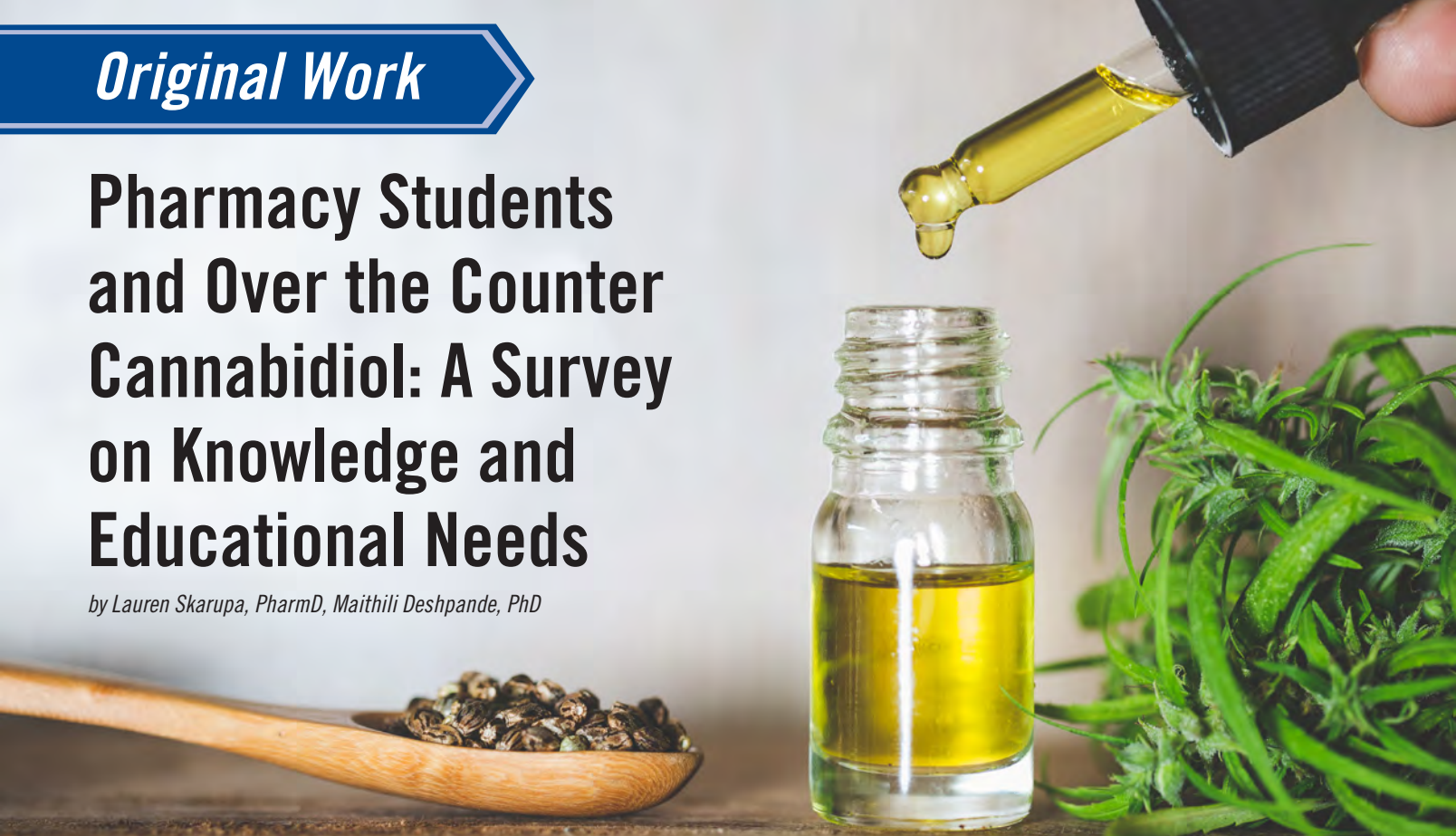


Pharmacy Students and Over the Counter Cannabidiol: A Survey on Knowledge and Educational Needs

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Cannabidiol (CBD) and tetrahydrocannabinol (THC) are two types of naturally occurring phytocannabinoids isolated from the cannabis plant.^{1,2} Hemp and marijuana are both cannabis plant species, but different varieties, with hemp having little to no THC.³ The psychoactive properties that are often associated with marijuana products are due to the presence of THC.^{1,3} CBD has relatively low toxicity and has shown no indications of abuse or dependence potential among humans.^{2,5} In 2019, two of the largest retail pharmacy chains in the United States, CVS and Walgreens, announced that they would begin carrying and selling CBD-containing products in multiple states across the country, including Illinois and Indiana.^{6,7} These products contain CBD derived from the hemp plant (*Cannabis sativa* L.) and have less than 0.3% THC.^{3,8,9} They are available over the counter (OTC) in a wide variety of formulations, including capsules, oils, tablets, high-concentration extracts, creams, vape liquids, teas, and others.¹⁰

The laws regarding CBD use vary greatly among states. This study included four schools of pharmacy representing three different states in the Midwest: Illinois, Indiana, and Wisconsin. In Illinois, hemp-

Abstract

Objective: Cannabidiol (CBD) is expected to be a nearly \$2 billion industry by 2022. Although CBD is available over the counter (OTC), little is known about pharmacy students' knowledge of CBD products. Therefore, the objectives of this study were to assess students' (1) knowledge of CBD and self-rated competency of OTC-CBD product pharmacotherapy, (2) concerns about OTC-CBD product safety and level of preparedness with answering questions about the product, and (3) current and future education needs of pharmacy students.

Methods: A 23-question anonymous, online survey was sent to 1570 first-through fourth-year pharmacy students from four pharmacy schools in the Midwest.

Results: A total of 347 students completed the survey, yielding a 22.1% response rate. A majority of the participants were 18-23 years old, working in chain community pharmacy settings. The study found that pharmacy students were concerned about the safety and quality of the OTC-CBD products. Most students felt unprepared to counsel a patient on OTC-CBD (n=196, 56.5%) and rated themselves incompetent in pharmacotherapy knowledge of OTC-CBD products. A majority of students (n=272, 91.3%) would like to see CBD-related material incorporated into their curriculum. Students also agreed that pharmacists should be trained before dispensing and/or counseling on OTC-CBD products (n=284, 82.1%).

Conclusions: A majority of the pharmacy students in this study felt underprepared regarding CBD products. The survey participants indicated a need for CBD product-related educational opportunities that focus on state and federal regulations, pharmacotherapy, and safety of these products.

TABLE 1. Demographic Characteristics

<i>Sample Characteristics</i>	<i>Overall N = 347</i>	<i>IL[^] Schools N=154</i>	<i>IN[^] School N= 51</i>	<i>WI[^] School N= 142</i>
<i>Age Range (in years)</i>				
18-23	202 (58.2)	90 (58.4)	44 (86.3)	68 (47.9)
24 and older	145 (41.8)	64 (41.6)	7 (13.7)	74 (52.1)
<i>Current Year in Pharmacy School</i>				
First Professional Year	85 (24.5)	40 (25.9)	9 (17.7)	36 (25.4)
Second Professional Year	85 (24.5)	34 (22.1)	18 (35.3)	33 (23.2)
Third Professional Year	85 (24.5)	42 (27.3)	14 (27.5)	29 (20.4)
Fourth Professional Year	92 (26.5)	38 (24.7)	10 (19.6)	44 (30.9)
<i>Primary Pharmacy Practice Setting*</i>				
Independent Community	49 (14.1)	23 (14.9)	8 (15.7)	18 (12.7)
Chain Community	179 (51.6)	87 (56.5)	34 (66.7)	58 (40.9)
Clinic	9 (2.6)	0	0	9 (6.3)
Managed Care	3 (0.9)	1 (0.65)	0	2 (1.4)
Hospital	91 (26.2)	35 (22.7)	13 (25.5)	43 (30.3)
Hospice/Assisted Living Facility	3 (0.9)	1 (0.65)	0	2 (1.4)
I don't work outside of pharmacy school	57 (16.4)	26 (16.9)	5 (9.8)	26 (18.3)
Other	12 (3.5)	3 (1.9)	2 (3.9)	7 (4.9)
*Percentages may not add up to 100% due to being a select all that apply question. [^] IL = Illinois, IN = Indiana, WI = Wisconsin				

sourced CBD for any use, marijuana-sourced CBD for medical use, and marijuana-sourced CBD for recreational use are all legal as of 2020.¹¹ In Indiana, hemp-sourced CBD for any use is legal, but marijuana-sourced CBD for medical use and for recreational use are both illegal as of 2020.¹¹ Wisconsin allows hemp-sourced CBD for any use, and marijuana-sourced CBD for medical use, but marijuana-sourced CBD for recreational use is still illegal as of January 2020.¹¹ Sales of CBD in the United States hovered near half a billion dollars in 2018, and this number is expected to increase to near \$1.8 billion by 2022.¹² In 2019, Illinois had approximately \$78 million in CBD sales, and Indiana had

approximately \$27 million in CBD sales.¹³

Educators have emphasized an increased need to educate medical professionals (this includes physicians, pharmacists, and nurses) on medical marijuana and related topics to help ensure patient safety.¹⁴ In 2018, The University of Pittsburgh surveyed pharmacy schools on the inclusion of medical marijuana in their curricula. Of the schools that participated, 62% stated that they included medical marijuana content in their curriculum, and 23% planned to incorporate it within the next year.¹⁵ The University of Maryland School of Pharmacy was one of the first in the country to offer a master's degree in medical cannabis science and therapeutics,

covering policy, direct patient care, pharmacology, and chemistry of different cannabinoids such as THC and CBD.¹⁴ A nationwide 2019 study of pharmacy students found that more than 70% of the respondents wanted to be involved in the marijuana dispensing process, yet only 15% stated that they had received formal education regarding medical cannabis, and only 15% received passing scores when their cannabis knowledge was assessed.¹⁶

To date, several previous studies have assessed the knowledge, confidence, and attitudes of pharmacy students towards medical marijuana.¹⁶⁻¹⁸ These studies showed a lack of knowledge among pharmacy students regarding adverse

TABLE 2. Knowledge Assessment About OTC-CBD Products

Knowledge Assessment		Overall N = 347	IL [^] Schools N=154	IN [^] School N= 51	WI [^] School N= 142	*p-value
It is likely for OTC-CBD products that contain no more than 0.3% THC to exert euphoric effects on the user? [Correct Response: No]	Answered Correctly N (%)	224 (65.1)	91 (59.5)	32 (65.8)	101 (72.1)	0.196
	Answered Incorrectly N (%)	53 (15.4)	27 (17.7)	10 (19.6)	16 (11.4)	
	Unsure N (%)	67 (19.5)	35 (22.9)	9 (17.7)	23 (16.4)	
OTC-CBD containing products (i.e. oils, capsules, topicals) are FDA approved products. [Correct Response: False]	Answered Correctly N (%)	261 (75.2)	101 (65.6)	45 (88.2)	115 (80.9)	0.001
	Answered Incorrectly N (%)	41 (11.8)	29 (18.8)	4 (7.8)	8 (5.6)	
	Unsure N (%)	45 (13)	24 (15.6)	2 (3.9)	19 (13.4)	
According to the World Health Organization's Expert Committee on Drug Dependence, CBD is generally well tolerated in humans with a good safety profile. [Correct Response: True]	Answered Correctly N (%)	202 (58.4)	95 (61.7)	30 (58.8)	77 (64.6)	0.622
	Answered Incorrectly N (%)	28 (8.1)	10 (6.5)	3 (5.9)	15 (10.6)	
	Unsure N (%)	116 (33.5)	49 (31.8)	18 (35.3)	49 (34.7)	
Under the Federal Controlled Substances Act, cannabis derived CBD prescription drugs that contain no more than 0.3% THC are classified under what drug schedule? [Correct Response: Schedule V]	Answered Correctly N (%)	125 (36)	41 (26.6)	25 (49.0)	59 (41.6)	0.003
	Answered Incorrectly N (%)	222 (64)	113 (73.4)	26 (50.9)	83 (58.5)	
OTC-CBD has been well studied for which of the following medical conditions? [Correct Response: None of the above]	Answered Correctly N (%)	147 (42.4)	58 (37.7)	26 (50.9)	63 (44.4)	0.204
	Answered Incorrectly N (%)	200 (57.6)	96 (62.3)	25 (49.0)	79 (55.6)	

*Chi-square/Fisher Exact Test. [^]IL = Illinois, IN = Indiana, WI = Wisconsin

reactions, indications, state laws, and confidence in their ability to counsel patients on medical marijuana.^{17,18} A nationwide study also indicated that, regardless of the legal status of marijuana, students lacked knowledge and preparation to counsel and educate on medical marijuana.¹⁶ However, these studies focused on medical marijuana, but not CBD products, and were at times limited to a single school of pharmacy. Only one study assessed the knowledge and attitudes of Illinois pharmacists, but not pharmacy students, about OTC-CBD products. The study noted that the majority of those surveyed did not feel comfortable answering questions about OTC-CBD products and were wary about product safety and quality.¹⁹ Therefore, this study focused specifically on CBD and OTC-CBD products and included students from

four pharmacy schools in three different states in the Midwest.

Objectives

The primary objectives of this study were to assess pharmacy students' (1) baseline knowledge of CBD and self-rated competency of OTC-CBD product pharmacotherapy, (2) concerns about OTC-CBD product safety and level of preparedness with answering questions about the product, and (3) current and future education needs. Secondly, we assessed whether there were state-based differences in responses to the survey.

Methods

Study Design

This observational, cross-sectional study obtained information from four schools of pharmacy located in Illinois

(two public institutions), Indiana (one private institution), and Wisconsin (one public institution). An anonymous, online, quantitative survey was provided to the students using Qualtrics. An email was sent to first- through fourth-year pharmacy students on August 15, 2019, with a survey link inviting them to participate in the study. Three follow-up emails were sent out at three-week intervals after the initial email as a reminder to participate in the study before the survey window ended on October 31, 2019.

The Southern Illinois University at Edwardsville Institutional Review Board reviewed and deemed the study to be exempt (Protocol #416).

Survey

The 23-question survey was developed using previous literature that used surveys

to gain pharmacist and student perspectives on marijuana-containing products.^{17,20} The survey was assessed for face validity by four pharmacy students, one each from professional year one through professional year four. Additionally, two faculty members assessed the survey for completeness. The survey was also shared with the individual school coordinators who were in charge of disseminating the survey. Minor modifications to the survey were made based on the feedback received.

The final survey assessed student demographics; objective 1: knowledge regarding CBD products and laws (6 questions), and competency in pharmacotherapy of CBD products (3 questions); objective 2: level of preparedness for counseling patients and other healthcare providers on OTC-CBD products (2 questions), and concerns regarding the use of OTC-CBD products (5 questions); and objective 3: current and future educational needs about CBD products.

Study Sample

The study included first- through fourth-year pharmacy students enrolled at four schools of pharmacy in the Midwest. A total of 1,570 students were invited to participate in the survey.

Statistical Analysis

Descriptive statistics including percentages were calculated for all survey

items using STATA 16 (StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC). Additionally, chi-square or Fisher's exact test were used to assess whether there was an overall difference in the responses among the three states.

Objective 1: Pharmacy students' knowledge of OTC-CBD products was assessed as correct/incorrect based on the response provided. Self-assessed competency in pharmacotherapy of OTC-CBD products was assessed by aggregating the responses to a 6-point Likert-type scale (strongly/mostly/slightly competent, strongly/mostly/slightly incompetent).

Objective 2: Concerns about the safety of OTC-CBD products was assessed by aggregating the responses to a 5-point Likert-type scale (no concern, slightly/somewhat concerned, moderately/highly concerned). Level of preparedness for counseling patients and discussing with healthcare providers was assessed by aggregating the responses to a 5-point Likert-type scale (not at all, slightly/somewhat, moderately/highly prepared).

Objective 3: Current and future interest in CBD-related education was assessed using a preference scale (not preferred, preferred, most preferred).

Results

Of the 1,570 invited participants, responses were received from 349 students, of which 2 were incomplete and excluded.

A total of 347 responses were included in the study, representing a 22.1% response rate. Table 1 displays the demographics of the respondents. A majority of the participants were 18-23 years old, and about half worked in a chain community pharmacy setting. Students were evenly spread among the four professional years (Professional Year 1 = 24.5%, Professional Year 2 = 24.5%, Professional Year 3 = 24.5%, Professional Year 4 = 26.5%).

Objective 1: Knowledge assessment and self-rated competency of OTC-CBD product pharmacotherapy

Overall, the knowledge assessment indicated that most participants correctly answered the questions regarding CBD side effects, FDA approval, and safety profile, but a majority incorrectly answered questions relating to drug scheduling, medical conditions, and routes of administration (Table 2). A large majority of respondents rated themselves as incompetent in all aspects of OTC-CBD pharmacology (Table 3). An overall difference was noted among students in different states, in correctly responding to the question about OTC-CBD products being FDA approved. A lower percentage of students in Illinois schools correctly noted that OTC-CBD products are not FDA approved, followed by Wisconsin and Indiana (65.6%, 80.9%, 88.2% respectively, $p = 0.001$) (Table 2).

TABLE 3. Self-Reported Competency in Pharmacotherapy Knowledge of CBD Products

Please rate your competency level in over the counter cannabidiol (CBD) product pharmacotherapy knowledge in the following areas.		Overall N = 347	IL [^] Schools N=154	IN [^] School N= 51	WI [^] School N= 142	*p-value
Pharmacology	Competent N (%)	92 (26.5)	44 (28.6)	13 (25.5)	35 (24.7)	0.735
	Incompetent N (%)	255 (73.5)	110 (71.4)	38 (74.1)	107 (75.4)	
Pharmacokinetics	Competent N (%)	67 (19.4)	33 (21.4)	5 (9.8)	29 (20.4)	0.173
	Incompetent N (%)	279 (80.6)	121 (78.6)	46 (90.2)	113 (79.6)	
Pharmacodynamics	Competent N (%)	65 (18.8)	29 (18.8)	6 (11.8)	30 (21.1)	0.339
	Incompetent N (%)	280 (81.2)	125 (81.2)	45 (88.2)	112 (78.9)	

*Chi-square/Fisher Exact Test. [^]IL = Illinois, IN = Indiana, WI = Wisconsin

TABLE 4. Safety Concerns and Level of Preparedness about OTC-CBD Products

<i>Concerns</i>		<i>Overall N = 347</i>	<i>IL^a Schools N=154</i>	<i>IN^a School N= 51</i>	<i>WI^a School N= 142</i>	<i>*p-value</i>
Safety of over the counter CBD product use (drug interactions, contraindications, adverse reactions)	No Concern N (%)	26 (7.5)	10 (6.5)	7 (13.7)	9 (6.3)	0.176
	Slightly, Somewhat Concerned N (%)	142 (40.9)	71 (46.1)	19 (37.3)	52 (36.6)	
	Moderately, Highly Concerned N (%)	179 (51.6)	73 (47.4)	25 (49.0)	81 (57.0)	
Consistency in quality of over the counter CBD products	No Concern N (%)	12 (3.5)	7 (4.6)	1 (2.0)	4 (2.8)	0.005
	Slightly, Somewhat Concerned N (%)	85 (24.5)	52 (33.8)	8 (15.7)	25 (17.6)	
	Moderately, Highly Concerned N (%)	250 (72.1)	95 (61.7)	42 (82.4)	113 (79.6)	
Federal regulation related to over the counter CBD products	No Concern N (%)	20 (5.8)	12 (7.8)	3 (5.6)	5 (3.5)	0.564
	Slightly, Somewhat Concerned N (%)	110 (31.7)	50 (32.5)	14 (27.5)	46 (32.4)	
	Moderately, Highly Concerned N (%)	217 (62.5)	92 (59.7)	34 (66.7)	91 (64.1)	
Psychoactive effects and potential addiction from over the counter CBD product use	No Concern N (%)	76 (21.9)	30 (19.5)	16 (31.4)	30 (21.1)	0.074
	Slightly, Somewhat Concerned N (%)	144 (41.5)	57 (37.0)	19 (37.3)	68 (47.9)	
	Moderately, Highly Concerned N (%)	127 (36.6)	67 (43.5)	16 (31.4)	44 (31.0)	
Limited evidence of therapeutic benefits from over the counter product use	No Concern N (%)	24 (6.9)	12 (7.8)	2 (3.9)	10 (7.0)	0.234
	Slightly, Somewhat Concerned N (%)	120 (34.6)	61 (39.6)	19 (37.3)	40 (28.2)	
	Moderately, Highly Concerned N (%)	203 (58.5)	81 (52.6)	30 (58.8)	92 (64.8)	
Level of Preparedness						
Patient Counseling	Not at all Prepared N (%)	196 (56.5)	95 (61.7)	27 (52.9)	74 (52.1)	0.463
	Slightly, Somewhat, Prepared N (%)	126 (36.3)	49 (31.8)	19 (37.3)	58 (40.9)	
	Moderately, Highly Prepared N (%)	25 (7.2)	10 (6.5)	5 (9.8)	10 (7.4)	
Discussing with a Healthcare Provider	Not at all Prepared N (%)	211 (61.2)	102 (67.1)	31 (60.8)	78 (54.9)	0.251
	Slightly, Somewhat, Prepared N (%)	107 (31)	39 (25.7)	15 (29.4)	78 (54.9)	
	Moderately, Highly Prepared N (%)	27 (7.8)	11 (7.2)	5 (9.8)	53 (37.3)	
*Chi-square/Fisher Exact Test. ^a IL = Illinois, IN = Indiana, WI = Wisconsin						

TABLE 5. Current and Future Education

<i>Concerns</i>		<i>Overall N = 347</i>	<i>IL[^] Schools N=154</i>	<i>IN[^] School N= 51</i>	<i>WI[^] School N= 142</i>	<i>*p-value</i>
Is there a required course at your school of pharmacy that covers cannabidiol (CBD) in the curriculum?	Yes N (%)	49 (14.1)	6 (3.9)	4 (7.8)	39 (27.5)	0.001
	No N (%)	171 (49.3)	95 (61.7)	25 (49.0)	51 (35.9)	
	Unsure N (%)	127 (36.6)	53 (34.4)	22 (43.1)	52 (36.6)	
Would you like to see cannabidiol (CBD) related material incorporated into your school of pharmacy's curriculum? Answered only by students who answered "No/Unsure" above	Yes N (%)	272 (91.3)	138 (93.2)	42 (89.4)	92 (89.3)	0.327
	No N (%)	8 (2.7)	4 (2.7)	0 (0.0)	4 (3.9)	
	Unsure N (%)	18 (6.0)	6 (4.1)	5 (10.6)	7 (6.8)	
Have you received any prior formal education (for example, pharmacy school courses, national or local meetings, webinars, etc.) on the use of cannabidiol (CBD)?	Yes N (%)	83 (23.9)	26 (16.9)	8 (15.7)	49 (34.5)	0.001
	No N (%)	252 (72.6)	123 (79.9)	43 (84.3)	86 (60.6)	
	Unsure N (%)	12 (3.5)	5 (3.3)	0 (0.0)	7 (4.9)	
Pharmacists should have special training before dispensing and/or counseling on cannabidiol (CBD)-containing over the counter products.	Yes N (%)	284 (82.1)	129 (84.3)	40 (78.4)	115 (81.0)	0.130
	No N (%)	36 (10.4)	17 (11.1)	8 (15.7)	11 (7.8)	
	Unsure N (%)	26 (7.5)	7 (5.6)	3 (5.9)	16 (11.3)	

**Chi-square/Fisher Exact Test. [^]IL = Illinois, IN = Indiana, WI = Wisconsin*

Objective 2: Concerns about OTC-CBD product safety and level of preparedness with answering questions about the product

When asked about safety concerns with OTC-CBD products, the biggest concern overall was with the consistency in quality of OTC-CBD products, with 72% of students being moderately/highly concerned. Most survey participants didn't feel prepared to counsel patients or to provide accurate and reliable information to a healthcare provider about OTC-CBD products (Table 4). When comparing results among the three states, a statistically significant overall difference was noted for the concern about the consistency in quality of OTC- CBD products. Indiana had the highest percentage of moderately/highly concerned pharmacy students, followed by Wisconsin and Illinois (82.4%, 79.6%, 61.7% respectively, p = 0.005) (Table 4).

Objective 3: Current and future education

About 85% of participants said their required coursework didn't have CBD-related content, or were unsure whether their curriculum covered CBD in a required course. Of these, 91.3% stated that they would like to see CBD-related material incorporated into their school of pharmacy's curriculum (Table 5). The most popular topics that participants would most like to learn about were the pharmacotherapy and safety of CBD products. The top two primary resources that students used to find CBD-related information were Internet searches and pharmacy organizations (results not shown). When comparing responses among the three participating states, Illinois and Indiana had the largest number of students state that they didn't have or were unsure if they had a required course in their curriculum on the topic, followed by Wisconsin (96.1%, 92.0%, 72.5% respectively, p = 0.001) (Table 5).

Discussion

Previous studies have reported on pharmacy students' knowledge and perceptions of medical marijuana, indicating a lack of knowledge of state laws, and lack of confidence in students' ability to counsel and educate patients.¹⁶⁻¹⁸ This study focuses specifically on OTC-CBD products (less than 0.3% THC), which are widely available in pharmacies as well as in specialty and grocery stores,⁶⁻⁸ rather than medical marijuana (more than 0.4% THC), and provides a baseline of knowledge regarding CBD among pharmacy students. The results of this study are similar to those in the medical marijuana studies,¹⁶⁻¹⁸ suggesting a significant lack of knowledge regarding all aspects of CBD-related pharmacotherapy. A lack of confidence among pharmacy students for counseling and educating on CBD, as well as wariness regarding product safety and quality, were observed. A recent study that assessed CBD knowledge among practicing Illinois pharmacists noted similar

trends.¹⁹ These results indicate a perceived need for pharmacy schools across the country to incorporate or provide more enhanced education about CBD into their curriculum.

The Federal Farm Bill legislation of 2018 changed the scheduling of CBD prescription drugs containing no more than 0.3% THC from Schedule I to Schedule V.^{3,8} Currently, Epidiolex (manufactured by Greenwich Biosciences) is the only FDA-approved prescription CBD-containing product and is dispensed as an oral solution.²¹ However, a majority of the students in this study could not correctly identify the drug scheduling for CBD prescription drugs that contain no more than 0.3% THC. Another common misconception is that CBD products are unsafe and produce euphoric effects. Per a World Health Organization report, CBD products containing less than 0.3% THC are considered generally safe, have relatively low toxicity and have shown no indication of abuse or dependence potential among humans.² The psychoactive effects often associated with THC are not associated with CBD containing less than 0.3% THC.^{1,3} However, assessing the safety and efficacy of OTC-CBD products is an ongoing venture, with many unknowns.⁴ As this research develops, students would benefit from a targeted safety and quality discussion.

In 2018, 62% of pharmacy schools that participated in a survey stated that they included medical marijuana content in their curriculum, and 23% planned to incorporate it within the next year.¹⁵ Comparatively, about 86% of the students in this survey stated that their school of pharmacy does not provide CBD education, or the student was unsure whether their curriculum included CBD education. This finding is reinforced when the majority of respondents consider themselves incompetent in the pharmacology, pharmacokinetics, and pharmacodynamics of CBD, all topics that would likely be covered in an educational course on the subject.

The differences among state laws as of 2020 could have a bearing on the results. Illinois allows hemp-sourced CBD for all uses, marijuana-sourced CBD for medical use, and marijuana-sourced CBD for

recreational use; Wisconsin allows all but marijuana-sourced CBD for recreational use; Indiana only allows hemp-sourced CBD for all uses.¹¹ While there were some overall differences noted among respondents in the three states, the trends indicated a lack of knowledge about CBD products, concerns about consistency in safety and quality, and a need for more CBD education in all three states. As the popularity and research associated with CBD continue to grow, future research opportunities could specifically focus on state laws and their impact on pharmacy curriculum and student as well as pharmacist knowledge.

A strength of this study is surveying students from multiple colleges as well as multiple states, which captures a wide variety of pharmacy students in the Midwest. Additionally, the survey was modeled after previous literature that successfully surveyed pharmacy students about cannabis, but was modified to fit the CBD framework.

A limitation of this study includes the timing of the survey, which was distributed to students from August through October 2019. The Illinois Pharmacists Association (IPhA) annual meeting, held in early October, contained educational content about CBD. Any student who attended the IPhA meeting and took this survey after the fact might have had biased responses due to the information they received at the meeting. Despite including four schools of pharmacy (from three different states), the relatively small sample size means that non-response bias cannot be entirely ruled out.

Conclusion

A majority of students in this study felt that they were lacking in the knowledge and preparation required to safely and accurately assist patients and providers in the selection and use of OTC-CBD products. Pharmacy students in this study indicated that they would be interested in educational content focused on state and federal regulations, pharmacotherapy, and safety of CBD-related products.

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References

1. National Center for Biotechnology Information. PubChem Compound Summary for CID 644019, Cannabidiol. <https://pubchem.ncbi.nlm.nih.gov/compound/644019>. Accessed May 10, 2019.
2. Expert Committee on Drug Dependence. Cannabidiol (CBD) Pre-Review Report. World Health Organization. https://www.who.int/medicines/access/controlled-substances/5.2_CBD.pdf. Published November 2017. Accessed May 10, 2019.
3. El-Alfy, A., 2020. Role of the pharmacist in the care of patients using cannabis. *J Am Pharm Assoc* (2003). 2020;60(3):426-428.
4. Iffland K, Grotenhermen F. An Update on Safety and Side Effects of Cannabidiol: A Review of Clinical Data and Relevant Animal Studies. *Cannabis Cannabinoid Res*. 2017;2(1):139-154.
5. Babalonis S, Haney M, Malcolm RJ, et al. Oral cannabidiol does not produce a signal for abuse liability in frequent marijuana smokers. *Drug Alcohol Depend*. 2017;172:9-13.
6. Boehm E. CVS Pharmacy, America's Largest Drug Store Chain, Will Carry CBD Products. Reason.com. <https://reason.com/2019/03/21/cvs-pharmacy-americas-largest-drug-store/>. Published March 21, 2019. Accessed May 10, 2019.
7. Tyko K. Walgreens will sell CBD products in nearly 1,500 stores. USA TODAY. <https://www.usatoday.com/story/money/2019/03/27/walgreens-sell-cbd-products-nearly-1-500-drugstores-report-says/3295939002/>. Published March 28, 2019. Updated August 16, 2019. Accessed May 10, 2019.
8. Stewart I, Kloss J, Willner N. Will Hemp-Derived CBD be Fully Legal with Passage of the 2018 Farm Bill? Not Quite. The National

- Law Review. <https://www.natlawreview.com/article/will-hemp-derived-cbd-be-fully-legal-passage-2018-farm-bill-not-quite>. Published December 4, 2018. Accessed May 10, 2019.
9. CBD Products. Walgreens. <https://www.walgreens.com/topic/promotion/cbd-faq.jsp?o=acs>. Accessed March 10, 2020.
10. Canabido1™. CBD Cacao-Tabs™. Canabido1™ (CBD Cannabis Oil). https://canabido1.com/cbd-cocoa-tabs/?attribute_strength=100mg. Accessed March 10, 2020.
11. 2020 CBD Laws by State. CBD Awareness Project. <https://www.cbdoil.org/cbd-laws-by-state/>. Published January 13, 2020. Accessed February 4, 2020.
12. Mikulic M. Total CBD consumer sales U.S. 2014-2022. Statista. <https://www.statista.com/statistics/760498/total-us-cbd-sales/>. Published August 9, 2019. Accessed October 10, 2019.
13. Conway J. Dollar Sales of CBD in the United States in 2019, by state. Statista. <https://www.statista.com/statistics/1065838/dollar-sales-of-us-cbd-market-by-state/>. Published May 13, 2020. Accessed May 15, 2020.
14. Cantlupe JA. Medical Marijuana Goes Mainstream. American Association of Colleges of Pharmacy. <https://www.aacp.org/article/medical-marijuana-goes-mainstream>. Accessed February 9, 2020.
15. Smithburger PL, Zemaitis MA, Meyer SM. Evaluation of medical marijuana topics in the PharmD curriculum: A national survey of schools and colleges of pharmacy. *Curr Pharm Teach Learn*. 2019;11(1):1-9.
16. Moeller KE, McGuire JM, Melton BL. A nationwide survey of pharmacy students' knowledge and perceptions regarding medical cannabis. *J Am Pharm Assoc* (2003). 2019;(60)1;218-224.e3.
17. Caligiuri FJ, Ulrich EE, Welter KJ. Pharmacy Student Knowledge, Confidence and Attitudes Toward Medical Cannabis and Curricular Coverage. *Am J Pharm Educ*. 2018;82(5).
18. Moeller KE, Woods B. Pharmacy Students' Knowledge and Attitudes Regarding Medical Marijuana. *Am J Pharm Educ*. 2015;79(6);85.
19. Link K, Deshpande M, Ferguson MK. Illinois Pharmacists and Over the Counter Cannabidiol Products: A Survey on Knowledge and Educational Needs. *Innov Pharm*. 2020;11(2);2.
20. Hwang J, Arneson T, St. Peter W. Minnesota Pharmacists and Medical Cannabis: A Survey of Knowledge, Concerns, and Interest Prior to Program Launch. *P T*. 2016;41(11);716-722.
21. EPIDIOLEX® (Cannabidiol) CV. EPIDIOLEX.com, www.epidiolex.com/. Accessed May 10, 2019.

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