knowledge” with respect to both medical and recreational cannabis, with a substantial minority indicating they felt “very prepared” and having the “appropriate amount of knowledge.”

An important trend captured in this survey is the increased reporting of students noting that evidence supporting cannabis for medical use is of “poor quality,” after course completion, as opposed to “moderate quality,” as seen precourse. Anecdotal evidence, lay media speculation of cannabis’ therapeutic potential and a push by cannabis producers and dedicated cannabis prescribers to promote cannabis as a medical alternative largely obscure the lack of research of cannabis for a variety of medical conditions or the poor quality of evidence supporting the use of cannabis for medical purposes.³⁰ With this change in knowledge about the quality of evidence surrounding medical cannabis, students are more informed to make appropriate clinical decisions in their practice regarding whether a trial with medical cannabis may result in efficacy. This is supported by the fact that students were also more likely to indicate that medical cannabis may be safe and effective for “select” as opposed to a “majority” of conditions and/or cases.

Medical cannabis has been permitted for over 2 decades in Canada, and in October 2018, recreational use was approved.

At the onset of licit medical authorization, cannabis was limited for use for select medical conditions and could only be prescribed by certain physician specialists. Eventually, this limitation was abolished in 2014 and 2016, expanding the use of cannabis for authorization by any physician or nurse practitioner for any medical indication. Despite this framework being in place for several years, a significantly larger majority of students indicated that medical cannabis should be legal for “select” as opposed to “all” medical conditions prior to taking the cannabis course. After the course, students shifted their opinion, with a greater majority indicating that medical cannabis be permitted only for “select” conditions. This divergent opinion among students from current medical cannabis laws underscores the pharmacist’s role in adhering to the principles of selecting a drug therapy that has evidence and/or an approved indication. Furthermore, with the knowledge that the evidence supporting medical cannabis is of poorer quality, it is likely that students felt that a more conservative approach and recommending cannabis use for select conditions and cases would be more therapeutically appropriate.

The current medical authorization document (commonly referred to as a prescription by patients, although not legally one) lacks the typical details present on a prescription for a pharmaceutical prescription drug. On a medical document, a prescriber indicates the name of the patient, amount of cannabis permitted per day in grams and the specified length of time the document is valid (to a maximum of 12 months). By law, the prescriber does not have to indicate the route, strengths of ingredients in cannabis, dosage form and frequency of use.

TABLE 3 Attitudes and beliefs of pharmacy students on recreational cannabis, pre- and postcurriculum

Question	Answer options						Chi-square test (<i>p</i> -value)
	Should be legal		Should <i>not</i> be legal				
What is your opinion regarding the legality of cannabis for recreational use?	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	$\chi^2(1, N = 77) = 44.607, p < 0.001$
	67.5	75.3	32.5	24.7			
How prepared do you feel when caring for patients who are using cannabis for recreational purposes?	Very prepared		Somewhat prepared		Do not feel prepared		
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
	3.9	18.2	42.9	72.7	53.2	9.1	$\chi^2(4, N = 77) = 11.874, p = 0.018$
Do you feel you have the adequate knowledge to care for patients who use cannabis recreationally?	Appropriate amount of knowledge		Some knowledge		Require more knowledge		
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
	6.8	33.8	33.8	58.1	59.5	8.1	$\chi^2(4, N = 74) = 5.708, p = 0.222$
What is your opinion on the safety of recreational cannabis use?	Safe generally at many doses and/or in much of the population		Safe for select individuals and/or at certain doses		Cannabis is not safe for any person and/or at any dose		
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
	9.2	5.3	80.3	82.9	10.5	11.8	$\chi^2(4, N = 76) = 55.599, p < 0.001$
Should recreational cannabis be sold in pharmacies?	Yes, it should be sold in pharmacies only			No, it should not be sold in pharmacies			

(continued)

TABLE 3 (continued)

Question	Answer options								Chi-square test (<i>p</i> -value)
	Before (%)		After (%)		Before (%)		After (%)		
	44.7		31.6		55.3		68.4		$\chi^2(1, N = 76)$ = 16.819, <i>p</i> < 0.001
What age limit should recreational be legal for use?	18 years		19 years		25 years		>25 years of age		
	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	Before (%)	After (%)	
	22.1	19.5	22.1	28.6	49.4	48.1	6.5	3.9	$\chi^2(9, N = 77)$ = 24.53, <i>p</i> = 0.004

Select LPs may accept restrictions on strengths of ingredients but are not mandated to adhere to such restrictions. Interestingly, prior to the survey, most students indicated that the medical document should be more prescriptive, and an even larger number indicated this opinion after the course. The reason why many students prior to and after the course were likely to state that medical cannabis documents should be more prescriptive may stem from encountering patients in externships and media, as well as speaking with friends and family about struggles to find the right dose and form of cannabis to take, with potential errors and harms occurring.

In regards to recreational cannabis, interestingly, students were significantly more likely to support legalization after taking the course. The rationale cited in favour of legalization by advocates and the government was in large part inspired by common use among the public, relatively lower harms as compared to other illicit substances, role of government regulation in curbing more harmful forms of cannabis and criminal activity and the burden of policing illicit cannabis production and possession on the public and justice system.^{31,32}

In Uruguay, both recreational and medical cannabis are sold in pharmacies.³³ A significant shift among students in the postcourse survey indicated they would not be in favour of this. The strong opinions against selling recreational cannabis at a pharmacy can be explained in part by the role of the pharmacy in Canada as a place for the medical provision of drugs and substances, with recreational substances such as tobacco being removed decades ago.³⁴ Furthermore, there is likely a fear of the pharmacy becoming less associated with therapeutics if recreational cannabis were to be sold there, with a decrease in the professional atmosphere in the pharmacy and

fear of negative impacts on patient experience and pharmacy staff productivity. The opinion held by a majority of students is in contrast to several major pharmacy chains and pharmacy advocacy groups, which are advocating for the right for pharmacies to sell medical cannabis (though not recreational).³⁵

There were several limitations of this survey. The dropout rate was moderate, with approximately one-third of students failing to complete the postsurvey. Although demographics of students were not collected upon completing the follow-up survey, as the sampled group is largely homogeneous in terms of age and profession, the significance of these dropouts is likely to have had a lesser impact on the results had the sample group been diverse in terms of age, profession and experience. It is also possible that students who did not like the course were less likely to complete the post-course survey, which may have affected our interpretation of the results. In addition, the length of the survey may have been too long for students to have completed, as the 6 numeric rating scale questions towards the end of the survey were all clustered around an average score of 7, which would suggest that students may not have read the questions at the end of the survey completely and perhaps completed it in a rushed manner. Therefore, the results obtained in these last questions are less likely to be representative of the actual opinions of surveyed students. Last, as the questionnaire was not validated, the findings may not reliably predict the attitudes, beliefs and knowledge regarding cannabis use among these sampled pharmacy students.

Conclusion

The inclusion of cannabis education in pharmacy school curricula resulted in increased confidence and knowledge among

students to handle scenarios that they will likely be faced with, given the high prevalence of cannabis use among the public for both recreational and medical purposes. Pharmacy students were more likely to be cautious regarding the therapeutic indications for which cannabis could be used medically, more aware of the limitations regarding the evidence for use and more likely to support more prescriptive practices among clinicians for cannabis. In regards to recreational cannabis,

pharmacy students gained more insight and confidence with various forms that are used but indicated they would not be in favour of it being distributed through pharmacies.

As the landscape of cannabis further evolves in Canada, the role of undergraduate pharmacy education, as well as continuing education programs for active pharmacists, will remain a cornerstone in providing pharmacists the knowledge and skill-set to provide optimal patient care. ■

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