

Clinician Attitudes, Training, and Beliefs About Cannabis: An Interprofessional Assessment

Brooke Worster,^{1,*i} Rebecca L. Ashare,^{2,3} Emily Hajjar,⁴ Greg Garber,¹ Kelsey Smith,⁵ and Erin L. Kelly⁵

Abstract

Background: Medical use of cannabis is growing in popularity across the United States, but medical education and clinician comfort discussing cannabis use for medical purposes have not kept pace.

Materials and Methods: A total of 344 clinicians in the state of Pennsylvania (response rate 14%) completed a brief online survey about their attitudes, training, and experiences regarding medical cannabis and certifying patients to use medical cannabis.

Results: Only 51% of clinicians reported completing any formal training on medical cannabis. Compared with noncertifying clinicians (pharmacists, nurse practitioners, and physician assistants), physicians were significantly more comfortable with patient use of medical cannabis, saw fewer risks, more benefits, and felt better prepared to discuss its use with vulnerable populations. All clinicians noted significant limitations to their understanding of how medical cannabis can affect patients, and many indicated a desire for more research and training to fill in gaps in their knowledge.

Conclusions: Insufficient medical curricula on the medical uses of cannabis are available to interprofessional clinicians across their disciplines, and clinicians report significant deficits in their knowledge base about its effects. Additionally, these data suggest an urgent need to expand training opportunities to the full spectrum of clinicians as all are involved in caring for patients who use medical cannabis.

Keywords: medical education; medical cannabis; workforce training

Background

Interest in and use of cannabis among adult patients across the United States continues to increase.¹ Rapid legislative changes within the United States and internationally continue to blur the distinction of whether it is an illicit substance or an adjuvant medical therapeutic option. At this time, cannabis use is completely illegal in only three states in the United States. The remaining 47 states have a varied patchwork of laws enabling medical and/or adult use.²

Neither Medicare, Medicaid, nor do commercial insurers cover the costs of anything associated with cannabis: physician visits specifically related to cannabis, state certification fees, or the products themselves, ex-

acerbating health care disparities.³ Due to Federal restrictions on cannabis and its FDA Schedule 1 designation, clinical research is extremely onerous. Patients potentially have many meaningful benefits derived from use of cannabis, yet, clinicians rarely engage in conversations around medical use of cannabis with patients.^{4,5}

Despite increasing patient interest in and access to cannabis, clinical training is significantly lacking for medical providers. In a national survey of medical school deans, residents, and fellows, 66.7% of deans reported that their graduates are not prepared at all to certify patients to use medical cannabis and 89.5% of residents and fellows felt unprepared.⁵ Tellingly, deans reported that 25% of their graduates were unprepared to answer

¹Department of Medical Oncology, Sidney Kimmel Cancer Center at Thomas Jefferson University, Philadelphia, Pennsylvania, USA.

²Department of Psychology, State University of New York at Buffalo, Buffalo, NY.

³Department of Psychiatry, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA.

⁴College of Pharmacy at Thomas Jefferson University, Philadelphia, Pennsylvania, USA.

⁵Department of Family and Community Medicine, Sidney Kimmel Medical School at Thomas Jefferson University, Philadelphia, Pennsylvania, USA.

ⁱORCID ID (<https://orcid.org/0000-0002-6687-1760>).

*Address correspondence to: Brooke Worster, MD, Department of Medical Oncology, Sidney Kimmel Cancer Center at Thomas Jefferson University, 925 Chestnut Street, Suite 420a, Philadelphia, PA 19107, USA, E-mail: brooke.worster@jefferson.edu

patient questions about cannabis and 35.3% of residents and fellows felt unprepared.

Training for pharmacists appears more common, as 62% reported having medical cannabis content in their curriculum.⁶ However, in a recent study, pharmacy students demonstrated poor mastery of information about qualifying medical conditions and possible adverse effects of cannabis.⁷ Few studies have explored preparation among nurses or physician assistants.⁸ Cumulatively, the above studies suggest that additional postgraduate training and curricular revisions are required to prepare clinicians, and it is important to identify their receptiveness to different forms of continuing education.

The lack of lectures, curriculum, or discussion in the vast majority of health science professional schools, from nursing to medical to pharmacy schools, has practical consequences for clinicians and their patients. In health professional schools in the United States, cannabis is either minimally discussed or more frequently associated as an illicit substance or drug of abuse in courses ranging from public health to pathophysiology.

A national survey of oncologists in 2016 revealed that only 30% of clinicians felt comfortable with their knowledge of this alternative therapeutic and most felt unprepared to make recommendations for its use.⁹ In a world where precision medicine and data regarding risk–benefit ratios for cancer therapeutics are available, this knowledge gap puts clinicians at odds with their natural inclination to let the data drive decision-making.¹⁰ This training gap often results in little to no patient–clinician engagement about the medical use of cannabis.⁹

The present study

While some surveys report a lack of education among physicians regarding cannabis, there are very few studies looking at interdisciplinary clinician preparation regarding medical cannabis. Patients look to nurse practitioners, pharmacists, and physician assistants for information and guidance on whether they should use medical cannabis or how to use it safely, even though they are not authorized to certify patients to use medical cannabis.^{11,12} This study sought to examine these topics in Pennsylvania (PA), a state with legal medical cannabis (not approved for recreational use). PA passed legislation in 2016 to allow state-approved dispensaries to sell cannabis products to patients whom have been certified to purchase and use cannabis by a physician (MD or DO).

In states that require certification, patients are required to meet with a physician to certify that they have a qualifying condition and that they are appropriate candidate to use medical cannabis treatment before they can receive a state-issued card authorizing their use of cannabis. Physicians, in this case, are the “prescribers” giving access to cannabis dispensaries in PA. The goal of the present study was to compare the knowledge, training, attitudes, and informational sources among clinicians able to certify patients to use medical cannabis (physicians) and clinicians whose patients may look to for information but are not able to certify medical cannabis use (i.e., pharmacists, nurse practitioners, and physician assistants) to identify critical areas for additional training.

Methods

Sample

In August 2020, a state-wide online survey was disseminated to 1334 physicians, 851 nurse practitioners/advanced practice providers, and 232 pharmacists in the state of PA through the combination of a state-wide listserv of registered cannabis-certifying physicians and professional listservs. Of these, 372 opened the survey and 344 fully completed the survey (14% overall response rate).

While the response rate was relatively low as this was launched in the middle of the COVID-19 pandemic, the sample included a very wide distribution of age, sex, years in practice, practice setting (urban, suburban, rural), as well as practitioner type (physician, nurse practitioner, pharmacist) and as such is a very representative population of certifying medical practitioners across the state (https://www.health.pa.gov/topics/Documents/Programs/Workforce%20Reports/FINAL_2014%20Pulse%20of%20Pennsylvania%27s%20Physician%20and%20Physician%20Assistant%20Workforce.pdf; <https://www.health.pa.gov/topics/Documents/Programs/Workforce%20Reports/2014%20LPN%20Report.pdf>).

Setting

PA’s Medical Marijuana (MMJ) Program[†] was legislatively approved in 2016, which authorized physicians to certify patients to use cannabis to treat qualified medical conditions. Physicians must take a 4-h state-approved continuing medical education (CME) course and register with the state to be confirmed as an

[†] The term cannabis is preferred, and we use it throughout the text. However, in the state of PA, the program is called the Medical Marijuana Program, and our survey items reflected that state’s accepted terms.

“approved practitioner.” The electronic database allows physicians to certify and attest that a patient has a qualifying condition and is under the certifying physician’s care for the qualifying condition.

Dispensing of cannabis began in 2018. Patients may qualify for the program if they have any of 23 conditions as of 2020 (www.medicalmarijuana.pa.gov). In 2019, of the 41,041 licensed physicians in PA, 3.65% of all actively practicing physicians in the state were able to certify patients for cannabis (~1500 physicians). As of January 2021, ~2.19% of the state’s population were able to participate and obtain cannabis and there were 281,000 active certifications.

Procedures

All procedures were approved by the institutional review board of Thomas Jefferson University. Pilot testing of the survey was completed with 100 clinicians affiliated with Thomas Jefferson University Hospital/Sidney Kimmel Medical College in 2017, and the survey was expanded. Time between pilot testing and state-wide deployment was intentional, allowing all clinicians exposure to both the program and patients interested or participating in the medical cannabis program. Participants were invited to complete an online survey via Qualtrics regarding their attitudes and knowledge about medical cannabis. All potential participants read the consent form and those who selected “yes” proceeded to the survey. The survey took 10–15 min to complete. All participants received a \$10 gift card.

Measures

All scales described below were drawn from the literature and used in physician cannabis surveys.^{13,14} While they have been used commonly as assessment tools, there are no validated instruments to assess medical provider knowledge, limitations, and attitudes about cannabis to deploy at this time.

Demographics and clinical practice characteristics

Participants were asked to self-report their demographic and workplace characteristics, including their sex, race/ethnicity, position title, clinical specialty (pre-determined categories or write-in), years in current position, geographic area of practice, and years of practice.

Certifying status and chart recording

Physicians were asked to report whether they are currently certifying patients for medical cannabis and, if yes, how many patients a month they typically cer-

tify. Physicians were asked to identify (1 = *yes*, 2 = *no*, 3 = *unsure*) whether they would recommend cannabis generally, for patients failing conventional treatment, for patients who requested it, and if there is a role for cannabis in their practice. Physicians also identified from a checklist or wrote-in if there were additional training opportunities or legal changes that would increase their likelihood of certifying or that they would like to participate in.

All participants were asked to identify if (1 = *yes*, 2 = *no*, 3 = *unsure*) and how they record information about cannabis use in their patients’ charts using a 4-item prespecified checklist or they could write-in where they record this information.

Training experiences and preferred educational modalities

All participants were asked if they had any formal training (accredited CME classes, received lectures associated with their training programs, or at professional conferences) regarding medical cannabis (yes/no). Of those who said yes, they were asked to select from a 5-item checklist (including other) the different ways that they had participated in training.

As only physicians are authorized to certify patients in PA, physician participants could select from a checklist of six possible training or education modalities that they would like for continuing education on cannabis. Options included peer-reviewed literature reviews, online learning programs, a set of online resources, workshops/small group sessions, symposia/conferences, and other.

Informational sources

Using an 11-item checklist from Kondrad and Reid,¹³ clinicians selected all the sources they use to learn about whether to recommend cannabis or write in an “other” response.

Attitudes about cannabis

Using an 11-item scale drawn from Kondrad and Reid¹³ and Carlini et al.,¹⁴ participants rated their attitudes about the dangers, benefits, training, and persons authorized to certify patients for medical cannabis. Items were rated on a 5-point Likert scale (1 = *strongly agree* to 5 = *strongly disagree*). The scale demonstrated adequate reliability (Cronbach’s $\alpha = 0.78$).

Perceived limitations of medical cannabis

Using a 12-item expanded version of Carlini and colleagues’¹⁴ scale, clinicians were asked to rate the degree

that various factors are limitations of medical cannabis on a 5-point Likert scale (1 = *strongly agree* to 5 = *strongly disagree*). Items included domains such as legal concerns, risk of dependence, risk of harm, lack of data or training, stigma, and practical concerns regarding use, such as dosing, mechanism of action, side effects, effectiveness, interactions with other medications, and need for monitoring. The scale demonstrated good reliability in the present study (Cronbach's $\alpha = 0.86$).

Self-assessed knowledge about medical cannabis

Using an 11-item scale drawn from Carlini and colleagues,¹⁴ participants rated their abilities to educate their patients about the mechanisms of action, side effects, drug interactions, benefits, and risks of cannabis as well as their knowledge of the certification processes. Items were rated on a 5-point Likert scale (1 = *strongly agree* to 5 = *strongly disagree*) or they could also select "will not recommend" or "not applicable." This reliability of this scale is excellent (Cronbach's $\alpha = 0.97$).

Vulnerable populations

Using a 6-item scale designed for this study, clinicians were asked to rate their comfort discussing cannabis with individuals from five populations (serious mental illness, pregnant or breastfeeding, substance use disorder, geriatric, children and adolescents) or to write in other populations. Items are rated on a 5-point Likert scale (1 = *strongly agree* to 5 = *strongly disagree*).

Analytic plan

Independent *t*-test comparisons of the different clinician types (physicians vs. nonphysicians) were conducted with the attitudes, perceived limits, self-assessed knowledge, and vulnerable populations. To adjust for multiple comparisons, only *p* values below 0.01 will be interpreted as significant. Cohen's *d* is used to represent effect sizes, with values above 0.20 interpreted as small, above 0.50 as medium, and above 0.80 as large.¹⁵

Results

Sample characteristics

A total of 344 clinicians completed the survey sufficient for inclusion in the final sample. The median completion time was 6.9 min (standard deviation = 36.4). Demographics and practice characteristics of the participants are presented in Table 1. Overall, providers were primarily white (74.7%, *n* = 257), female (56.7%, *n* = 195), and located in Southeast PA (52%, *n* = 179).

Table 1. Demographic and Clinical Practice Factors

	<i>n</i>	%
Sex		
Male	144	41.9
Female	195	56.7
Other	3	0.9
Missing	2	0.6
Race/ethnicity		
White	257	74.7
Black	11	3.2
Asian	36	10.5
Hispanic/Latinx	6	1.7
Other	33	9.6
Missing	1	0.3
Clinician type		
Physician assistant	38	11.0
Nurse practitioner	88	25.6
Pharmacist	66	19.2
Physician	152	44.2
Practice region		
Southeast	179	52.0
Northeast	110	32.0
Southcentral	30	8.7
Northcentral	6	1.7
Southwest	26	7.6
Northwest	10	2.9
Practice specialty		
Internal Medicine	65	18.9
Family Practice	54	15.7
Oncology	27	7.8
Neurology	12	3.5
Psychiatry	5	1.5
Gastroenterology	5	1.5
Ophthalmology	3	0.9
Pain Medicine	10	2.9
Emergency Medicine	12	3.5
Hospice/Palliative	12	3.5
Other	136	39.5
Missing	3	0.9
Certifying status (physicians only)		
Actively certifying	130	85.5
Not actively certifying	14	9.2
Unsure	2	1.3
Missing	6	3.9
Average number of patients certified per month		
< 5	42	32.3
5–10	38	29.2
11–20	26	20.0
> 20	24	18.5
	<i>M</i>	<i>SD</i>
Years in practice	16.98	12.99

M, mean; *SD*, standard deviation.

Physicians comprised the largest group (44.2%, *n* = 152), followed by nurse practitioners (25.6%, *n* = 88), pharmacists (19.2%, *n* = 66), and physician assistants (11%, *n* = 38). Of the predetermined specialty categories, Internal Medicine (18.9%, *n* = 65) and Family Practice (15.7%, *n* = 54) were the most endorsed. Participants were experienced clinicians, with 57% (*n* = 196) of participants practicing for 10 or more years.

Across all clinicians, 73.7% ($n=274$) reported that they are likely to recommend cannabis to a patient with a qualifying condition and 76% reported that there is a role for cannabis in their practice/specialty ($n=260$). However, these recommendations were contextualized by nonresponse to standard, first-line treatment as 86% would recommend cannabis to a patient failing conventional therapy ($n=295$) and only 40% would recommend cannabis to a patient based on a patient request, regardless of previous treatments ($n=137$).

Training experiences

Just over half (51%, $n=175$) of participants reported completing formal training on medical cannabis. Physicians were far more likely to have had formal training (90%, $n=137$) than noncertifying clinicians (20%, $n=38$). The most common way that clinicians received training was through a conference (29%, $n=99$). Only 7.8% reported training during residency or fellowship and 3.5% did so in graduate or professional school. A small number reported completion of online courses ($n=19$) or CME ($n=16$).

Certifying physicians

Of the 152 physicians, 85.5% indicated that they are currently certifying patients for medical cannabis use. Five physicians noted that they are unsure if they are certifying, perhaps indicating that they are uncertain if they will begin or to continue to certify. Of the 130 actively certifying physicians, about two thirds were certifying 5 or more patients per month and nearly 20% reported certifying more than 20 per month (Table 1). Physicians currently certifying patients stated that they would be more likely to recommend if there was more peer-reviewed research (58%, $n=76$), if they completed more training or education on the topic (42%, $n=54$), and if the Drug Enforcement Administration changed cannabis to a non-Schedule 1 drug (39%, $n=51$).

Among physicians who are not certifying patients or are unsure if they are certifying ($n=16$), 64% would do so if there was more peer-reviewed research ($n=9$), if it was no longer a Schedule 1 drug ($n=9$), or if they had more training and education ($n=9$). Of all the physicians surveyed, 41% wanted more training and education ($n=63$), 25% would complete online training programs ($n=38$), 16% would like a set of online resources ($n=25$), 16% would attend symposia/conferences ($n=24$), 29% would attend workshops/small group sessions ($n=18$), and 1 desired a form of assessment-based learning.

Recording of cannabis in charts

Seventy-one percent of clinicians reported recording information about medical cannabis in their patient's charts ($n=255$). The most common part of the chart to record this information was in the Notes section (50%, $n=171$), followed by 37% in the medication list ($n=127$) and 22% in the social history ($n=77$). An additional five add it to the problem list and two add it to their treatment plan.

Informational sources

The sources clinicians reported using to get information about medical cannabis are presented in Figure 1. The most common sources across all clinicians were the medical literature and from patients. Compared with noncertifying clinicians, physicians were significantly more likely to gain information from their patients [$\chi^2(1344)=19.64, p<0.001$]. Physicians were less likely to look to legal restrictions or policy guidelines created by their health system or practice [$\chi^2(1344)=13.55, p<0.001$] or to other physicians [$\chi^2(1344)=8.02, p=0.004$] as information sources compared with other clinicians. No other between-clinician differences were significant.

Attitudes

On average, all clinicians agreed that education about medical cannabis should be incorporated into health professional, graduate, and CME training, and none of the comparisons were below the threshold of $p<0.01$ (Table 2).

In terms of whether physicians should be allowed to certify patients, physicians were significantly more likely than other clinicians to endorse the legislation requiring physicians certify patients and the effect was moderate ($d=0.69$). Conversely, when asked whether nonphysicians should be able to certify patients, other clinicians were significantly more likely than physicians to endorse this item and the difference was large ($d=1.29$).

In terms of the risks and benefits of medical cannabis, physicians were more likely to see the benefits and less likely to see the harm than other clinicians on four of the six items on these domains, and effect sizes for these comparisons were all large (Cohen's $d>0.80$).

Knowledge

Clinicians generally felt knowledgeable about all aspects of medical cannabis. Across both groups, clinicians felt most comfortable explaining the therapeutic uses and providing risks, benefits, and side effect

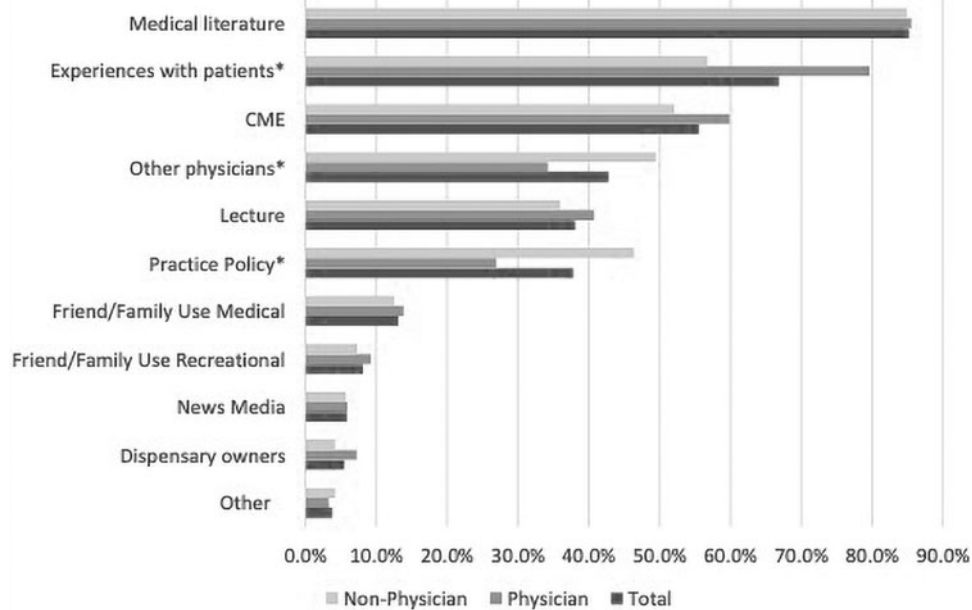


FIG. 1. Chi-square comparisons of informational sources between physicians and nonphysicians. Compared with physicians, other clinicians were significantly more likely to look to practice policy ($p < 0.001$) and other physicians ($p < 0.001$) and less likely to look to patients ($p < 0.001$) for information about medical cannabis.

Table 2. Independent t-Test Comparisons of Clinicians' Attitudes About Certification Authority, Risks, Benefits, and Training for Medical Cannabis

Variable	Physician (n = 152)	Nonphysician (n = 192)	t	p	d
	M (SD)	M (SD)			
Certification authority					
Physicians should be able to certify for MMJ	1.22 (0.65)	1.46 (0.72)	-3.27	0.001	0.69
Nonphysicians should be able to certify for MMJ	2.93 (1.48)	1.84 (1.10)	7.57	<0.001	1.29
Risks and benefits					
MMJ can help patients who have chronic debilitating conditions	1.29 (0.58)	1.36 (0.65)	-1.12	0.266	0.62
Cannabis can be physically addictive	3.13 (1.33)	2.65 (1.31)	3.35	0.001	1.32
Using cannabis poses serious physical health risks, even when used as recommended by a health care professional	3.93 (1.06)	3.17 (1.19)	6.25	<0.001	1.13
Using cannabis poses serious mental health risks, even when used as recommended by a health care professional	3.69 (1.14)	3.11 (1.23)	4.42	<0.001	1.19
There are significant physical health benefits to using MMJ as recommended by a health professional	1.62 (0.85)	1.85 (0.87)	-2.54	0.012	0.86
There are significant mental benefits to using MMJ as recommended by a health professional	1.66 (0.78)	1.96 (0.88)	-3.37	0.001	0.84
Training					
Training about MMJ should be incorporated into health professional training	1.46 (0.80)	1.29 (0.68)	2.10	0.037	0.74
Training about MMJ should be incorporated into postgraduate training	1.44 (0.77)	1.26 (0.63)	2.50	0.015	0.69
CME on MMJ should be available	1.21 (0.54)	1.13 (0.45)	1.63	0.103	0.49

To adjust for multiple comparisons, only $p < 0.01$ will be considered significant. Ratings are from: 1 = *strong agree*, 2 = *agree*, 3 = *neither agree nor disagree*, 4 = *disagree*, 5 = *strongly disagree*.

CME, continuing medical education; MMJ, medical marijuana.

Table 3. Independent t-Test Comparisons by Physicians Versus Nonphysicians for Self-Assessed Knowledge

Variable	Clinician types		t	p	d
	Physician (n = 152)	Nonphysician (n = 192)			
	M (SD)	M (SD)			
1. I can discuss MMJ with patients and obtain their consent to use MMJ	1.28 (0.46)	3.55 (1.33)	-19.28	<0.001	0.98
2. I can provide risks, benefits, and side effects information about MMJ to patients	1.34 (0.60)	3.12 (1.24)	-16.63	<0.001	0.99
3. I can provide risks, benefits, and side effects information about MMJ to health care professionals	1.44 (0.66)	3.25 (1.24)	-16.05	<0.001	1.01
4. I can explain the potential therapeutic uses of MMJ	1.38 (0.55)	2.77 (1.19)	-13.71	<0.001	0.95
5. I can explain the mechanism of action of MMJ	1.83 (0.87)	3.27 (1.17)	-12.71	<0.001	1.04
6. I can describe the alternative route of administration of cannabis	1.55 (0.65)	2.87 (1.22)	-12.38	<0.001	0.99
7. I can provide MMJ dosing and effective treatment plans for patients	2.50 (1.25)	3.80 (1.10)	-9.76	<0.001	1.18
8. I can explain to patients how to obtain an ID card for MMJ	1.30 (0.53)	3.36 (1.35)	-18.33	<0.001	1.04
9. I can state the steps I need to take to register as a practitioner who can recommend MMJ to patients	1.34 (0.59)	3.86 (1.17)	-24.20	<0.001	0.93
10. I can explain the potential drug interactions with MMJ	2.03 (0.96)	3.34 (1.24)	-10.73	<0.001	1.12
11. If I provide recommendations or restrictions with my prescription, my patients receive the forms and doses of MMJ that I intended	2.32 (1.10)	3.50 (1.23)	-8.08	<0.001	1.16

To adjust for multiple comparisons, only $p < 0.01$ will be considered significant. Cohen's d is used to estimate the effect sizes of comparisons. Cohen's $d > 0.80$ is interpreted as a large effect. Rating scale: 1 = strong agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree.

information about cannabis, and they felt least prepared to provide dosing and effective treatment plans. However, in between-group comparisons, there were large differences regarding knowledge about medical cannabis (Table 3, range of Cohen's $d = 0.93-1.16$), as physicians felt significantly more knowledgeable compared with all other clinicians in every domain.

dosing, and limited clinician knowledge were the limitations most commonly reported by all clinicians. Physicians were less likely to perceive limitations than other clinicians in all but two domains: legal issues and that there is little information regarding cannabis's effectiveness. The magnitude of the differences for all the significant items was large.

Perceived limitations

Clinicians agreed or strongly agreed about most perceived limitations (Table 4). Legal issues, uncertain

Vulnerable populations

Clinicians indicated being neutral or slightly uncomfortable discussing medical cannabis with most

Table 4. Independent t-Test Comparisons by Physicians Versus Nonphysicians for Perceived Limitations of Medical Cannabis

	Physician (n = 152)	Nonphysician (n = 192)	t	p	d
	M (SD)	M (SD)			
1. Legal issues	1.74 (0.95)	1.65 (0.85)	1.00	0.317	0.90
2. Legal issues for certifying physician	2.76 (1.23)	1.78 (0.82)	8.39	<0.001	1.02
3. Limited clinician knowledge of available products and where to get them	1.91 (1.01)	1.65 (0.77)	2.64	0.009	0.89
4. Uncertain dosing	1.93 (1.03)	1.56 (0.68)	3.76	<0.001	0.85
5. Risk of abuse/dependence	3.16 (1.09)	2.49 (1.18)	5.38	<0.001	1.15
6. Stigma associated with recreational use of cannabis	2.27 (1.00)	1.86 (0.90)	4.02	<0.001	0.94
7. Limited evidence of effectiveness	2.84 (1.30)	2.64 (1.15)	1.50	0.134	1.22
8. Route of delivery	3.14 (1.19)	2.49 (1.11)	5.18	<0.001	1.15
9. Side effects	3.06 (1.05)	2.54 (1.05)	4.52	<0.001	1.05
10. Interactions with other medications	3.09 (1.08)	2.54 (1.08)	4.72	<0.001	1.08
11. Mechanism of action	3.39 (1.00)	2.73 (1.06)	5.94	<0.001	1.03
12. Need for monitoring	3.21 (1.12)	2.50 (1.06)	5.99	<0.001	1.09

To adjust for multiple comparisons, only $p < 0.01$ will be considered significant. Cohen's d is used to estimate the effect sizes of comparisons. Cohen's $d > 0.80$ is interpreted as a large effect. Rating scale: 1 = strong agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, 5 = strongly disagree.

Table 5. Independent t-Test Comparisons Between Physicians and Nonphysicians Regarding Comfort Discussing Medical Cannabis with Vulnerable Populations

Variable	Clinician types		t	p	d
	Physician (n = 151)	Nonphysician (n = 192)			
	M (SD)	M (SD)			
Have a comorbid diagnosis of serious mental illness (schizophrenia, depression, or bipolar)	2.52 (1.33)	3.43 (1.19)	-6.54	<0.001	1.25
Are pregnant or breastfeeding	3.08 (1.43)	3.82 (1.05)	-5.27	<0.001	1.23
Have a substance use diagnosis (not for cannabis)	2.28 (1.19)	3.56 (1.18)	-9.86	<0.001	1.19
Are geriatric (>60 years old)	1.66 (0.92)	3.05 (1.27)	-11.85	<0.001	1.13
Are a child/adolescent (<18 years old)	3.18 (1.48)	3.72 (1.12)	-3.70	<0.001	1.29

To adjust for multiple comparisons, only $p < 0.01$ will be considered significant. Rating scale: 1 = *strong agree*, 2 = *agree*, 3 = *neither agree nor disagree*, 4 = *disagree*, 5 = *strongly disagree*.

vulnerable populations except for geriatric patients, with whom clinicians appeared slightly more comfortable. Physicians felt significantly more comfortable discussing medical cannabis than all other clinicians with patients who have serious mental illnesses, are pregnant or breastfeeding, have a substance use diagnosis, are children/adolescents, or are geriatric (Cohen's $d = 1.13$ – 1.29 ; Table 5).

Discussion

This study highlights the diversity in knowledge, comfort, and willingness to recommend or incorporate cannabis into medical care among interprofessional clinicians. Given the rapid growth of medical cannabis programs internationally, it is critical to understand how different clinicians perceive cannabis,^{16–18} what their training experiences and knowledge gaps are, and how new educational material can best reach them. The results of the present study highlight critical differences in the level of preparation that certifying physicians are given relative to other health professionals who may frequently encounter patients using medical cannabis but cannot authorize its use.

Echoing prior international research^{5,19,20} on the preparation of health care professionals about cannabis, these data also demonstrate that there are significant deficits in the knowledge base and training even among physicians in the United States who can certify patients for use. There is an urgent need to improve the quality of cannabis training and for investment in high-quality research testing the medical risks and benefits of cannabis use in specific populations.

Consistent with the prior literature, this study found a significant need for additional training for clinicians regarding medical cannabis as barely more than half reported receiving formal training.^{21,22} Indeed, most

clinicians agreed that medical cannabis training should be included in health professional, postgraduate, or CME training and reported key gaps in their awareness of dosing, forms, or local guidelines for its use.²³ While not the primary source, a significant number of clinicians in the present study reported getting information from patients about cannabis (67%), which is similar to or slightly higher than what previous surveys have found (ranging from 54% to 61% across surveys^{13,14,24}).

Encouragingly, compared with Carlini and colleagues' (2017) survey, which was collected in 2014, clinicians in our study were more likely to learn information about cannabis from peer-reviewed journals (85% vs. 52%, respectively) and CME (56% vs. 24%, respectively) rather than informal sources such as other physicians (43% vs. 53%, respectively) or news media (6% vs. 57%, respectively).

This may reflect that the evidence base for medical cannabis has rapidly grown in the past two decades,²⁵ allowing clinicians to glean more scientifically grounded, peer-reviewed sources. Legal issues and uncertain dosing were the two of the limitations most commonly reported by all clinicians in this study and in the Carlini et al.'s study, which suggests that these are persistent knowledge gaps that require urgent attention in future research.

Clinicians have a limited ability to learn and access more in-depth cannabis medical information; however, it is apparent that more standard approaches to integration of medical cannabis use, pathophysiology, drug–drug interactions, and legal concerns are also needed across all health science-related professional curricula. As cannabis use continues to increase across all ages for many medical conditions,²⁶ this should be a part of standard medical education rather than the onus on industry or state governments.

Physicians indicated that they felt more confident than nonphysicians felt in many domains and were far more likely to see the benefits and less likely to see the limitations of medical cannabis. Of note, most clinicians were much more likely to recommend cannabis to those not responding to first-line treatments rather than if a patient requested or inquired about cannabis use. While cannabis use seems more “acceptable” in palliative or end-of-life care,²⁷ this distinction may create a barrier to access for less sick patients who may benefit from cannabis use.

Additionally, while many clinicians supported or recommended use in certain instances, very few appropriately documented cannabis as a medication or as a treatment, giving rise to the lack of universal clinical visibility into patient use. The need for more connected cannabis education and data sharing continues to grow to safely recommend and inform our patients and families.²⁸

Each state legislature has taken varied approaches resulting in state-to-state differences in who can certify patients or work in dispensaries, further highlighting the need for ongoing research and a universal increase in professional education. In most states, as in PA, only physicians can certify and a variety of programs offer certification training (<https://www.health.pa.gov/topics/programs/Medical%20Marijuana/Pages/Physicians.aspx>).

However, other states have different policies; for example, Maryland allows physicians, nurse practitioners, dentists, podiatrists, and nurse midwives to certify their patients. Nursing support of cannabis as a medical therapeutic remains high; prior reports support up to 90% of surveyed nurses would recommend cannabis if allowed to do so.²⁰ Although beyond the scope of this study, future work should evaluate state-by-state differences in training provided and the impact that allowing nonphysicians to certify has on access and use.

Limitations

The study was cross-sectional and did not test actual knowledge about cannabis but does provide a temperature check of clinician preparation to address this growing domain of clinical care. The response rate of the present study was somewhat low, which may be due to the timing of the study during COVID-19. However, it is notable that participants in the present study represent a broad cross section of clinician types, allowing important comparison tests between certifying and noncertifying clinicians. This study surveyed clinicians

in one state only, not nationally; however, it is representative of a similar larger status of cannabis education in health care.

Few studies have included this range of positions about general medical cannabis practices⁸ (most studies include a single specialty or focus on a specified disease), are from Washington state only (where a five types of health care providers can certify), and response rate information was either not provided¹⁴ or had similar sample sizes.¹⁸ Finally, this study was funded by a cannabis company. All data and interpretations of the present study’s data were completed independently by the research team and were not subjected to approval by the study’s sponsor, which limits concern about potential bias due to the sponsorship.

Conclusions

There is an urgent need to educate and train all clinicians who are involved in the care of patients who use medical cannabis, as these patients receive care in broad spectrum of specialties and provider types. Establishing tools and supports to facilitate high-quality conversations and guidance regarding medical cannabis should be an important next step for future research.

Author Disclosure Statement

The lead author (B.W.) discloses that she is on an advisory board for PAX. No other contributing authors have anything to disclose. Additionally, this study was funded by a grant from Ethos Cannabis.

Funding Information

This study was supported by a grant from Ethos Cannabis.

References

1. Carliner H, Brown QL, Sarvet AL, et al. Cannabis use, attitudes, and legal status in the U.S.: a review. *Prev Med (Baltim)*. 2017;104:13–23.
2. Brooks E, Gundersen DC, Flynn E, et al. The clinical implications of legalizing marijuana: are physician and non-physician providers prepared? *Addict Behav*. 2017;72:1–7.
3. Han BH, Sherman S, Mauro PM, et al. Demographic trends among older cannabis users in the United States, 2006–2013. *Addiction*. 2017;112:516–525.
4. Cooke AC, Knight KR, Miaskowski C. Patients’ and clinicians’ perspectives of co-use of cannabis and opioids for chronic non-cancer pain management in primary care. *Int J Drug Policy*. 2019;63:23–28.
5. Evanoff AB, Quan T, Dufault C, et al. Physicians-in-training are not prepared to prescribe medical marijuana. *Drug Alcohol Depend*. 2017;180:151–155.
6. 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 Pharmacy Teach Learn*. 2019;11:1–9.
7. Caligiuri FJ, Ulrich EE, Welter KJ. Pharmacy student knowledge, confidence and attitudes toward medical cannabis and curricular coverage. *Am J Pharm Educ*. 2018;82:424–432.

8. Gardiner KM, Singleton JA, Sheridan J, et al. Health professional beliefs, knowledge, and concerns surrounding medicinal cannabis—a systematic review. *PLoS One*. 2019;14:1–13.
9. Braun IM, Wright A, Peteet J, et al. Medical oncologists' beliefs, practices, and knowledge regarding marijuana used therapeutically: a nationally representative survey study. *J Clin Oncol*. 2018;36:1957–1962.
10. Abrams DI. Integrating cannabis into clinical cancer care. *Curr Oncol*. 2016;23(Suppl. 2):S8–S14.
11. von Wrede R, Moskau-Hartmann S, Amarell N, et al. Knowledge, expectations and fears of cannabis use of epilepsy patients at a tertiary epilepsy center. *Epilepsy Behav*. 2019;99:106458.
12. Bobitt J, Qualls SH, Schuchman M, et al. Qualitative analysis of cannabis use among older adults in Colorado. *Drugs Aging*. 2019;36:655–666.
13. Kondrad E, Reid A. Colorado family physicians' attitudes toward medical marijuana. *J Am Board Fam Med*. 2013;26:52–60.
14. Carlini BH, Garrett SB, Carter GT. Medicinal cannabis: a survey among health care providers in Washington State. *Am J Hosp Palliat Med*. 2017;34:85–91.
15. Cohen J. *Statistical power analysis for the behavioral sciences*, 2nd ed. Hillsdale, NJ: Erlbaum, 1988.
16. Corroon J, Sexton M, Bradley R. Indications and administration practices amongst medical cannabis healthcare providers: a cross-sectional survey. *BMC Fam Pract*. 2019;20:1–12.
17. Kaplan L, Klein T, Wilson M, et al. Knowledge, practices, and attitudes of Washington State health care professionals regarding medical cannabis. *Cannabis Cannabinoid Res*. 2020;5:172–182.
18. Charuvastra A, Friedmann PD, Stein MD. Physician attitudes regarding the prescription of medical marijuana. *J Addict Dis*. 2005;24:87–93.
19. Zolotov Y, Grinstein CO, Findley PA, et al. Attitudes and knowledge about medical cannabis among Israeli and American nursing students. *Nurse Educ Today*. 2021;99:104789.
20. Reece S, Holle L, Mukherjee K. Survey of pharmacists' knowledge of Connecticut's medical cannabis program. *Cannabis Cannabinoid Res*. 2021;6:66–73.
21. Friedmann PD, McCullough D, Saitz R. Screening and intervention for illicit drug abuse: a national survey of primary care physicians and psychiatrists. *Arch Intern Med*. 2001;161:248–251.
22. Balneaves LG, Alraja A, Ziemianski D, et al. A national needs assessment of Canadian nurse practitioners regarding cannabis for therapeutic purposes. *Cannabis Cannabinoid Res*. 2018;3:66–73.
23. Zolotov Y, Vulfsons S, Zarhin D, et al. Medical cannabis: an oxymoron? Physicians' perceptions of medical cannabis. *Int J Drug Policy*. 2018;1:4–10.
24. Kelly E, Pasquarella FJ, Davis L, et al. Managing substance use for clients with serious mental illnesses: knowledge, attitude, and training challenges among outpatient behavioral health providers in California, Ohio, and New York. *J Subst Abuse Treat*. 2021;10854.
25. Treister-Goltzman Y, Freud T, Press Y, et al. Trends in publications on medical cannabis from the year 2000. *Population Health Manag*. 2019;22:362–368.
26. Wall MM, Liu J, Hasin DS, et al. Use of marijuana exclusively for medical purposes. *Drug Alcohol Depend*. 2019;1:13–15.
27. Uritsky TJ, McPherson ML, Pradel F. Assessment of hospice health professionals' knowledge, views, and experiences with medical marijuana. *J Palliat Med*. 2011;14:1291–1295.
28. Whiting PF, Wolff RF, Deshpande S, et al. Cannabinoids for medical use: a systematic review and meta-analysis. *JAMA*. 2015;313:2456–2473.

Cite this article as: Worster B, Ashare RL, Hajjar E, Garber G, Smith K, Kelly EL (2021) Clinician attitudes, training, and beliefs about cannabis: an interprofessional assessment, *Cannabis and Cannabinoid Research X:X*, 1–10, DOI: 10.1089/can.2021.0022.

Abbreviations Used

CME = continuing medical education
 MMJ = Medical Marijuana
 PA = Pennsylvania
 SD = standard deviation