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Use of Cannabis to Relieve Pain and Promote Sleep by Customers at an Adult Use Dispensary

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ABSTRACT

Medical cannabis patients consistently report using cannabis as a substitute for prescription medications; however, little is known about individuals accessing cannabis through adult-use markets. A survey at two retail stores was conducted in Colorado, United States. Between August 2016 and October 2016, store staff asked customers if they wanted to participate and, if so, provided an electronic survey link. All customers reporting medical certification were excluded. Of 1,000 adult-use only customer respondents, 65% reported taking cannabis to relieve pain and 74% reported taking cannabis to promote sleep. Among respondents taking cannabis for pain, 80% reported that it was very or extremely helpful, and most of those taking over-the-counter pain medications (82%) or opioid analgesics (88%) reported reducing or stopping use of those medications. Among respondents taking cannabis for sleep, 84% found it very or extremely helpful, and most of those taking over-the-counter (87%) or prescription sleep aids (83%) reported reducing or stopping use of those medications. *De facto* medical use of cannabis for symptom relief was common among adult-use dispensary customers and the majority reported that cannabis decreased their medication use. Adult use cannabis laws may broaden access to cannabis for the purpose of symptom relief.

Introduction

Cannabis has been used for pain relief and to promote sleep for thousands of years (Zuardi 2006). Over the past several decades in the United States (U.S.), a therapeutic role for cannabis in mainstream medicine has increasingly emerged. In January 2017, the National Academies of Sciences, Engineering, and Medicine released a landmark report reviewing the available evidence of the benefits and harms of cannabis use, and found "substantial evidence" that cannabis is effective for chronic pain and "moderate evidence" that cannabinoids are effective at improving short-term sleep outcomes in individuals with sleep disturbance from certain medical conditions (National Academies of Sciences Engineering and Medicine 2017). As of January 2019, 33 states and the District of Columbia have enacted medical cannabis laws and 10 states and the District of Columbia have enacted laws legalizing cannabis sales to the general adult population age 21 years and older.

Patients and health care providers are interested in alternatives to commonly used prescription analgesics (e.g., opioid analgesics) and sleep aids (e.g., benzodiazepines and Z-drugs) because of concern about medication-associated adverse events such as injuries, misuse, use disorder, and overdose (Araujo et al. 2017; Bachhuber et al. 2016; Glass et al. 2005; Goshua et al. 2017; Rudd et al. 2016). In surveys of patients taking medical cannabis, 51–80% report taking cannabis as a substitute for prescription drugs (Boehnke, Litinas, and Clauw 2016; Corroon, Mischley, and Sexton 2017; Lucas and Walsh 2017; Nunberg et al. 2011; Piper et al. 2017; Reiman 2009; Reiman, Welty, and Solomon 2017; Zaller et al. 2015). However, access to medical cannabis typically requires a physician's certification and registration in a state database. These requirements may serve as barriers to some individuals because of lack of health care access. In addition, as not all states provide legal employment protections for registered medical cannabis patients, some individuals may be concerned about the possibility of employment discrimination (Goldsmith et al. 2015).

Adult use markets (i.e., areas where cannabis is legal to purchase for the general adult population) do not have such requirements to register and, therefore, may

broaden access to cannabis for the purpose of symptom relief among individuals who are unable or unwilling to register with the medical cannabis program. However, in contrast to registered medical cannabis patients, little is known about adult use customers' use of cannabis for symptom relief and substitution of cannabis for prescription and over-the-counter medications. In a recent survey in Washington State, 24.4% of people who used cannabis in the past 90 days without a medical certification reported substituting cannabis for prescription medications (Corroon, Mischley, and Sexton 2017), however these respondents were not necessarily adult use dispensary customers. Specifically, the use of cannabis for symptom relief and potential substitution of cannabis for prescription and over-the-counter medications among adult use customers is not known. To address this gap in knowledge, we conducted a survey among individuals who purchased cannabis from an adult use dispensary.

Methods

The survey was conducted as part of a customer feedback program at two retail stores within a single cannabis dispensary organization located in Colorado. Colorado's adult use law requires that dispensaries check customers' photo identification to verify age (21 years or over) prior to entry and limits the quantity of cannabis that can be purchased at one time. Eligible survey participants were all adult use customers (i.e., without a medical certification).

Between August 2016 and October 2016, store staff asked a convenience sample of customers if they wanted to participate in the survey and, if so, provided an electronic link to the survey (SurveyGizmo, Widgix Software, LLC, Boulder, CO, USA). Survey respondents were offered a chance to enter in a raffle for one $100 gift card. The survey was developed internally by the dispensary organization to elicit customer feedback and understand customers' use of cannabis for symptom relief. It consisted of questions about sociodemographic factors (age, gender, race/ethnicity, education level, history of military service), self-reported health status, use of cannabis for pain relief, and use of cannabis to promote sleep. For respondents reporting use of cannabis to relieve pain, the survey then asked, "How, if at all, has cannabis changed your over-the-counter pain medication use in the last 6 months?" with examples of over-the-counter pain medications listed with the response options: "I never took over-the-counter pain medication," "I have not changed my over-the-counter pain medication use," "I have increased my over-the-counter pain medication use," "I have decreased my over-the-counter

pain medication use," and "I completely stopped taking over-the-counter pain medication." Question wording was the same when asking about prescription pain medications (opioid analgesics) and when asking about prescription and over-the-counter sleep aids. The full text of the survey questions is publicly archived on figshare (https://doi.org/10.6084/m9.figshare.7781105).

Survey responses were anonymous and researchers were provided a link to download survey data directly from the electronic survey platform. Not all respondents answered all questions; for each item we used the number of responses as the denominator. Anonymized data were provided to researchers by the dispensary organization. Descriptive statistics were performed using SAS 9.4 (Cary, NC). The study was approved by the Albert Einstein College of Medicine Institutional Review Board.

Results

Of 1,240 unique responses, 240 respondents were excluded due to medical certification, yielding a final sample of 1,000 respondents who reported being exclusively adult use customers. Most respondents were under age 50 years (90%), with 42% women, and 66% reporting white, non-Hispanic race/ethnicity (Table 1). Over half (54%) reported excellent or very good health status.

Of all respondents, 65% reported using cannabis to relieve pain (Table 2). Of those, most (72%) reported taking cannabis daily, and 80% reported that cannabis was very or extremely helpful for relieving pain. Among respondents taking over-the-counter pain medications, 82% reported reducing or stopping use of those medications. Among respondents taking opioid analgesics, 88% reported reducing or stopping use of those medications.

Of all respondents, 74% reported using cannabis to promote sleep (Table 3). Similar to those using cannabis to relieve pain, 68% of those using cannabis to promote sleep reported taking cannabis daily and 83% found cannabis to be very or extremely helpful for sleep. Among respondents taking over-the-counter sleep aids, 87% reported reducing or stopping use of those medications. Among respondents taking prescription sleep aids, 83% reported reducing or stopping use of those medications.

Discussion

In a survey of adult use customers, we found that the majority reported taking cannabis to relieve pain or to promote sleep. In addition, most respondents taking cannabis for pain or sleep reported substituting cannabis for prescription or over-the-counter analgesics or

Table 1. Characteristics of survey respondents recruited from retail cannabis dispensaries in Colorado (n = 1,000).

Characteristic	N (%)
Age category (n = 994)	
21–25	208 (21)
26–29	204 (21)
30–34	211 (21)
35–49	267 (27)
50–64	92 (9)
≥65	12 (1)
Female gender (n = 988)	418 (42)
Race/ethnicity (n = 924)	
White, non-Hispanic	610 (66)
Black, non-Hispanic	93 (10)
Hispanic/Latino, of any race	171 (19)
American Indian/Alaskan Native	13 (1)
Asian/Pacific Islander	0 (0)
Some other race, multiple races	37 (4)
Highest level of education (n = 982)	
Some high school	19 (2)
High school graduate	168 (17)
Some college	347 (35)
Trade/technical/vocational	113 (12)
College graduate	235 (24)
Some postgraduate	33 (3)
Postgraduate degree	67 (7)
Ever served in the military (n = 983)	82 (8)
Self-reported health status (n = 996)	
Excellent	157 (16)
Very good	380 (38)
Good	360 (36)
Fair	88 (9)
Poor	11 (1)

Table 2. Characteristics of survey respondents recruited from retail cannabis dispensaries in Colorado who report using cannabis to treat pain (n = 647).[*]

Characteristic	N (%)
Type of pain (n = 647)	
Chronic daily pain, neuropathic	201 (31)
Musculoskeletal	153 (24)
Headache	260 (40)
Menses[†]	87 (30)
Back pain	352 (54)
Pain after an injury	143 (22)
Other	74 (11)
Presence of multiple pain conditions (n = 647)	
2	159 (25)
3	109 (17)
4 or more	74 (11)
Frequency of cannabis use for pain (n = 646)	
Daily	462 (72)
2–3 times per week	90 (14)
Once per week	32 (5)
2–3 times per month	40 (6)
Once per month	13 (2)
Less than once per month	9 (1)
Helpfulness of cannabis for pain (n = 647)	
A little	17 (3)
Moderate	114 (18)
Very	240 (37)
Extremely	276 (43)
Took over-the-counter analgesics in past 6 months (n = 647)	535 (83)
Effect of cannabis on over-the-counter analgesic use[‡]	
No change	55 (10)
Increase	5 (1)
Decrease	310 (58)
Completely stopped taking	127 (24)
Other	5 (1)
Took opioid analgesics in past 6 months (n = 647)	319 (49)
Effect of cannabis on opioid analgesic use[‡]	
No change	30 (9)
Increase	2 (0.6)
Decrease	119 (37)
Completely stopped taking	162 (51)
Other	6 (2)

[*]Percentages may not sum to 100% due to rounding. For each variable, the number of respondents with complete information is reported in parentheses.
[†]Percentage calculated among female respondents who reported using cannabis for pain relief (n = 292)
[‡]Percentages calculated with the denominator equal to the number of respondents reporting over-the-counter or opioid analgesic use in the last 6 months, as appropriate.

sleep aids. Our findings suggest that *de facto* medical use may be highly prevalent among adult use customers, and that access to an adult use cannabis market may influence individuals' use of other medications.

Compared with surveys of medical cannabis patients, we found that adult use customers were relatively younger with a lower percentage taking either opioid analgesics (32%) or prescription sleep aids (17%); however, patterns of substitution among those survey respondents taking prescription pain or sleep medications were roughly similar to medical cannabis patients. In one recent survey of medical cannabis patients in New England, 76.7% of those taking opioids and 65.2% of those taking sleep aids reported reducing use (Corroon, Mischley, and Sexton 2017). In another recent survey of people with chronic non-cancer pain, respondents estimated that their opioid use decreased by 64% after starting medical cannabis (Boehnke, Litinas, and Clauw 2016). Our findings therefore suggest that adult use customers may be similar to medical cannabis patients in their use of cannabis as a substitute for prescription analgesics or sleep aids. Clinical studies, such randomized controlled trials examining the effect of cannabis use on prescription and over-the-counter medication use among individuals with chronic pain, are needed to determine the net benefits and harms of such substitution.

Our finding of decreased use of prescription and over-the-counter analgesics and sleep aids among customers at an adult use cannabis dispensary has potential policy implications. In a recent study of Medicaid enrollees, compared to states with medical cannabis laws and states where cannabis remained illegal, the presence of an adult use cannabis law was associated with a 6.38% lower rate of opioid prescribing (Wen and Hockenberry 2018). An early analysis of Colorado's adult-use cannabis law found a relative reduction in the opioid overdose death rate after the law's passage (Livingston et al. 2017). Our results suggest that at least some adult use customers may substitute cannabis use for prescription and over-the-counter analgesics and sleep aids. Longitudinal studies are needed to better understand whether and how individuals change their use of prescription or over-the-counter analgesics and sleep aids in states that pass adult use cannabis laws.

This study has several limitations. First, survey respondents were a convenience sample of adult use

Table 3. Characteristics of survey respondents recruited from retail cannabis dispensaries in Colorado who report using cannabis for sleep (n = 742)[*].

Characteristic	N (%)
Frequency of cannabis use for sleep (n = 742)	
Daily	500 (68)
2–3 times per week	163 (22)
Once per week	24 (3)
2–3 times per month	40 (5)
Once per month	5 (0.7)
Less than once per month	10 (1)
Helpfulness of cannabis for sleep (n = 740)	
A little	21 (3)
Moderate	105 (14)
Very	241 (33)
Extremely	373 (50)
Took over-the-counter sleep medicine in past 6 months (n = 742)	303 (41)
Effect of cannabis on over-the-counter sleep medicine use[†]	
No change	35 (12)
Increase	2 (0.6)
Decrease	106 (35)
Completely stopped taking	158 (52)
Other	2 (0.3)
Took prescription sleep medicine in past 6 months (n = 742)	174 (23)
Effect of cannabis on prescription sleep medicine use[†]	
No change	21 (12)
Increase	2 (1)
Decrease	46 (26)
Completely stopped taking	99 (57)
Other	6 (3)

[*]Percentages may not sum to 100% due to rounding. For each variable, the number of respondents with complete information is reported in parentheses.

[†]Percentages calculated with the denominator equal to the number of respondents reporting over-the-counter or prescription sleep medicine use in the past 6 months, as appropriate.

customers and, because respondents were sampled at the retail store, were likely to be more frequent visitors than the general adult use population. Further, respondents who had specific experiences or opinions may have been more likely to respond that those who did not. Second, the dispensary organization did not collect information on the number of customers approached or the survey response rate. In addition, we did not have demographic or other information about the overall pool of adult use customers that visit the dispensary organization. Because of these limitations, we do not know if survey respondents were a representative sample. Third, we did not ask respondents to indicate their primary reason for taking cannabis, and respondents may use for both symptom relief and pleasurable psychoactive effects, either concurrently, sequentially, or both. Fourth, the pain condition categories in the survey are not mutually exclusive and do not represent a comprehensive list therefore we were unable to make meaningful conclusions about differences between respondents with different types of pain conditions. Fifth, as the survey was conducted within one dispensary organization focusing predominantly on adult use customers, generalizability is unknown and comparisons to individuals registered for medical cannabis cannot be made. Sixth, responses may, at least in part, reflect social desirability bias and we did not verify responses against medical or prescription records which may be discrepant (Vigil, Stith, and Reeve 2018).

In summary, we found that *de facto* medical cannabis use is common among adult use customers at a cannabis dispensary. Both pain relief and sleep promotion are common reasons for cannabis use, and the majority of respondents who reported using cannabis for these reasons also reported decreasing or stopping their use of prescription or over-the-counter analgesics and sleep aids. While adult-use laws are frequently called "recreational," implying that cannabis obtained through the adult use system is only for pleasure or experience-seeking, our findings suggest that many customers use cannabis for symptom relief.

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Declarations of interest

Dr. Bachhuber has nothing to declare. Dr. Arnsten has nothing to declare. Dr. Wurm has served as a paid consultant for for Sweetwater Partners, LLC, Colorado, which has a financial interest in the dispensary organization.

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References

Araujo, T., D. C. Jarrin, Y. Leanza, A. Vallieres, and C. M. Morin. 2017. Qualitative studies of insomnia: Current state of knowledge in the field. *Sleep Medicine Reviews* 31:58–69. doi:10.1016/j.smrv.2016.01.003.

Bachhuber, M. A., S. Hennessy, C. O. Cunningham, and J. L. Starrels. 2016. Increasing benzodiazepine prescriptions and overdose mortality in the United States, 1996-2013 (In Press). *American Journal of Public Health* 106:686–88. doi:10.2105/AJPH.2016.303061.

Boehnke, K. F., E. Litinas, and D. J. Clauw. 2016. Medical cannabis use is associated with decreased opiate medication use in a retrospective cross-sectional survey of patients with chronic pain. *The Journal of Pain : Official*

Journal of the American Pain Society 17 (6):739–44. doi:10.1016/j.jpain.2016.03.002.

Corroon, J. M., Jr., L. K. Mischley, and M. Sexton. 2017. Cannabis as a substitute for prescription drugs - a cross-sectional study. *Journal of Pain Research* 10:989–98. doi:10.2147/jpr.s134330.

Glass, J., K. L. Lanctot, N. Herrmann, B. A. Sproule, and U. E. Busto. 2005. Sedative hypnotics in older people with insomnia: Meta-analysis of risks and benefits. *Bmj* 331 (7526):1169. doi:10.1136/bmj.38623.768588.47.

Goldsmith, R. S., M. C. Targino, G. J. Fanciullo, D. W. Martin, N. P. Hartenbaum, J. M. White, and P. Franklin. 2015. Medical marijuana in the workplace: Challenges and management options for occupational physicians. *Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine* 57 (5):518–25. doi:10.1097/jom.0000000000000454.

Goshua, A., S. Craigie, G. H. Guyatt, A. Agarwal, R. Li, J. S. Bhullar, N. Scott, J. Chahal, S. Pavalagantharajah, Y. Chang, et al. 2017. Patient values and preferences regarding opioids for chronic noncancer pain: A systematic review. *Pain Medicine (Malden, Mass.)*. doi:10.1093/pm/pnx274.

Livingston, M. D., T. E. Barnett, C. Delcher, and A. C. Wagenaar. 2017. Recreational cannabis legalization and opioid-related deaths in Colorado, 2000-2015. *American Journal of Public Health* 107 (11):1827–29. doi:10.2105/ajph.2017.304059.

Lucas, P., and Z. Walsh. 2017. Medical cannabis access, use, and substitution for prescription opioids and other substances: A survey of authorized medical cannabis patients. *The International Journal on Drug Policy* 42:30–35. doi:10.1016/j.drugpo.2017.01.011.

National Academies of Sciences Engineering and Medicine. 2017. *The health effects of cannabis and cannabinoids: Current state of evidence and recommendations for research*. Washington, DC: National Academies Press. doi:10.17226/24625.

Nunberg, H., B. Kilmer, R. L. Pacula, and J. Burgdorf. 2011. An analysis of applicants presenting to a medical marijuana specialty practice in California. *Journal of Drug Policy Analysis* 4 (1). doi: 10.2202/1941-2851.1017.

Piper, B. J., R. M. DeKeuster, M. L. Beals, C. M. Cobb, C. A. Burchman, L. Perkinson, S. T. Lynn, S. D. Nichols, and A. T. Abess. 2017. Substitution of medical cannabis for pharmaceutical agents for pain, anxiety, and sleep. *Journal of Psychopharmacology (Oxford, England)* 31:569–75. doi:10.1177/0269881117699616.

Reiman, A. 2009. Cannabis as a substitute for alcohol and other drugs. *Harm Reduction Journal* 6:35. doi:10.1186/1477-7517-6-35.

Reiman, A., M. Welty, and P. Solomon. 2017. Cannabis as a substitute for opioid-based pain medication: Patient self-report. *Cannabis Cannabinoid Research* 2 (1):160–66. doi:10.1089/can.2017.0012.

Rudd, R. A., P. Seth, F. David, and L. Scholl. 2016. Increases in drug and opioid-involved overdose deaths - United States, 2010-2015. *MMWR. Morbidity and Mortality Weekly Report* 65 (5051):1445–52. doi:10.15585/mmwr.mm655051e1.

Vigil, J. M., S. S. Stith, and A. P. Reeve. 2018. Accuracy of patient opioid use reporting at the time of medical cannabis license renewal. *Pain Research & Management : the Journal of the Canadian Pain Society = Journal De La Societe Canadienne Pour Le Traitement De La Douleur* 2018:5704128. doi:10.1155/2018/5704128.

Wen, H., and J. M. Hockenberry. 2018. Association of medical and adult-use marijuana laws with opioid prescribing for medicaid enrollees. *JAMA Internal Medicine* 178:673. doi:10.1001/jamainternmed.2018.1007.

Zaller, N., A. Topletz, S. Frater, G. Yates, and M. Lally. 2015. Profiles of medicinal cannabis patients attending compassion centers in rhode island. *Journal of Psychoactive Drugs* 47 (1):18–23. doi:10.1080/02791072.2014.999901.

Zuardi, A. W. 2006. History of cannabis as a medicine: A review. *Revista Brasileira De Psiquiatria (Sao Paulo, Brazil : 1999)* 28 (2):153–57. doi:/S1516-44462006000200015.