



Factors associated with having a medical marijuana card among Veterans with recent substance use in VA outpatient treatment



Alan K. Davis^{a,b,*}, Erin E. Bonar^c, Mark A. Ilgen^{b,c}, Maureen A. Walton^{c,e},
Brian E. Perron^d, Stephen T. Chermack^{b,c}

^a Department of Psychology, Bowling Green State University, 822 E. Merry Ave, Bowling Green, OH 43403, USA

^b HSR&D Center for Clinical Management Research (CCMR), VA Ann Arbor Healthcare System, 2800 Plymouth Road, Building 16, Floor 2, Ann Arbor, MI 48109, USA

^c University of Michigan Addiction Center, Department of Psychiatry, University of Michigan School of Medicine, 4250 Plymouth Road, Ann Arbor, MI 48109, USA

^d School of Social Work, University of Michigan, 1080 S. University, Ann Arbor, MI 48109, USA

^e University of Michigan Injury Center, University of Michigan School of Medicine, 2800 Plymouth Road, NCRC10-G080, Ann Arbor, MI, 48109, USA

HIGHLIGHTS

- Among Veterans with a medical marijuana card, most report using it for chronic pain
- PTSD, sleep problems, and pain level are associated with having a medical marijuana card
- Assessing medical marijuana use may be important among Veterans in SUD treatment

ARTICLE INFO

Article history:

Received 27 February 2016

Received in revised form 24 May 2016

Accepted 7 July 2016

Available online 8 July 2016

Keywords:

Marijuana

Cannabis

Treatment

Veterans

Substance use problems

ABSTRACT

Psychiatric symptoms, somatic problems, and co-occurring substance use have been associated with medical marijuana consumption among civilian patients with substance use disorders. It is possible that these factors may impact Veterans' ability to engage in or adhere to mental health and substance use disorder treatment. Therefore, we examined whether psychiatric functioning, substance use, and somatic problems were associated with medical marijuana use among Veterans receiving substance use disorder and/or mental health treatment. Participants ($n = 841$) completed screening measures for a randomized controlled trial and 67 (8%) reported that they had a current medical marijuana card. Most of these participants (78%) reported using marijuana to treat severe/chronic pain. Significant bivariate differences revealed that, compared to participants without a medical marijuana card, those with a card were more likely to be in a middle income bracket, unemployed, and they had a significantly higher number of recent days of marijuana use, synthetic marijuana use, and using sedatives prescribed to them. Additionally, a significantly higher proportion of participants with a medical marijuana card scored above the clinical cutoff for posttraumatic stress disorder (PTSD) symptoms, had significantly higher severity of sleep-related problems, and reported a higher level of pain. These findings highlight the co-occurrence of substance use, PTSD symptoms, sleep-related problems, and chronic pain among Veterans who use medical marijuana. Future research should investigate the inter-relationships among medical marijuana use and other clinical issues (e.g., PTSD symptoms, sleep, pain) over time, and potential implications of medical marijuana use on treatment engagement and response.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

The efficacy and use of medical marijuana remains controversial. However, emerging evidence supports the short-term benefits of

marijuana on a wide range of symptoms including nausea and vomiting associated with cancer chemotherapy, appetite stimulation in wasting illnesses, chronic pain, neuropathic pain, and spasticity related to multiple sclerosis (Hill, 2015; Volkow, Baler, Compton, & Weiss, 2014). This evidence notwithstanding, many of the conditions for which medical marijuana is approved as a treatment in the United States (US), including Posttraumatic Stress Disorder (PTSD), anxiety, depression, Parkinson's disease, Crohn's disease, and Amyotrophic Lateral Sclerosis,

* Corresponding author at: Bowling Green State University, 822 E. Merry Ave., Bowling Green, OH 43403, USA.

E-mail address: alan.kooi.davis@gmail.com (A.K. Davis).

have weak or no empirical support (Hill, 2015), and some adverse health effects of recreational marijuana use have been identified (Volkow et al., 2014). Additionally, there is no federal legislation regulating the use or recommendation of medical marijuana in the US, leaving states to decide for what conditions, and under what circumstances medical marijuana can be used or recommended in their jurisdictions (Bestrashniy & Winters, 2015).

The inconsistency between state and federal legislation presents a unique problem for US military Veterans receiving care at Veterans Affairs (VA) medical centers (which are governed by federal legislation). Specifically, those Veterans who live in one of the states (24 at present), or the District of Columbia, where comprehensive medical marijuana programs have been approved at the state level (Maii, 2013; National Conference on State Legislatures, 2016), may obtain certification from a non-VA provider either as a supplement to or in lieu of their VA care. There is also a high prevalence of psychiatric conditions (PTSD in particular) and co-occurring substance use-related problems among Veterans (Bonn-Miller, Bucossi, & Trafton, 2012; Seal et al., 2011; Stecker, Fortney, Owen, McGovern, & Williams, 2010), and evidence suggests that large proportions of Veterans with co-occurring substance use and PTSD drop out of treatment after only one or two sessions (Oliva, Bowe, Harris, & Trafton, 2013). Moreover, it is possible some Veterans using medical marijuana might be less likely to initiate specialty treatment all together at the VA because of perceptions that medical marijuana use will be forbidden.

Given the possibility that Veterans might present for substance use or mental health treatment while concomitantly using medical marijuana, combined with the potential complicating treatment initiation and retention factors noted above, it is crucial to understand the context of medical marijuana use in this population. To the best of our knowledge, there have been no studies evaluating medical marijuana consumption among Veterans receiving VA treatment for substance use or mental health problems. However, recent evaluations of community samples of individuals using marijuana medically or recreationally indicate that most people report consuming the substance to treat chronic pain (Bonn-Miller, Boden, Bucossi, & Babson, 2014; Ilgen et al., 2013; Osborn et al., 2015), and many also report using it as a treatment for PTSD, anxiety, and depression symptoms (Bonn-Miller et al., 2014; Osborn et al., 2015). Additionally, a recent investigation of a community sample of first-time medical marijuana patients revealed that 23% screened positive for PTSD (Bohnert et al., 2014), and another investigation (Ashrafioun, Bohnert, Jannausch, & Ilgen, 2015) found that patients receiving substance use disorder (SUD) treatment and using medical marijuana specifically for pain were significantly younger than patients who did not use medical marijuana. These findings highlight the importance of assessing for background, somatic, and psychiatric factors among medical marijuana patients. Thus, the present exploratory study sought to assess medical marijuana use among Veterans, and to evaluate whether medical marijuana use is associated with demographic characteristics, frequency of substance use, and psychiatric functioning among those who present for treatment in outpatient substance use disorder or mental health clinics.

2. Method

2.1. Recruitment & procedure

This study reports on a secondary analysis from screening data collected as part of a randomized controlled trial (RCT) for a substance use and violence prevention intervention conducted in a single VA hospital in the Midwest (screening is complete, but follow-up assessments are ongoing). Veterans who were initiating or receiving treatment (for the first time or after a break in care) at VA outpatient SUD and mental health treatment clinics were screened for the RCT. In order to be eligible for screening, participants had to have recent substance use and be in outpatient SUD or mental health treatment. Patients in treatment

were approached and informed of the study and, if interested, provided written informed consent and completed RCT eligibility screening surveys. Exclusion criteria for screening included: an inability to read/speak English, current suicidal ideation, active psychosis, cognitive problems limiting ability to consent, having a legal guardian, insufficient cognitive orientation due to acute substance use, active participation in another intervention study, or residing outside of the study catchment area. The screening survey was designed to be completed in approximately 45–60 min by patient self-report, although research assistants were available to assist participants with reading or vision difficulties. Participants were remunerated \$10 in gift cards for completing the screening survey. The present sample included the 841 participants who completed screening surveys for the RCT. All procedures were approved by the local VA's institutional review board.

2.2. Measures

2.2.1. Medical marijuana use

We used two items from Ilgen et al.'s (2013) questionnaire to examine medical marijuana use: 1) "Have you been issued a medical marijuana card?" 2) "If you have been issued a medical marijuana card, which of the following health conditions were you diagnosed with?". We then provided the following list of conditions, from which they could check all that applied to them: severe and chronic pain, severe nausea, severe and persistent muscle spasms, cancer, glaucoma, seizures, Crohn's disease, agitation of Alzheimer's disease, amyotrophic lateral sclerosis, Hepatitis-C, HIV/AIDS, nail patella, cachexia or wasting syndromes, other. This list of conditions was designed to match the conditions for which medical marijuana was approved in the state at the start of study recruitment (June, 2012).

2.2.2. Posttraumatic Stress Disorder Checklist – Civilian (PCL-C)

This 17-item self-report measure assesses PTSD symptoms (e.g., "Repeated, disturbing memories, thoughts, or images of a stressful experience from the past," "Avoid activities or situations because they remind you of a stressful experience from the past"; Gerrity, Corson, & Dobscha, 2007; Weathers, 1996) based on criteria set forth in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV-TR, American Psychiatric Association, 2000). Participants were asked to rate how much these symptoms had bothered them during the past 30 days on a scale from "1 = Not at all" to "5 = Extremely." The recommended cutoff suggesting a PTSD diagnosis is 45 to 50 among Veterans presenting in VA specialty mental health clinics (National Center for PTSD, 2014). We chose to use the conservative cutoff of 50 for the present study. Due to an error in the survey, item 17 (i.e., "Feeling jumpy or easily startled") was not included. Scores were adjusted using mean substitution to account for error. Cronbach's alpha in our sample was 0.95.

2.2.3. Patient Health Questionnaire – 9 (PHQ-9)

This 9-item measure was used to assess symptoms of major depression (e.g., "Little interest or pleasure in doing things," "Feeling down, depressed or hopeless"). Participants were asked to rate how often these symptoms had occurred during the past two weeks on a scale from "0 = Not at all" to "3 = Nearly every day." The PHQ-9 yields a severity score ranging from 0 to 27, with a cutoff score of 10 indicating clinically significant depression (Kroenke, Spitzer, & Williams, 2001). The PHQ-9 has been reported to have good construct validity and reliability as a measure of depressive symptoms in the general population (Martin, Rief, Klaiberg, & Braehler, 2006). Cronbach's alpha in our sample was 0.90.

2.2.4. Generalized Anxiety Disorder – 7 (GAD-7)

This questionnaire measures anxiety symptoms (e.g., "Feeling nervous, anxious, or on edge," "Not being able to stop or control worrying") consistent with the diagnostic criteria in the DSM-IV (Spitzer, Kroenke,

Williams, & Lowe, 2006). Participants were asked to rate how much these symptoms had bothered them during the past two weeks on a scale from “0 = Not at all” to “3 = Nearly every day.” There is strong evidence for the internal consistency reliability and criterion validity of the GAD-7 (Löwe et al., 2008). Higher total scores indicate more severe levels of anxiety and a score of 10 or greater is considered clinically significant anxiety (Spitzer et al., 2006). Cronbach's alpha in the present sample was 0.93.

2.2.5. Insomnia Symptom Questionnaire (ISQ)

The ISQ is a self-report instrument designed to measure sleep problems (e.g., “Difficulty falling asleep,” “Difficulty staying asleep,”) and sleep problem-related consequences (e.g., “How much do your sleep problems bother you,” “Have your sleep difficulties affected your work”) that have occurred during the past 30 days (Okun et al., 2009). Patients were asked to rate how often they have experienced sleep problems (“0 = Never” to “5 = Always: 5–7 times per week”) and to what degree their sleep-related problems have affected their daily life during the past 30 days (“0 = Not at all” to “4 = Extremely”). The ISQ has demonstrated strong specificity in identifying chronic insomnia (Okun et al., 2009). In the current sample, Cronbach's alpha was 0.93 for sleep-related problems and 0.96 for the sleep problems-related consequences.

2.2.6. Substance use

Items adapted from The Substance Abuse Outcomes Module (SAOM) were used to assess for recent substance use (Smith et al., 1996). Specifically, participants were asked to report the number of days (0–30) over the past month prior to entering treatment that they used alcohol and a variety of other substances (e.g., marijuana, synthetic marijuana, cocaine, amphetamines, hallucinogens, inhalants, etc.). The SAOM has demonstrated strong internal consistency, convergent validity, and sensitivity to clinical changes (Smith et al., 2006).

2.2.7. Military service history

We used 5 items from the original 49-item PTSD Status Form to assess participants' military service era (i.e., Vietnam, Post-Vietnam, Persian Gulf, Operation Enduring Freedom/Iraqi Freedom/New Dawn; not mutually exclusive) and whether they had ever served in a war zone (National Center for PTSD, 1990).

2.2.8. Numeric Rating Scale (NRS)

The NRS is an 11-point unidimensional measure of pain intensity in adults (Farrar, Young, LaMoreaux, Werth, & Poole, 2001). It is a single item (“How would you rate your pain on average during the last 3 months?”), and patients are asked to respond using a numeric scale from “0 = No pain at all” to “10 = Worst pain possible.” External validity for the NRS has been supported by Farrar et al. (2001), wherein the NRS was found to be sensitive to clinical meaningful changes in the intensity of subjective pain.

2.2.9. Demographic characteristics

These single item questions were used to collect information regarding participants' age, gender, ethnicity, employment status, relationship status, education level, income, current legal status, and whether they had health insurance.

2.3. Statistical analyses

We began by categorizing participants into two groups based on whether they reported having a medical marijuana card. We then conducted frequency counts and descriptive analyses among demographic variables for each group. Next, we conducted a series of chi-square analyses evaluating differences in sociodemographic, military service history, and psychiatric variables between groups. Finally, we conducted a series of independent samples *t*-tests evaluating differences in age,

self-reported number of recent substance use days, and scores on measures of sleep problems and pain.

3. Results

3.1. Participant characteristics

A total of 841 participants (94% male; $M_{\text{age}} = 48.21$, $SD = 13.34$) completed screening measures and 67 (8%) reported that they had been issued a medical marijuana card. Most participants (78%) reported using medical marijuana for severe and chronic pain. Smaller proportions indicated using medical marijuana for severe nausea (12%), Hepatitis C (8%), severe and persistent muscle spasms (8%), cancer (6%), glaucoma (6%), seizures (1%), and Crohn's disease (1%). Approximately 21% used an opened-ended response option (i.e., “other”) to report conditions or concerns not listed on the questionnaire, including PTSD (6%), sleep (4%), anxiety/panic (4%), and eating/appetite (3%). Responses were not mutually exclusive and approximately 40% of participants reported use for more than one reason. See Table 1 for further demographic characteristics.

3.2. Associations with having a medical marijuana card

As Table 1 reveals, a larger proportion of the participants in the medical marijuana card group reported being unemployed (87% vs. 75%), $\chi^2(1, 840) = 4.49$, $p = 0.03$, $\phi = 0.07$, and in a middle income bracket (60% vs. 40%), $\chi^2(2, 830) = 9.83$, $p = 0.007$, $V = 0.11$, compared to those without a card. Additionally, participants with a medical marijuana card used the following substances on significantly more days prior to screening than those who did not have a card: marijuana ($M = 13.59$, $SD = 13.26$ vs. $M = 4.40$, $SD = 9.24$), $t(836) = 8.76$, $p < .001$, $d = 0.80$, synthetic marijuana ($M = 0.98$, $SD = 4.91$ vs. $M = 0.23$, $SD = 2.37$), $t(824) = 2.68$, $p = 0.007$, $d = 0.20$, and prescribed sedatives ($M = 5.39$, $SD = 10.46$ vs. $M = 2.58$, $SD = 7.60$), $t(835) = 3.15$, $p = 0.002$, $d = 0.31$. There were no significant differences in recent days using other substances or alcohol.

A significantly larger proportion of participants with a medical marijuana card were above the clinical cutoff for significant PTSD symptoms (58% vs. 39%), $\chi^2(1, 829) = 9.04$, $p = 0.003$, $\phi = 0.10$. However, those with a medical marijuana card did not differ significantly in terms of scoring above the clinical cutoff for depression symptoms (67% vs. 55%), $\chi^2(1, 838) = 3.71$, $p = 0.054$, $\phi = 0.07$, or symptoms of anxiety (58% vs. 47%), $\chi^2(1, 838) = 2.92$, $p = 0.088$, $\phi = 0.06$, although both approached statistical significance. Participants with a medical marijuana card reported greater severity of sleep problems ($M = 18.00$, $SD = 7.37$ vs. $M = 15.75$, $SD = 7.99$), $t(808) = 2.20$, $p = 0.03$, $d = 0.29$, sleep problem-related consequences ($M = 16.69$, $SD = 9.19$ vs. $M = 13.47$, $SD = 9.18$), $t(821) = 2.75$, $p < 0.01$, $d = 0.36$, and higher average pain level over the past three months ($M = 5.31$, $SD = 2.71$ vs. $M = 4.60$, $SD = 2.67$), $t(824) = 2.08$, $p = 0.04$, $d = 0.26$.

4. Discussion

Although only a small proportion of Veterans in our study reported having a medical marijuana card, our results suggest that VA mental health and substance use disorder treatment providers should be aware that Veterans with a medical marijuana card appear to have co-occurring symptoms and treatment needs that could be associated with poorer treatment engagement or response if not addressed simultaneously. For example, our findings indicated that Veterans who report having a medical marijuana card also reported more frequent marijuana use and prescription sedative use, had higher rates of unemployment, and were more likely to be in a middle income bracket, compared to those Veterans without a card. Also, they were more likely to report a cluster of somatic and psychiatric problems, including clinically meaningful PTSD symptoms, sleep problems, and pain. Although potentially

Table 1

Psychiatric, substance use, and demographic characteristics of the overall sample and of those with and those without a medical marijuana card.

	Overall (n = 841) ^a	No Med. MJ Card (n = 774) ^b	Med. MJ Card (n = 67) ^c	p-Value ^d
	n (%) or M (SD)	n (%) or M (SD)	n (%) or M (SD)	
<i>Sociodemographic characteristics</i>				
Age	48.2 (13.3)	48.3 (13.3)	47.4 (13.8)	NS
Male	786 (94%)	726 (94%)	60 (90%)	NS
Caucasian ^e	601 (72%)	551 (71%)	50 (76%)	NS
Not employed	638 (76%)	580 (75%)	58 (87%)	0.036
More than a high school education	584 (70%)	537 (69%)	47 (70%)	NS
Married/live together	256 (30%)	231 (30%)	25 (37%)	NS
Have health insurance	453 (54%)	411 (53%)	42 (63%)	NS
On probation/parole	190 (23%)	169 (22%)	21 (31%)	NS
Income				0.007
Less than \$20,000	381 (46%)	361 (47%)	20 (30%)	
\$20,000–\$60,000	348 (42%)	308 (40%)	40 (60%)	
More than \$60,000	103 (12%)	96 (13%)	7 (10%)	
<i>Military History</i>				
Vietnam Era Veteran	247 (29%)	229 (30%)	18 (27%)	NS
Post-Vietnam Era Veteran	265 (32%)	243 (31%)	22 (33%)	NS
Persian Gulf Era Veteran	193 (23%)	177 (23%)	16 (24%)	NS
OEF/OIF/OND ^f Era Veteran	251 (30%)	229 (30%)	22 (33%)	NS
Ever served in a war zone	395 (48%)	363 (48%)	32 (48%)	NS
<i>Past 30-day substance use</i>				
Number of recent days using:				
Marijuana or Hashish	4.4 (9.2)	3.6 (8.4)	13.6 (13.3)	<0.001
Synthetic marijuana	0.2 (2.4)	0.2 (2.0)	1.0 (4.9)	0.007
Sedatives prescribed to you	2.6 (7.6)	2.3 (7.3)	5.4 (10.5)	0.002
Sedatives not prescribed to you	0.7 (3.7)	0.7 (3.6)	1.3 (4.9)	NS
Alcohol	11.5 (11.9)	11.6 (11.9)	10.9 (12.0)	NS
Cocaine or Crack	1.8 (5.7)	1.8 (5.9)	1.0 (3.3)	NS
Stimulants prescribed to you	0.7 (4.0)	0.6 (3.9)	1.2 (4.9)	NS
Stimulants not prescribed to you	0.3 (2.2)	0.2 (2.1)	0.5 (2.7)	NS
Heroin	1.2 (5.0)	1.2 (5.0)	1.1 (5.2)	NS
Other opiates prescribed to you	3.3 (8.3)	3.2 (8.3)	3.5 (8.5)	NS
Other opiates not prescribed to you	2.0 (6.4)	1.9 (6.3)	2.1 (7.2)	NS
Hallucinogens	0.1 (1.0)	0.1 (1.1)	0.0 (0.0)	NS
Tobacco	18.4 (14.0)	18.3 (14.0)	18.6 (14.2)	NS
Inhalants	0.1 (1.1)	0.1 (1.1)	0.2 (1.2)	NS
Bath salts	0.1 (1.5)	0.1 (1.6)	0.0 (0.0)	NS
Anabolic steroids	0.2 (2.1)	0.2 (1.9)	0.6 (3.9)	NS
Average number of standard drinks per day	6.1 (7.2)	6.1 (7.1)	6.0 (7.6)	NS
<i>Psychiatric variables</i>				
PTSD Symptom Checklist (cutoff of 50)	333 (40%)	295 (39%)	38 (58%)	0.003
Patient Health Questionnaire – 9 (cutoff of 10)	469 (56%)	424 (55%)	45 (67%)	NS
Generalized Anxiety Disorder – 7 (cutoff of 10)	404 (48%)	365 (47%)	39 (58%)	NS
Average pain rating	4.7 (2.7)	4.6 (2.7)	5.3 (2.7)	0.038
Sleep problems	15.9 (8.0)	15.8 (8.0)	18.0 (7.4)	0.028
Sleep problem-related consequences	13.7 (9.2)	13.5 (9.2)	16.7 (9.2)	0.006

^a Number of participants varied (n ranged from 809 to 841) due to missing data.

^b Number of participants varied (n ranged from 745 to 774) due to missing data.

^c Number of participants varied (n ranged from 64 to 67) due to missing data.

^d Chi-square or t-test.

^e Dichotomized this variable due to skewed distribution.

^f OEF = Operation Enduring Freedom; OIF = Operation Iraqi Freedom; OND = Operation New Dawn.

a barrier for treatment initiation and engagement, the combination of marijuana and sedative use is perhaps not surprising among individuals who choose medical marijuana treatment, given the likelihood that these individuals might be prescribed (or recommended) several medications to manage a variety of co-occurring somatic and psychiatric problems. Similarly, the challenges associated with managing this combination of psychiatric and somatic complaints could also explain why we found that a larger proportion of Veterans with a medical marijuana card were unemployed, possibly due to the potentially disabling effects of these conditions.

Even though our assessment did not explicitly ask about using medical marijuana for the treatment of PTSD, 6% of participants with a medical marijuana card wrote in that they used marijuana for this reason. Additionally, the prevalence of reporting clinically significant symptoms of PTSD was almost 20% higher in those with a medical marijuana card compared to those without a card. Although it is possible that marijuana use is one way in which the Veterans in our sample attempted to cope with these symptoms in addition to their somatic complaints, coping motives were not directly assessed. Thus far, there is no empirical evidence demonstrating that medical marijuana is an effective treatment for PTSD. However, Boden, Babson, Vujanovic, Short, and Bonn-Miller (2013) found that Veterans with PTSD and marijuana dependence were more likely to report using marijuana to cope with problems, higher levels of craving for the drug compared to those without PTSD, and co-occurring mood and anxiety disorders. It is important for future research to evaluate the effect of medical marijuana on somatic and psychiatric problems and on SUD and mental health treatment outcomes using longitudinal and/or randomized controlled designs.

Consistent with other studies of people who use medical marijuana in the US (Ilgen et al., 2013; Bonn-Miller et al., 2014), the vast majority of medical marijuana patients in our sample reported using marijuana to treat severe and chronic pain. However, our results extend this finding to Veterans and to patients using medical marijuana for both chronic pain and other qualifying conditions. In addition, it is clear that those Veterans with a medical marijuana card, who are also in substance use or mental health treatment, report medical marijuana use for multiple conditions that may extend beyond the uses originally approved by the certifying provider, suggesting that they have a significant number of co-occurring problems and perceive marijuana as beneficial. These expectancies provide a significant challenge for VA treatment providers who may have the goal of helping patients consider empirically based treatments (e.g., Prolonged Exposure for PTSD, Cognitive Behavioral Therapy for pain and sleep problems) when some patients may perceive marijuana use as the only effective treatment for their psychiatric and somatic problems. In this regard, research is needed to understand and address these motives for use (e.g., reduction of PTSD symptoms and sleep-related problems) and to evaluate strategies for improving education and brief interventions linking patients to empirically-based care.

Several limitations should be considered when interpreting the findings from the present study. First, study personnel working for the VA screened all Veterans in this study. Given the current illegal status of recreational and medical marijuana at the federal level in the US, some Veterans may not have been willing to disclose use of medical marijuana, potentially resulting in an underestimate of prevalence. Second, our sample was comprised of mostly male Veterans from one location in the Midwestern US who were currently in SUD or mental health treatment. More research is needed to determine whether these findings generalize to the larger VA population, as well as civilians in SUD or mental health treatment or populations that contain a greater proportion of women. Third, the list of approved conditions for which medical marijuana could be recommended in our state was changed to include PTSD approximately halfway through data collection (Oosting, 2014); therefore, it is possible that factors associated with medical marijuana use among Veterans who seek marijuana treatment for PTSD could be different than those who seek it primarily for somatic or chronic pain

problems. Fourth, this study is cross-sectional and thus no causal links between medical marijuana consumption and psychiatric and substance use characteristics could be established. Fifth, our assessment relied on self-report and may have been influenced by biases related to retrospective recall and social desirability. Future studies could be enhanced by including confirmatory and comprehensive assessment (e.g., urine drug screen, pain functioning, psychiatric functioning) of patient self-reports.

These limitations notwithstanding, our findings highlight the importance of assessing medical marijuana consumption among Veterans with substance use problems receiving care in outpatient substance use disorder and mental health clinics. Consistent with the conceptualization that marijuana, as with any prescription medication, is intended to reduce the symptoms of but not ameliorate (or “cure”) somatic and psychiatric conditions, our findings also suggest that those with a medical marijuana card may continue to have problems with pain, symptoms of PTSD, and sleep disturbance despite their use of this medicine. Given the cross-sectional design of our study, we were unable to evaluate severity of PTSD, pain, and sleep-related problems prior to initiation of medical marijuana treatment. Therefore, it is unclear whether this treatment provides clinical benefits or interferes with other treatments and symptom reduction. Given the recent changes in states' approval of medical marijuana, it is critical for future research to examine whether medical marijuana use attenuates treatment engagement or outcomes (e.g., PTSD symptoms, sleep problems, substance use outcomes) using rigorous longitudinal designs.

Author disclosures

1. Funding for this study was supported by VA Merit Review Grant: HX000294; IIR 09-333-3. VA had no role in study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.
2. Authors Davis and Chermack designed the study and conducted the main analyses. Authors Davis, Chermack, and Bonar were responsible for writing the initial drafts of the manuscript. Authors Chermack, Walton, and Ilgen, were responsible for writing the protocol for the grant that supported the work on this study. Author Perron provided statistical guidance and all authors contributed to and have approved the final manuscript. Additionally, Dr. Bonar was supported by a career development award from the National Institute on Drug Abuse (#036008) during her work on this study.
3. The authors have no conflicts of interest to declare.

References

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders (4th ed., text rev.)*. Washington, DC: Author.

Ashrafioun, L., Bohnert, K. M., Jannausch, M., & Ilgen, M. A. (2015). Characteristics of substance use disorder treatment patients using medical cannabis for pain. *Addictive Behaviors*, 42, 185–188.

Bestrashniy, J., & Winters, K. C. (2015). Variability in medical marijuana laws in the United States. *Psychology of Addictive Behaviors*, 29, 639–642.

Boden, M. T., Babson, K. A., Vujanovic, A. A., Short, N. A., & Bonn-Miller, M. O. (2013). Post-traumatic stress disorder and cannabis use characteristics among military veterans with cannabis dependence. *The American Journal on Addictions*, 22, 277–284.

Bohnert, K. M., Perron, B. E., Ashrafioun, L., Kleinberg, F., Jannausch, M., & Ilgen, M. A. (2014). Positive posttraumatic stress disorder screen among first-time medical

cannabis patients: Prevalence and association with other substance use. *Addictive Behaviors*, 39, 1414–1417.

Bonn-Miller, M. O., Bucossi, M. M., & Trafton, J. A. (2012). The underdiagnosis of cannabis use disorders and other axis-I disorders among military veterans within VHA. *Military Medicine*, 177, 786–788.

Bonn-Miller, M. O., Boden, M. T., Bucossi, M. M., & Babson, K. A. (2014). Self-reported cannabis use characteristics, patterns and helpfulness among medical cannabis users. *American Journal of Drug and Alcohol Abuse*, 40, 23–30.

Farrar, J. T., Young, J. P., Jr., LaMoreaux, L., Werth, J. L., & Poole, R. M. (2001). Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. *Pain*, 94, 149–158.

Gerrity, M. S., Corson, K., & Dobscha, S. K. (2007). Screening for posttraumatic stress disorder in VA primary care patients with depression symptoms. *Journal of General Internal Medicine*, 22, 1321–1324. <http://dx.doi.org/10.1007/s11606-007-0290-5>.

Hill, K. P. (2015). Medical marijuana for treatment of chronic pain and other medical and psychiatric problems. *Journal of the American Medical Association*, 313, 2474–2482.

Ilgen, M. A., Bohnert, K., Kleinberg, F., Jannausch, M., Bohnert, A. S. B., Walton, M., & Blow, F. C. (2013). Characteristics of adults seeking medical marijuana certification. *Drug and Alcohol Dependence*, 132, 654–659.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16, 606–613 (doi: jgi01114 [pii]).

Löwe, B., Decker, O., Müller, S., Braähler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and standardization of the generalized anxiety disorder screener (GAD-7) in the general population. *Medical Care*, 46, 266–274.

Maii. (2013). Re: Medical marijuana laws around the world [Web blog comment]. [July 9 Retrieved September 25, 2015, from] <http://marijuana.cc/2013/07/09/medical-marijuana-laws-around-the-world>

Martin, A., Rief, W., Klaiberg, A., & Braehler, E. (2006). Validity of the brief patient health questionnaire mood scale (PHQ-9) in the general population. *General Hospital Psychiatry*, 28, 71–77. <http://dx.doi.org/10.1016/j.genhosppsych.2005.07.003>.

National Center for PTSD (1990). *The PTSD status form (PSF)*. Washington, DC: Office of Mental Health Services.

National Center for PTSD (2014). Using the PTSD checklist for DSM-IV (PCL). [Retrieved from] <http://www.ptsd.va.gov/professional/pages/assessments/assessment-pdf/pcl-handout.pdf>

National Conference on State Legislatures (2016). State Medical Marijuana Laws. [Retrieved May 6, 2016, from] <http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx>

Okun, M. L., Kravitz, H. M., Sowers, M. F., Moul, D. E., Buysse, D. J., & Hall, M. (2009). Psychometric evaluation of the insomnia symptom questionnaire: A self-report measure to identify chronic insomnia. *Journal of Clinical Sleep Medicine*, 5, 41–51.

Oliva, E. M., Bowe, T., Harris, A. H. S., & Trafton, J. A. (2013). False starts in psychotherapy for substance use disorders and PTSD in the VHA. *Psychiatric Services*, 64, 722.

Oosting, J. (2014). Michigan medical marijuana law expanding to include post-traumatic stress disorder. [Mlive Media Group (March 18, 2014 ed.)] http://www.mlive.com/lansing-news/index.ssf/2014/03/michigan_medical_marijuana_law.html

Osborn, L. A., Lauritsen, K. J., Cross, N., Davis, A. K., Rosenberg, H., Bonadio, F., & Lang, B. (2015). Self-medication of somatic and psychiatric conditions using botanical marijuana. *Journal of Psychoactive Drugs*, 47, 345–350.

Seal, K. H., Cohen, G., Waldrop, A., Cohen, B. E., Maguen, S., & Ren, L. (2011). Substance use disorders in Iraq and Afghanistan veterans in VA healthcare, 2001–2010: Implications for screening, diagnosis and treatment. *Drug and Alcohol Dependence*, 116, 93–101.

Smith, G. R., Babor, T., Jr., Burnam, M. A., Mosley, C. L., Rost, K., & Burns, B. (1996). *Substance abuse outcomes module User's manual*. Little Rock, AR: University of Arkansas for Medical Sciences.

Smith, G. R., Burnam, M. A., Mosley, C. L., Hollenberg, J. A., Mancino, M., & Grimes, W. (2006). Reliability and validity of the substance abuse outcomes module. *Psychiatric Services*, 57, 1452–1460.

Spitzer, R. L., Kroenke, K., Williams, J. B., & Lowe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine*, 166, 1092–1097. <http://dx.doi.org/10.1001/archinte.166.10.1092> [166/10/1092 [pii]].

Stecker, T., Fortney, J., Owen, R., McGovern, M. P., & Williams, S. (2010). Co-occurring medical, psychiatric, and alcohol-related disorders among Veterans returning from Iraq and Afghanistan. *Psychosomatics*, 51, 503–507.

Volkow, N. D., Baler, R. D., Compton, W. D., & Weiss, S. R. B. (2014). Adverse health effects of marijuana use. *The New England Journal of Medicine*, 370, 2219–2227.

Weathers, F. J. (1996). Psychometric review of PTSD checklist (PCL-C, PCL-S, PCL-M, PCL-PR). *Measurement of stress, trauma, and adaptation* (pp. 250–251).