Towards a comprehensive understanding of complex medical conditions among patients in a large medical cannabis database: A descriptive analysis

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ABSTRACT

INTRODUCTION Cannabis use for medical purposes has surged in the past decade. However, understanding who medical cannabis patients are and their accompanying health issues remains limited.
METHODS Utilizing Leafwell patient database (LPD) data from 2022, we describe the demographics and top 15 primary qualifying conditions (PQCs) of medical cannabis patients across 32 states of the United States. We employed descriptive statistics and χ^2 tests to discern differences in PQCs across age, sex, and race/ethnicity. We describe the self-reported rank-order (1–5) of co-occurring conditions.
RESULTS In 2022, there were 81433 new medical cannabis patients registered in the LPD, 93.2% of whom (n=75904) reported a list of the top 15 PQCs. Leading PQCs were chronic pain (n=24340), anxiety (n=20370), and post-traumatic stress disorder (PTSD) (n=8517). The top 15 conditions varied across all demographics (p<0.001). Notably, a lower percentage of Hispanics reported chronic pain as their PQC compared to other race/ethnicities; a higher percentage of those aged <21 years reported insomnia as their PQC compared to older age groups. Anxiety and chronic pain were either the first or second PQC or rank-order second condition. Insomnia was a more common rank-order third condition (n=3597) and rank-order fourth condition (n=1796). PTSD was the leading rank-order fifth condition (n=784).
CONCLUSIONS This study underscores demographic differences across PQCs among a large sample of medical cannabis patients representing data from 36 states of the US. We note patients often report more than one medical condition, suggesting that the reasons for using medical cannabis may be more complex medically than previously understood.

INTRODUCTION

The use of cannabis for medical purposes has existed for centuries[1] and has garnered increased attention in the past two decades[2,3]. Growing interest in the use of medical cannabis has led to an increase in its use by patients[2]. The increase in the use of medical cannabis in the US is due to state-level law changes. As of 2024, the use of medical cannabis products has been legalized in 38 states, three territories, and the District of Columbia, resulting in roughly 4.1 million registered medical cannabis patients[3].

To facilitate access to legal medical cannabis, states established medical cannabis programs providing oversight over those who were obtaining medical cannabis and

why, via a registration process, i.e. medical cards. As part of obtaining a medical card most states with legalized medical cannabis maintain a list of primary qualifying medical conditions (PQC). Prospective patients must obtain certification from a physician confirming their diagnosis with one of these conditions, in order to become eligible for medical cannabis use via a medical card. Utilization of state-run medical cannabis programs has steadily increased since the mid 2010s[2-5]. PQCs vary significantly from state to state. While the majority of states maintain a strict list of conditions for a patient to obtain a card, a small number of states including Massachusetts, California, and New York, allow for physicians to exercise discretion in their medical

card approval recommendations[6].

Several recent studies have examined the demographics of medical cannabis patients and their PQCs related to their use of medical cannabis[2-8]. Research analyzing state patient registry data from the early 2000s to the mid 2010s, indicated an increase in participation in medical cannabis programs, with chronic pain being the most common qualifying condition, followed by multiple sclerosis[2,4,5]. These studies noted an increasing trend in registrants and emphasized the prevalence of different co-occurring conditions among patients, or patients reporting more than one condition as their reason for using medical cannabis.

Recent research, using data from 22 medical cannabis evaluation clinics across five states (e.g. Colorado, Connecticut, Maine, Maryland, and Massachusetts), revealed that the majority of medical cannabis users were predominantly White, non-Hispanic, mostly male, with average age in the mid 40s[7]. Additionally, they found that males had a mean of 3.1 co-occurring conditions, whereas females had 2.3. The proportion of self-reported medical conditions varied across states[7]. The finding that patients on average had 3 medical conditions was notable, as it suggests that simply knowing a patient's PQC may not be satisfactory for understanding their total health status. Other descriptive studies of medical cannabis patients from a population-level perspective are limited by sample size[9], describe patients from outside the US[10,11], or focus on specific populations[8].

The primary objective of this study is to understand the following research questions: 1) 'What are the key demographics of medical cannabis patients from a large-scale patient database?'; 2) 'Do differences in PQCs exist across key demographics?'; and 3) 'What is the average number of medical conditions a patient reports, and what are the most common other medical conditions that medical cannabis patients have?'.

METHODS

This cross-sectional study was conducted using retrospective, anonymized data supplied by Leafwell[12], a telehealth platform for obtaining medical cards. Leafwell operates in 32 states in the US and is advertised on internet search engines and digital media for connecting potential medical cannabis patients with physicians within their state. After a physician deems a patient qualified for medical cannabis, Leafwell assists patients in obtaining their medical card. Leafwell patients are asked to fill in a baseline questionnaire regarding basic demographic information and medical conditions, which comprises the Leafwell patient database (LPD).

To achieve our research aims, we accessed and analyzed LPD data from 1 January to 31 December 2022. All patients were from the US. Leafwell's patient registry data were collected through a structured questionnaire. The questionnaire asked patients their basic demographic information including age, race/ethnicity, sex, as well as

health. As this was a retrospective study, we included all patients that obtained a medical card, which meant that their PQC was confirmed by a physician.

For patient confidentiality, only de-identified data from the LPD were shared with internal researchers. Researchers did not have access to non-anonymized data. This project received ethics exempt status from an external, third-party Institutional Review Board, BRANY (IRB Number: IRB00000080). Patients consented to the use of their questionnaire data in aggregate form as part of the Leafwell terms of service.

The questionnaire asked patients to report their primary reason for seeking medical cannabis, or PQC, which was later approved or denied by a physician. The questionnaire then asked patients to report any other medical conditions they have that are related to their potential use of medical cannabis as a treatment. If patients responded, 'yes', to the question: 'Do you have any other medical conditions related to why you are seeking medical cannabis?', they were able to select multiple conditions in a preference list, i.e. medical condition 1, medical condition 2, etc. These other conditions were not confirmed by a physician. They were provided by the patient in a rank order of relevance related to their potential use of medical cannabis as a treatment. The completion rate of this baseline questionnaire was near 90% during the study period.

We classified racial/ethnic identity into four groups: Black, non-Hispanic, White, non-Hispanic, Hispanic, and other races. Sex was categorized into male and female categories. Age was stratified into 3 categories: <21; 21–49; and ≥50 years. We also examined age as a continuous variable. For this analysis, we focused on the most frequent 15 PQCs.

Statistical analysis

We present frequencies and percentages of the top 15 PQCs across various demographic categories. We also present the distribution of patients' age. To understand whether differences in PQCs exist across key demographics, we tested whether the top 15 PQCs varied across each demographic category (race/ethnicity, sex, and age) using χ^2 tests of statistical independence. To understand the average number of medical conditions a patient reports and the most common other medical conditions that medical cannabis patients have, we provide a breakdown of the rank-order (1–5) of the conditions provided by patients as part of the self-reported questionnaire. All analyses were conducted using Stata13, version 18.0.

RESULTS

In total, there were 81433 medical cannabis patients within the LPD in 2022. The top 15 PQCs accounted for 93.2% (n=75904) of the primary conditions reported (Table 1). Among qualifying conditions, chronic pain (n=24340) was most often reported, followed by anxiety (n=20370), and post-traumatic stress disorder (PTSD) (n=8517). We found

Table 1. Distribution of and difference for primary qualifying medical conditions by demographics, medical cannabis patients from the Leafwell patient database, United States, 2022 (N=75904)

	Sex		Age (years)			Race/Ethnicity				Total
	Female	Male	<21	21–49	≥50	White non-Hispanic	Black non-Hispanic	Hispanic	Other Race	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
TOTAL	36893 (48.93)	38600 (51.07)	6274 (8.27)	49518 (65.24)	20112 (25.40)	54253 (71.78)	7857 (10.35)	6352 (8.37)	5399 (7.11)	75904 (100)
Chi-squared p	<0.001		<0.001			<0.001				
Condition										
Chronic pain	10554 (28.61)	13713 (35.53)	994 (15.84)	14164 (28.6)	9182 (45.65)	18054 (33.28)	2472 (31.46)	1326 (20.88)	1552 (28.75)	24340 (32.07)
Anxiety	10352 (28.06)	9902 (25.65)	2435 (38.81)	14935 (30.16)	3000 (14.92)	14558 (26.83)	1849 (23.53)	2129 (33.52)	1454 (26.93)	20370 (26.84)
PTSD	4751 (12.88)	3687 (9.55)	540 (8.61)	6615 (13.36)	1362 (6.77)	5903 (10.88)	1146 (14.59)	668 (10.52)	595 (11.02)	8517 (11.22)
Other	4172 (11.31)	3481 (9.02)	617 (9.83)	4854 (9.8)	2247 (11.17)	5660 (10.43)	770 (9.8)	579 (9.12)	562 (10.41)	7718 (10.17)
Insomnia	1403 (3.8)	2480 (6.42)	705 (11.24)	2396 (4.84)	795 (3.95)	2467 (4.55)	353 (4.49)	617 (9.71)	401 (7.43)	3896 (5.13)
Headache	1365 (3.7)	1023 (2.65)	291 (4.64)	1744 (3.52)	366 (1.82)	1589 (2.93)	273 (3.47)	284 (4.47)	198 (3.67)	2401 (3.16)
Depression	1264 (3.43)	1084 (2.81)	445 (7.09)	1601 (3.23)	336 (1.67)	1499 (2.76)	276 (3.51)	341 (5.37)	214 (3.96)	2382 (3.14)
Cancer	802 (2.17)	801 (2.08)	13 (0.21)	440 (0.89)	1151 (5.72)	1226 (2.26)	132 (1.68)	75 (1.18)	94 (1.74)	1604 (2.11)
Arthritis	816 (2.21)	643 (1.67)	16 (0.26)	498 (1.01)	950 (4.72)	1081 (1.99)	166 (2.11)	90 (1.42)	91 (1.69)	1464 (1.93)
Muscle spasms	478 (1.3)	696 (1.8)	49 (0.78)	838 (1.69)	287 (1.43)	728 (1.34)	208 (2.65)	87 (1.37)	108 (2)	1174 (1.55)
Epilepsy	296 (0.8)	298 (0.77)	32 (0.51)	446 (0.9)	122 (0.61)	424 (0.78)	69 (0.88)	46 (0.72)	40 (0.74)	600 (0.79)
Crohn's disease	291 (0.79)	299 (0.77)	22 (0.35)	400 (0.81)	171 (0.85)	484 (0.89)	36 (0.46)	26 (0.41)	28 (0.52)	593 (0.78)
Nausea/ vomiting	323 (0.88)	251 (0.65)	113 (1.8)	413 (0.83)	51 (0.25)	434 (0.8)	38 (0.48)	52 (0.82)	48 (0.89)	577 (0.76)
HIV/AIDS	22 (0.06)	237 (0.61)	1 (0.02)	169 (0.34)	89 (0.44)	139 (0.26)	69 (0.88)	32 (0.5)	13 (0.24)	259 (0.34)
Muscular dystrophy	4 (0.01)	5 (0.01)	1 (0.02)	5 (0.01)	3 (0.01)	7 (0.01)	0 (0)	0 (0)	1 (0.02)	9 (0.01)

Figure 1. Top 15 physician-approved primary qualifying medical conditions by percentage of patients among the Leafwell patient database, United States, 2022 (N=75904)
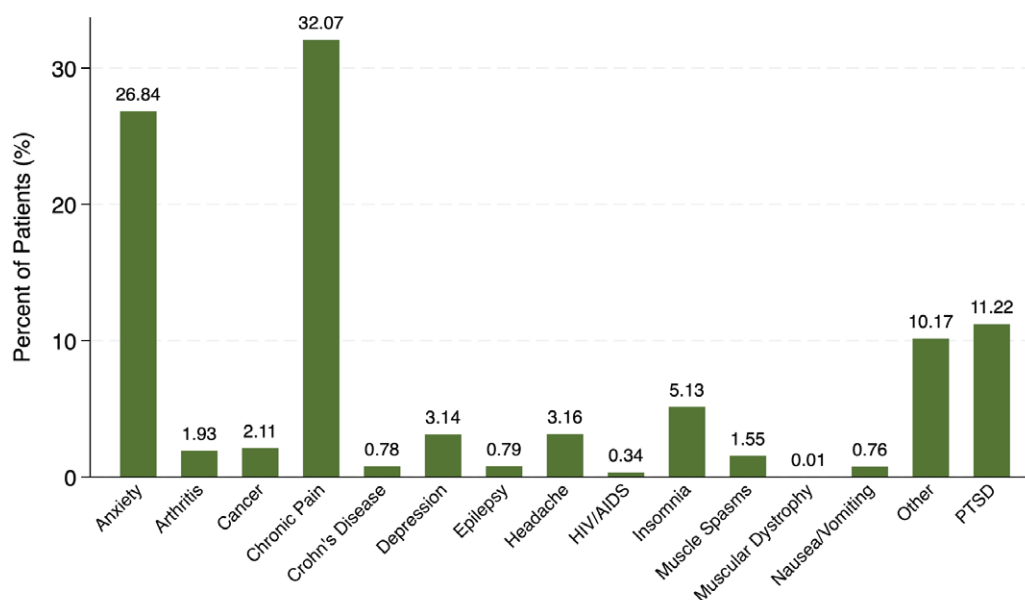
medical cannabis patients were predominantly White non-Hispanic (71.5%), followed by Black non-Hispanic (10.4%), Hispanic (8.4%) and other races (7.1%). Medical cannabis patients were 51.1% male and 48.9% female. The majority of medical cannabis patients were aged 21–50 years (65.3%), followed by ≥50 years (25.4%), and <21 years (8.3%). Supplementary file Figure 1 provides a histogram of patients' age. The mean age of the patients was 40.1 years.

The top 15 PQCs varied by race/ethnicity, age group, and sex (all p<0.001). A lower percentage of Hispanics (20.9%) reported having chronic pain as a PQC compared to White non-Hispanics (33.3%), Black non-Hispanics (31.5%), and other races (28.8%). Conversely, a slightly higher percentage of Hispanics reported anxiety (33.5%) compared to around 25% for all other race/ethnicities. Nearly 6% of those aged ≥50 years reported cancer as their PQC, compared to <0.21% for those aged <21 years, and 0.89% for those aged 21–49 years. Insomnia was reported by 11.2% for those aged <21 years, which was double the percentage for those aged 21–49 years or ≥50 years. On average, there were 2.13 (SD=1.29) total conditions reported per patient (data not shown). Only 41.4% of patients reported having only one medical condition.

Of the 75904 patients with a list of the top 15 PQCs, 42517 (56%) reported at least one other condition, 19420 (25.6%) reported at least three conditions, 8026 (10.6%) reported at least four conditions, and 3495 (4.6%) reported five conditions. Figure 1 provides the distribution of the top 15 physician approved PQCs in 2022 in the LPD, expressed as percentage of patients. Figure 1 displays the data provided

in the total column from Table 1 expressed as a percent of patients. We also provide the percent of patients for the rank-order second, third, fourth, and fifth listed conditions in the Supplementary file.

Similar to the PQC, anxiety (32.9%) and chronic pain (22.3%) were also the most common secondary rank-order medical condition, though here anxiety represented a larger percentage of patients compared to chronic pain (Supplementary file Figure 2). For the third-ranked condition, insomnia (18.5%) was the most common medical condition followed by chronic pain (16.6%) (Supplementary file Figure 3). For the fourth-ranked medical condition, insomnia (22.4%) was the most common, followed by muscle spasms (15.8%) (Supplementary file Figure 4). PTSD was the most common fifth-ranked medical condition (22.4%) (Supplementary file Figure 5).

DISCUSSION

Our results represent a further step towards understanding the complex co-occurring medical conditions associated with the initiation of medical cannabis treatment. Understanding who medical cannabis patients are and the types of self-reported co-occurring conditions they report, will assist medical professionals in communicating with patients about using medical cannabis. In line with previous study efforts, we find that chronic pain is the leading physician diagnosed medical condition for using medical cannabis[2,4,6,7]. The finding that anxiety and PTSD were the second and third leading PQCs align more with research using commercial datasets[6,7], in contrast to earlier research using state-registries, which

found multiple sclerosis and cancer as leading PQCs related to medical cannabis[4]. This suggests that the reasons for using medical cannabis may have changed over time. Similar to prior research, we found that medical cannabis patients report more than 2 conditions related to their treatment initiation[2,6,7].

Limitations

This study has some limitations, due to reliance on self-reported data obtained from a large-scale commercial entity, which may introduce bias in the information presented for non-physician approved medical conditions. It is necessary to note that the self-reported medical conditions do not represent clinical diagnoses. Due to the nature of some states setting strict limits on which patient conditions qualify for medical cannabis, we must also note that it is possible that PQCs and other conditions provided here may not reflect a patient's reason for obtaining a medical card. Although this is a lower concern for the primary condition, as this medical condition is verified by a physician.

CONCLUSIONS

Understanding patients' self-reported number of medical conditions holds value and aids in comprehending patients' perceptions of their medical conditions as it relates to medical cannabis usage. Overall, this work contributes to our understanding who medical cannabis patients are and why they use medical cannabis, in the US. It presents a novel exploration of how medical conditions are rank-ordered, providing information regarding multiple co-occurring conditions.

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