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Identifying Risk Factors for Marijuana Use Among Veterans Affairs Patients

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Abstract

Objectives—Cannabis is the most widely used drug in the United States, and its use carries negative health consequences; however, universal screening for cannabis use is cumbersome. If data commonly collected in the primary care setting (eg, use of alcohol, smoking status, and depression symptoms) could predict cannabis use, then providers can implement targeted marijuana screening in high-risk groups.

Methods—We reviewed Behavioral Health Laboratory data collected between 2003 and 2006 from 5512 patients referred by Veterans Affairs primary care clinics for potential mental health needs. Logistic regression was used to determine the predictors of past year marijuana use.

Results—A total of 11.5% of the sample reported using marijuana in the past year. Age, gender, other drug use, presence of alcohol use disorders, smoking status, depressive disorders, posttraumatic stress disorder, anxiety disorders, and psychotic symptoms, individually, were associated with the patients' use of marijuana during the past year. When controlling for age, race, and gender in a logistic regression analyses, only other drug use, alcohol use disorder, and smoking status were linked to past year marijuana use. Patients were 5.4 (95% confidence interval [CI] 4.3–6.7) times more likely to have used marijuana during the past year if they used another illicit drug during the past year. Those with alcohol use disorder diagnosis or current smokers were 2.3 (95% CI 1.9–2.8) and 1.5 times (95% CI 1.3–1.7), respectively, more likely to have used marijuana during the past year. Receiver operating characteristic curve (area under curve = 0.79) represents good sensitivity and specificity of the model, correctly classifying 88.4% of the past year marijuana users.

Conclusion—Identifying patients at high risk for cannabis use may facilitate targeted screening and provision of interventions in primary care. Patients who screen positive for cigarette use, alcohol abuse or dependence, or have evidence of other illicit drug use could be considered for cannabis screening.

Keywords

veterans; cannabis; screening; primary care

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Scope of Marijuana Use

With 3.2 million daily marijuana smokers, cannabis is the most widely used illicit drug in the United States.¹ Ninety-seven million Americans over the age of 12 years have tried marijuana, and 14.6 million report having used marijuana in the last month,¹ with a higher rate of marijuana use among the US veteran population.² The estimated percentage of marijuana users that will become dependent is expected to rise because the concentration of delta-9-tetrahydrocannabinol (THC) in marijuana has increased.³

Medical Consequences of Marijuana Use

Although cannabis is widely believed to be relatively safe among the illicit drugs, its use is associated with numerous negative health consequences among the US veteran population.^{4,5} Repeated cannabis use may lead to dose-related large airway inflammation and airflow obstruction,⁶⁻⁸ independent of tobacco smoking.⁷ Studies also suggest a link between cannabis smoking and lung, neck, and head cancers^{9,10} through a dose-response effect of cannabis use and a multiplicative impact of cannabis and tobacco smoking on cancer risk.¹⁰ Case reports linked cannabis use to cardiac arrhythmias,¹¹⁻¹³ which may lead to myocardial infarction in susceptible individuals.¹⁴ Cerebrovascular accidents and transient ischemic attacks have also been reported.¹⁵

A variety of cognitive disturbances, including impairment in attention, memory, and executive functions, are associated with cannabis use,¹⁶⁻¹⁸ and acute use is linked to motor vehicle accidents.¹⁹⁻²² Identifying marijuana smokers in the primary care setting provides the opportunity to impact prevention of pulmonary disease and cancer, and to reduce the impact of cardiovascular and trauma related morbidity and mortality.

Marijuana Use and Comorbid Psychiatric Diagnoses

In previous studies examining the comorbidity of marijuana use and other psychiatric conditions in the general population, the use of marijuana significantly predicted the occurrence of substance use disorder (SUD) other than cannabis, alcohol use disorders, mood disorders, and anxiety disorders (in order from highest to lowest prevalence).²³⁻²⁷ In primary care settings, recurrent depression, agoraphobia, and hazardous alcohol use were significantly related to marijuana use.²⁸ In the US veteran population, marijuana use was noted in patients undergoing treatment for posttraumatic stress disorder (PTSD), schizophrenia, schizoaffective disorder, and other severe and persistent mental illnesses.^{29,30}

Aims

Given the serious health consequences of cannabis use and its under recognition in the primary care setting, some have suggested developing a cannabis-specific screening tool for the primary care settings.³¹ Although the US Preventive Services Task Force recommends universal primary care screening for nicotine and alcohol use, their risk-benefit analysis does not support screening all primary care patients for marijuana use.³² Targeted screening of patients at risk for cannabis use can be a more realistic goal for primary care providers (PCPs) and is consistent with the screening and brief intervention initiatives brought forth by National Institute on Drug Abuse (NIDA).³³ An efficient way to target marijuana screening in the primary care setting would be to use other prevalent patient factors that are associated with marijuana use. To this end, this study examined the predictiveness of other drug and alcohol use, smoking, and psychiatric disorders on cannabis use among Veterans Affairs (VA) primary care patients who were identified by their PCPs as having potential mental health needs. We hypothesized that use of other illicit drugs and alcohol, cigarette smoking, and presence of psychiatric conditions would predict past year cannabis use.

MATERIALS AND METHODS

Clinical Referral and BHL Assessment

Between June 2003 and July 2006, PCPs from a Veterans Affairs Medical Center and associated community-based outpatients clinics referred 7236 primary care patients with potential mental health needs to the Behavioral Health Laboratory (BHL)³⁴ for an initial triage assessment. The purpose of the referrals involved (1) annual screenings for substance misuse and mental health issues, or (2) psychiatric consultations for mental health concerns. The BHL procedures for patient contact, assessments, and interviews are described in detail elsewhere.³⁴

The BHL assessments include basic demographics, the Mini International Neuropsychiatric Interview (MINI)³⁵ (for psychosis, mania, panic disorder, generalized anxiety disorder, PTSD, and alcohol abuse or dependence), and patient health questionnaire-9³⁶ for depression.

Patients' use of illicit substances was assessed by asking whether they had used any "street drugs" (eg, cocaine, heroin, and marijuana). Endorsing this item (ie, "yes" to drug use) led to a series of questions that would quantify their use of each substance, but not establish a diagnosis of SUD. For example, patients were asked if they have "ever used marijuana," "used marijuana in the past year," and "used more than or less than 10 joints in the past year." Similar questions were asked regarding heroin, cocaine, speed, and barbiturates use. For smoking status, patients were asked if they currently smoke cigarettes.

Participants

Among the initial 7236 patients referred to the BHL, 5512 participants were included in this analysis. A total of 1724 patients were excluded if (1) unable to contact patients (n = 847), (2) refused BHL assessment (n = 594), and (3) missing data on drug use (n = 283). The sample size was further reduced to 5492 participants due to missing data on 4 variables of interest: race (n = 2), alcohol use disorder (n = 14), smoker status (n = 2), and PTSD (n = 2). Among the 5492 participants, 92% were men, 48% were white, and 46% were African American. Mean age of participants was 56.5 years (SD = 14.6) (Table 1).

Consent

As a clinical service, an informed consent was not required for participation in the BHL interviews. Patients were informed that the results of the BHL assessment would be communicated to their PCPs and included as part of their clinical record. Approval was obtained from the Philadelphia Veterans Affairs Medical Center Institutional Review Board for conducting a review, analyses, and publication of the BHL data.

Variables of Interest

The variables of interest include past year use of cannabis, other drug use (an aggregate of "yes" answers to "past year use" questions regarding specific drugs, ie, heroin, cocaine, barbiturates, or speed, but not including marijuana use), a diagnosis of current alcohol abuse and/or dependence, use of cigarettes at initial assessment, a diagnosis of current major depression and/or other depression diagnosis (patient health questionnaire-9), a diagnosis of current PTSD (MINI), a diagnosis of current generalized anxiety disorder or current panic disorder (MINI), and an acknowledgment of psychotic symptoms (MINI). Because acute use of marijuana can present a health risk, such as motor vehicle accidents,²¹ acute myocardial infarction,¹⁴ and stroke,¹⁵ we focused on all respondents who used marijuana in the past year (both less than 10 and greater than 10 times).

Statistical Analysis

Unadjusted odds ratios associated with the prediction of marijuana use by the independent variables were calculated. A separate hierarchical logistic regression analysis was used to determine the potential predictor variables and their interactions with marijuana use. Variables were entered into the regression equations in the following order: demographic variables (age, race, and gender), any other drug use, presence of alcohol use disorders, smoking status, presence of major depressive episode or other depressive disorders, presence of PTSD, presence of any anxiety disorders, and presence of psychotic symptoms. Substance use variables such as other illicit drugs, alcohol, and cigarette use were entered before psychiatric disorder variables due to higher prevalence of these conditions among cannabis users, based on published studies.^{23–27}

A forward selection approach was used in conjunction with the specified ordering of the variables. This method ensured that a “more important” predictor variable was not removed by a “less important” variable. A statistically significant change in the log-likelihood ratio statistic because of inclusion of a variable in the model was used as the entry criterion. A conservative Bonferroni correction of α level 0.005 was used as the entry criterion for statistical significance in the primary models to adjust for type I error. We first report a model that included main effects of predictor variables using Hosmer-Lemeshow goodness-of-fit χ^2 Nagelkerke R^2 , regression coefficients, standard errors, and confidence intervals. We also report the percentage correctly classified by the primary model and the area under curve from a receiver operating characteristic curve to assess the sensitivity and specificity.

RESULTS

Participant Characteristics

Six hundred thirty-five patients (11.5%) reported using marijuana during the past year. Overall, past year marijuana users were younger (mean = 49.6, SD = 11.1) than the nonusers (mean = 57.4, SD = 14.7) ($t = 12.88, P < 0.001$). A significantly greater proportion of men than women ($\chi^2 = 11.13, df = 1, P < 0.001$), and African American than white and other races ($\chi^2 = 65.45, df = 2, P < 0.001$) reported past year marijuana use. Sixty-seven percent of past year marijuana users were identified as cigarette smokers. Patients with past year drug use (other than marijuana), alcohol use disorders, depressive disorders, PTSD, anxiety disorders, or psychotic symptoms were more likely to report past year marijuana use (Table 1).

Predictor Variables for Past Year Marijuana Use

Table 2 presents the unadjusted odds ratios for all main effects of predictor variables for past year marijuana use. Age, gender, other past year drug use, presence of alcohol use disorders, smoking status, depressive disorders, PTSD, anxiety disorders, and psychotic symptoms, individually, are predictive of the patients' use of marijuana during the past year.

Table 3 presents the main effects from the logistic regression analyses adjusted for age, race, and gender in predicting past year marijuana use based on other drug use, alcohol use disorders, smoking status, depression, PTSD, anxiety disorders, and psychotic symptoms.

The logistic regression for the past year marijuana use produced a 3-variable model ($\chi^2 = 27.12, df = 8, P = 0.007$; Nagelkerke Pseudo- $R^2 = 0.227$), consisting of the patients' past year drug use, presence of alcohol use disorders, and smoking status (Table 3). Patients were 5.4 times more likely to have used marijuana during the past year if they used another illicit drug during the past year. Those with alcohol use disorder diagnosis or those who are smokers were 2.3 and 1.5 times more likely to have used marijuana during the past year, when controlling for the other 2 significant predictors. Receiver operating characteristic

curve (area under curve = 0.79) represents good sensitivity and specificity of the model. This model correctly classified 88.4% of the past year marijuana users.

DISCUSSION

Despite the multiple negative consequences of cannabis use, universal screening for cannabis use among primary care patients is not recommended, and would be a cumbersome undertaking for the practitioner and may not benefit the patients. However, identifying patients at increased risk for cannabis use can facilitate targeted screening and provision of interventions in the primary care setting. In this study, we examined the association of patient factors prevalent in the primary care setting (eg, alcohol abuse/dependence, illicit drug use, nicotine use, depression, and anxiety disorders) and other psychiatric diagnosis (eg, PTSD and psychosis) with cannabis use in a primary care VA population. Past year drug use, alcohol use disorders, and cigarette use were significantly associated with past year cannabis use. Our findings suggest that initial positive screening for cigarette use, alcohol abuse or dependence, or evidence of other illicit drug use could help identify patients at risk for cannabis use and its multiple, associated medical complications. This study is the first to examine the association of these variables with cannabis use in the screening-triage setting. Clinically informed screening, such as offered in the present investigation, could prove to be a practical and efficient method of screening for cannabis use. With the advancement of medical record technologies, a screening algorithm can be developed to identify the cannabis users based on other clinically identified conditions.

The main effect of each predicting variable, including alcohol use disorders, other drug use, and cigarette use, was predictive of cannabis use during the past year. In previous studies, cannabis users were 6.6 to 13.9 times more likely to have alcohol use disorders,²⁴ 14.4 times more likely to use illicit drugs,²⁴ and 6.4 times more likely to smoke cigarettes.²³ Our results are in line with these previous findings, ie, high comorbidity between cannabis use and alcohol, drug, and cigarette use. According to Stinson et al,²⁷ cannabis abuse/dependence were significantly correlated with alcohol, drug and nicotine dependence. Our investigation demonstrated a high correlation between these comorbid conditions and cannabis use, ie, a broader category than cannabis abuse or dependence, thus potentially identifying a larger group of at risk patients.

The main effects for depressive disorders, PTSD, anxiety disorders, and psychosis, individually, were significantly associated with past year cannabis use, although these potential predictors were not selected in our theoretically based logistic regression model. Previously, Degenhardt et al^{25,26} reported that controlling for demographics and other SUDs excluded mood and anxiety disorders as predictors of cannabis use. The exclusion of these variables may be a function of their entry order into the analysis.

In our sample, we found that 11.5% of the patients reported using cannabis in the past year. Screening and education about cannabis use may be an important first step in the prevention of a variety of health problems. Brief interventions by healthcare providers, eg, asking patients if they are currently smoking cigarettes, can significantly increase the odds of patients changing or attempting to change their behavior.^{37,38} One preliminary study in adolescents has demonstrated brief, single visit interventions, and education may reduce cannabis use.³⁹ Future studies, including a cost-benefit analysis, could help clarify which levels of intervention (eg, education vs brief motivational interviewing) are most appropriate for different levels of cannabis use, similar to the work of Babor et al⁴⁰ for alcohol.

In the case of cigarette smoking and cannabis use, 67% of past year cannabis users in our sample were also identified as tobacco smokers. Cannabis and tobacco smoke have an

additive effect on impairment of lung function.⁴¹ According to our posthoc analysis using Short Form-12 Physical Health Component scores in this VA BHL sample,⁴² cigarette smokers who used cannabis reported more health problems than patients who only smoked cigarettes ($m = 35.46$ and $m = 38.30$, respectively; $F = 4.96$; $P = 0.03$), although the scores in both groups reflect moderately severe health problems.

Our study has a number of important limitations. First, 24% of those referred for BHL assessment were not included in our analysis due to incomplete data. Given that over half ($n = 1441$) of those excluded from the sample were due to refusing BHL assessment or BHL not being able to contact the patients, our study sample may represent a biased sample. Second, the study was conducted at a VA medical center and associated outpatient clinics. Our sample included veterans with higher prevalence of mental health and SUD and a smaller percentage of women patients, thus, limiting the generalizability of our findings. Third, all BHL screens were performed by a trained health technician (nonclinician) via telephone. The validity of performing screens for complex psychiatric conditions in this manner may be of concern, although this method has been found to be effective and reliable in VA primary care settings.²³ Fourth, with the exception of alcohol use disorders, the BHL does not include a diagnostic screen for SUDs. Fifth, given that our analysis was based on epidemiological data, our suggested procedure cannot be clinically validated in this study. Additional studies are needed to test the clinical effectiveness of this screening method.

We relied on diagnostic assessments rather than primary care general screening to construct our predictive model. Also, the BHL provides assessments to a clinically selected sample with elevated prevalence rates for psychiatric and SUDs. Both of these factors limit the generalizability of our results to the typical primary care setting. Future investigations are needed to examine the prevalence of cannabis use and comorbid conditions associated with cannabis use in the broader VA primary care population and other, non-VA primary care populations. Further research into the risks associated with cannabis use and the effectiveness of primary care based marijuana screening and educational interventions should guide the effort to prevent the multiple serious health consequences of cannabis use.

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TABLE 1

Demographic and Diagnostic Characteristics of Veterans Referred to Philadelphia-VAMC Behavioral Health Lab for Initial Triage Assessment in 2003 to 2006*

Variables	Overall (N = 5492)	Past Year Marijuana Use (N = 635)	No Marijuana Use (N = 4857)
Age, mean (SD) [†]	56.49 (14.6)	49.59(11.1)	57.39 (14.7)
Male, n (%) [†]	5035 (91.7)	604 (95.1)	4431 (91.2)
Race			
White, n (%) [†]	2642 (48.1)	213 (33.5)	2429 (50.0)
African American, n (%) [†]	2500 (45.5)	382 (60.2)	2118 (43.6)
Other drug use, n (%) [†]	562 (10.2)	242 (38.1)	320 (6.6)
Alcohol use disorders, n (%) [†]	802 (14.6)	224 (35.5)	578 (11.9)
Smoking status, n (%) [†]	2112 (38.5)	425 (66.9)	1687 (34.8)
Depressive disorders, n (%) [†]	3597 (65.5)	476 (75.0)	3121 (64.0)
Posttraumatic stress disorder, n (%) [†]	1381 (25.1)	217 (34.2)	1164 (24.0)
Anxiety disorders, n (%) [†]	2005 (36.5)	306 (48.2)	1699 (35.0)
Psychotic symptoms (%) [†]	560 (10.2)	118 (18.6)	442 (9.1)

* All tests were conducted between subjects who reported past year marijuana use and no marijuana use.

[†] $P < 0.01$.

TABLE 2

Unadjusted Odds Ratios and 95% Confidence Intervals for Main Effects of Variables Predicting Marijuana Use (Past Year) (N = 5512)

Variables	OR	(95% CI)
Age*	0.96	(0.96–0.97)
Race (African American vs white)	2.07	(1.7–2.5)
Gender*	0.53	(0.4–0.8)
Other drug use (past year)*	8.64	(7.1–10.5)
Alcohol use disorder*	4.07	(3.4–4.9)
Smoking status*	2.56	(2.2–3.0)
Presence of depressive disorders*	1.68	(1.4–2.0)
Posttraumatic stress disorder*	1.64	(1.4–2.0)
Anxiety disorders*	1.71	(1.5–2.0)
Psychotic symptoms*	2.28	(1.8–2.8)

* $P < 0.001$.

OR, odds ratio; CI, confidence interval.

TABLE 3

Summary of Logistic Regression Model Predicting Past Year Marijuana Use: Effects (N = 5512)*

Predictor [†]	OR	95% CI	P
Other drug use (past year)	5.40	(4.3–6.7)	<0.001
Alcohol use disorder	2.31	(1.9–2.8)	<0.001
Smoking status	1.50	(1.3–1.7)	<0.001

* Adjusted for age, race, and sex.

[†] A forward stepwise selection based on likelihood ratio statistics was used to fit the final model, using an alpha entry criterion of 0.005.