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Potential radiating effects of misusing substances among medical patients receiving brief intervention

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Abstract

Background—The societal benefits of substance use interventions are largely driven not by reducing use per se, but by the broader implications of those reductions. This encompasses “potential radiating effects of misusing substances” (PREMiS) such as utilization of high-cost hospital and emergency care, injury, productivity losses, incarceration, and driving while impaired.

Methods—This study is a secondary analysis from a randomized trial comparing in-person vs. computerized brief intervention among 360 adult community health center patients with moderate-risk illicit drug use ($N=302$ with complete data through 12 months of follow-up). This study aims to examine four aspects of PREMiS outcomes in this sample: (1) their frequency; and their association with (2) type of brief intervention received (by random assignment), (3) type of drug misused, and (4) baseline drug problem severity (within the moderate risk range).

Results—12-month prevalence was 18.5% for hospitalization (399 cumulative days), 33.1% for emergency department utilization (166 cumulative visits), 39.1% for injury (1818 injury-days), and 8.3% for incarceration (278 days of detention). There were 729 missed work days among those who reported employment. Fifty percent reported driving under the influence (DUI) of substances. There were no differences in PREMiS outcomes by type of brief intervention. Participants with only marijuana misuse at baseline were not at lower risk of experiencing PREMiS events than participants with other drug misuse. Higher baseline drug problem severity was predictive of future hospitalization ($p<.05$) and number of hospitalization days ($p<.01$).

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Conclusion—This community health center sample with moderate-risk illicit drug use reported considerable high-cost healthcare utilization, injury, missed work, and DUI. Interventions are needed that can reliably lower risk of negative outcomes among drug users.

Keywords

primary care; brief intervention; drug misuse; Potential Radiating Effects of Misusing Substances (PREMiS); hospitalization; injury; productivity losses

1. Introduction

Most individuals in the U.S. who have substance use disorders, or who use alcohol or drugs in ways that put them at risk for adverse health and social consequences, do not access formal substance use treatment (Substance Abuse and Mental Health Administration (SAMHSA), 2013). Thus, general medical settings have been put forth as promising venues in which to identify and intervene in problematic substance use (Babor et al., 2007; Madras et al., 2009). Screening, brief intervention, and referral-to-treatment (SBIRT) is a service model that provides a framework for identifying and addressing the spectrum of substance use problems within the context of medical care. Patients are typically screened for alcohol and/or drug use problems by self-report, and those who meet certain risk thresholds receive brief intervention as part of their medical visit, while patients with severe substance use problems are referred to specialty treatment. Because this latter group of patients who require specialty treatment typically represents a small segment of the patient population, brief intervention is the most commonly applied approach in health care settings for changing patients' substance use behaviors.

1.1 Assumptions Underpinning the Expansion of SBIRT

The last decade has seen a major expansion of SBIRT services for alcohol and drug misuse throughout various medical settings (Madras et al., 2009). Although there is good evidence supporting brief interventions for alcohol misuse in adult primary care patients (Moyer, 2013), the evidence is weak for illicit drug misuse (Saitz, 2014). Although some randomized trials have found support for brief interventions reducing drug use (Bernstein et al., 2005; Humeniuk et al., 2012), others have not (Roy-Byrne et al., 2014; Saitz et al., 2014). Nevertheless, the lack of scientific consensus has not been a barrier to the expansion of SBIRT, which has continued with substantial government investment (Humphreys & McLellan, 2010; Saitz, 2014).

A major impetus for promoting SBIRT as a policy initiative (and more broadly, the movement towards providing substance use services within mainstream medical care) is the assumption that effectively addressing substance use will naturally give way to a range of other benefits to public health and safety (Humphreys & McLellan, 2010; McLellan & Woodworth, 2014). These broader consequences of substance misuse can be far-reaching, and include high-cost healthcare utilization such as hospital and acute emergency care, injury, missed work days, incarceration, and motor vehicle accidents resulting from driving under the influence of alcohol or drugs, among other consequences. In this article, we refer to these kinds of consequences as *Potential Radiating Effects of Misusing Substances*

(PREMiS). The public health impact of SBIRT in a patient population depends in part on the extent of these broader substance use consequences, the degree to which they are actually directly or indirectly attributable to substance misuse (as opposed to merely associated with it), and whether they can be plausibly interrupted via brief intervention.

Studies of brief intervention effects on these kinds of broader consequences have been inconsistent. Some studies have found that alcohol brief interventions can impact outcomes such as hospitalizations (Fleming et al., 2000) and even mortality (Cuijpers, Riper, & Lemmers, 2004), although a systematic review found the strength of the evidence on such outcomes to be uniformly low or insufficient to draw conclusions (Jonas et al., 2012). Recent trials of brief intervention for drug misuse found no significant effects on broader outcomes such as healthcare utilization (Roy-Byrne et al., 2014; Saitz et al., 2014).

1.2 Aims

The current study examines PREMiS outcomes among community health center patients in New Mexico, USA who received either a computerized BI (CBI) or an in-person BI (IBI) for illicit drug misuse as part of a randomized clinical trial (Schwartz et al., 2014). The paper will investigate four aspects of the PREMiS outcomes in this sample: (1) their frequency; and their association with (2) type of brief intervention received (by random assignment), (3) type of drug misused, and (4) baseline severity of drug misuse.

1.3 Hypotheses

We originally hypothesized that CBI would be superior to IBI in reducing PREMiS events, under the rationale that participants would be more comfortable interacting with a computer than a person regarding substance use behaviors that may be viewed as private or sensitive. Moreover, CBI would always deliver the same content as programmed, whereas counselors may have greater variability in the content and therapeutic quality of interventions delivered.

Additional hypotheses pertaining to PREMiS were generated after conducting the trial but before examining the data reported herein. We hypothesized that participants whose risky drug use at baseline was limited to marijuana would be less likely to experience PREMiS events than their counterparts with other risky drug use (either alone or in addition to risky marijuana use). Finally, we hypothesized that the degree of drug misuse risk at baseline would be prospectively associated with experiencing PREMiS events.

2. Methods

2.1 Study Design

This secondary analysis reports data on PREMiS measures collected as part of a randomized clinical trial comparing a computerized brief intervention and an in-person brief intervention for illicit drug misuse in adult community health center patients in New Mexico, USA. The methodology and results of the trial have been described in detail elsewhere (Gryczynski et al., in press; Schwartz et al., 2014). Briefly, 360 adult patients with moderate-risk illicit drug misuse as defined by the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) (Humeniuk et al., 2008) were randomly assigned on a 1:1 basis to receive an

interactive computerized brief intervention (CBI) or an in-person brief intervention (IBI) delivered by an experienced, Masters-level behavioral health counselor. The study found no significant differences between IBI and CBI on the primary outcomes of global ASSIST drug risk scores or drug-positive hair test results, while CBI outperformed IBI on several substance-specific drug risk scores examined as secondary outcomes. Analyses to date have examined the results of hair drug testing and self-reported ASSIST scores at a 3-month endpoint (Schwartz et al., 2014), and in terms of differential change through 12-months of follow-up (Gryczynski et al., in press). In summary, these analyses found no overall reductions, or between-condition differences in drug hair test results. Participants in both conditions reported significant reductions in global and substance-specific ASSIST scores (a composite measure of self-reported use and associated problems), and CBI had an advantage on some substance-specific ASSIST scores examined as secondary outcomes. The current study uses data from the trial to examine several research questions related to PREMIS, as described below.

2.2 Prevalence and Frequency of PREMIS events

The study provides information about the extent of various PREMIS events in a community health sample with moderate-risk drug use, which as described previously is an important consideration for estimating the potential public health impact of SBIRT.

2.3 Setting

The clinical trial was conducted at two federally-qualified community health centers in two different rural communities in New Mexico. Both clinics included primary care and dentistry services, and both had long-standing experience with providing brief drug misuse interventions from their early participation in the national SBIRT demonstration project (Gonzales et al., 2012; Madras et al., 2009).

2.4 Participants

The trial enrolled 360 adults (one of whom was excluded immediately post-randomization after revealing their current enrollment in addiction treatment, which was an exclusion criterion for the trial). The analysis sample for the current study includes 302 participants who provided complete information on PREMIS measures at all study interviews (baseline, 3-, 6-, and 12-month follow-up). The analysis sample was 47% female, 46% Hispanic ethnicity, 90% white race, and with a mean age of 37 (ages 18-85; SD=15).

2.5 Procedures

Clinic patients were approached in the waiting room by a research assistant, who invited them to complete a confidential eligibility screening for a “health study”. Patient who agreed were taken to a private room where they completed the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST), a widely-used screening tool for detecting substance misuse problems in health settings (Humeniuk et al., 2008). Patients were eligible to participate in the study if they scored in the “moderate-risk” range of the ASSIST for any illicit drug category (substance-specific involvement score 4-26). Patients were excluded if they scored in the high-risk range for any substance other than tobacco, abstained from

drugs in the past 3 months, received substance use treatment in the past year, received a BI at the clinic in the past month, or had plans to move out of state in the next year.

Participants were randomly assigned to CBI or IBI, which they completed after their regular medical visit. CBI consisted of an interactive computer program, while IBI was delivered by a behavioral health counselor embedded in the clinics. More details about the interventions can be found in earlier reports (Schwartz et al., 2014). Follow-ups were conducted at 3-, 6-, and 12-months post enrollment (follow-up rates of 91%, 89%, and 86%, respectively). The study was approved by the Institutional Review Boards of Friends Research Institute and Christus Health, and all participants provided informed consent.

2.6 Measures

2.6.1 ASSIST—Substance use problems were measured during screening by the ASSIST. The ASSIST was developed and refined through a research-driven process that included extensive feasibility testing and validation in multi-site international studies (Humeniuk et al., 2008; Newcombe, Humeniuk, & Ali, 2005; WHO Assist Working Group, 2002). The instrument provides substance-specific risk scores for tobacco, alcohol, marijuana, cocaine, amphetamine-type stimulants, sedatives, inhalants, and opioids. Empirically-informed score ranges for each substance group patients into one of three risk categories: low-risk (abstinence or low-level use without problems), moderate-risk (good candidate for brief intervention), and high-risk (likely requiring additional assessment and specialty treatment). By definition, the current study sample consists of individuals with moderate-risk illicit drug use. In addition to the substance-specific scores, a global drug risk score integrates information from all illicit drugs to provide a general yardstick of illicit drug problems. The global ASSIST score has been employed as an outcome measure in several clinical trials to track changes in drug use problems following brief intervention (Humeniuk et al., 2012; Saitz et al., 2014; Schwartz et al., 2014).

2.6.2 PREMIS Measures—PREMIS measures included hospitalizations, emergency department (ED) utilization, injury, missed work days, incarceration, and driving under the influence of alcohol or drugs. PREMIS measures were assessed by self-report questions adapted from epidemiological surveys. These questions asked about events during the past 3 months at the baseline, 3-, and 6-month assessments, and during the past 6 months at the 12-month assessment. Hospitalization was assessed by the question “*During the past 3 months, how many nights were you an inpatient in a hospital? (Include only instances where you were admitted to the hospital. Do not include staying overnight in an Emergency Room).*” ED utilization was assessed by the question “*During the past 3 months, how many times have you gone to a hospital emergency room about your own health?*” Injury was assessed by the question “*During the past 3 months, how many days did injury keep you in bed more than half of the day? (include days that you were in a hospital; include only injuries, do not include illness).*” Missed work days were assessed by the question “*During the past 3 months, how many whole days of work did you miss? [DO NOT include days missed because of a planned vacation or staying home with a sick child or family member]*”. Incarceration was assessed by the question: “*During the past 3 months, how many nights have you spent in jail or prison?*” Driving under the influence (DUI) was assessed by two

yes/no questions about DUI for alcohol and drugs, which were combined for analysis: “During the past 3 months, have you driven a vehicle while you were under the influence of alcohol/drugs?” Thus, the questions reflect self-report of DUI behavior, and not a criminal charge or legal definition.

2.7 Statistical Analysis

We first examined descriptively the prevalence, frequency, and cumulative counts (person-days) for each PREMIS measure collected at baseline for the 3 months preceding the interview, as well as cumulatively during the 12-month study period. We then examined 12-month rates of each PREMIS measure by specific substance misuse at baseline, as determined by scoring in the moderate-risk range on the ASSIST for alcohol, marijuana, cocaine, amphetamine-type stimulants, sedatives, and opioids (categories can overlap as participants could score moderate-risk on multiple substances). Bivariate differences in PREMIS measures were tested using likelihood-ratio χ^2 tests of independence for 2×2 tables representing baseline moderate risk status for each substance (low risk vs. moderate risk; high risk use of any substance except tobacco was an exclusion criterion) and PREMIS event (occurred vs. did not occur). This same analysis was also conducted comparing PREMIS events for participants with moderate risk use of marijuana alone vs. other drugs.

We also conducted a series of regression analyses to test the study hypotheses. We fit logistic regression models predicting whether each PREMIS event was experienced over the 12-month study period, as well as negative binomial regression models predicting the number of event days for each outcome. All models adjusted for gender, Hispanic ethnicity, age (in years), and whether or not each respective event occurred in the 3 months prior to baseline. Key predictors of interest in these models were Study Condition (Reference = In-Person BI) and a categorical variable denoting type of drug misuse at baseline (moderate-risk for marijuana only vs. other drug). To test the problem severity hypothesis, an alternative set of models was fit which included (in lieu of type of drug misuse) baseline drug problem severity as measured by the ASSIST Global Drug Risk score.

3. Results

3.1 Participant Characteristics by Type of Drug Misuse

Table 1 shows participant background characteristics by type of drug misuse at baseline (moderate-risk for marijuana only vs. other drugs). Participants with marijuana misuse only were older (mean age = 39 vs. 34; $p < .01$), less likely to report Hispanic ethnicity (39% vs. 55%; $p < .01$), and more likely to report white race (93% vs. 86%; $p < .05$). There were no significant differences between marijuana only vs. other drug misuse with respect to gender, educational attainment, employment, or marital status.

3.2 Frequency of PREMIS Outcomes

Based on participant report, many PREMIS events were reported in the 3 months prior to study enrollment, as well as in the 12-month study period (Table 2). During the 12-month study period, hospitalization was reported by 19%, representing a cumulative 399 days in the hospital. One third of the sample reported obtaining care at an ED, with 166 cumulative

visits. Serious injury (resulting in the participant having to spend at least half the day in bed) was reported by 39% of the sample, with a cumulative total of 1,818 days injured. Eight percent were incarcerated during the study period, with a cumulative 278 days of incarceration across the sample. Among participants who reported continuous employment throughout the study period, 52% reported missing work, with a cumulative 729 missed work days.

3.3 PREMIS Measures by Drug Type

Table 3 shows 12-month prevalence rates for each PREMIS measure by type of drug risk at baseline (participants could score as moderate-risk for more than one drug, thus drug categories can overlap). There were few significant differences based on type of drug. Participants with risky opioid use were more likely to experience hospitalization in the 12-month period following study entry compared to participants without risky opioid use (29% vs. 16%; $p < .05$). Participants with risky cocaine use were more likely than participants without risky cocaine use to experience incarceration (17% vs. 6%; $p < .05$). Participants with risky alcohol use were more likely than participants without risky alcohol use to report DUI (60% vs. 46%; $p < .05$). Finally, the differences between participants with marijuana misuse only and participants with other drug misuse were not statistically significant for any PREMIS measure.

3.4 Regression Analyses

Below we describe the results of the regression analyses as they relate to each study hypothesis. The logistic regression models with Study Condition and baseline drug problem severity as predictors of PREMIS measures are shown in Table 4. The results of other models are not tabled for parsimony, but the results are described in the text.

3.4.1 CBI vs. IBI—There were no significant differences between CBI and IBI on any of the PREMIS measures in the logistic regression models. Likewise, the negative binomial models predicting the number of events over the 12-month study period showed no significant differences between CBI and IBI.

3.4.2 Type of Risky Drug Use at Baseline: Marijuana vs. Other Drugs—There were no significant differences in the likelihood of experiencing any of the PREMIS events, or in the number of events, between participants with risky marijuana use only as compared with those who had other risky drug use (alone or in combination with risky marijuana use). Thus, no significant differences in PREMIS measures could be discerned based on marijuana risks vs. other drug risks.

3.4.3 Baseline Drug Problem Severity—Higher global illicit drug risk scores on the ASSIST at baseline were associated with higher likelihood of hospitalization over 12 months, such that for each additional point on the Global ASSIST scale, participants had a 2% increase in the odds of experiencing hospitalization (adjusted odds ratio [AOR]= 1.02; 95% CI=1.00-1.04; $p < .05$). This relationship was also found for number of hospitalization events in the negative binomial analysis (incidence rate ratio [IRR]= 1.05; 95% CI=1.01-1.09; $p < .01$). However, baseline drug problem severity as measured by the

ASSIST global drug risk score was not associated with any other PREMIS measure in any of the statistical models.

4. Discussion

This secondary analysis from a randomized trial comparing computerized brief intervention to in-person brief intervention found a considerable number of *Potential Radiating Effects from Misusing Substances (PREMiS)* among community health center patients with moderate-risk illicit drug use. We considered a range of events, including hospitalization, emergency department utilization, injury, incarceration, missed work days, and driving under the influence of alcohol or drugs. These types of events are of considerable importance in terms of morbidity and costs to society.

Two recent trials of brief intervention for drug use in primary care (both of which did not find brief interventions to be effective) reported on some of these outcomes (Roy-Byrne et al., 2014; Saitz et al., 2014). Rates of hospitalization and emergency department utilization were higher in those studies than in our sample, perhaps due to sample differences among the studies and/or in part to the relatively isolated location of the rural communities in which our study was conducted. In the study by Saitz and colleagues (2014), hospitalization and emergency department visits were reported during the 3 months prior to baseline assessment by 14% and 36% of the 528 primary care participants in Boston. These base rates are twice as high as those reported by our sample during a similar 3 month pre-intervention period. Even in our sample, these kinds of events were relatively commonplace, suggesting ample opportunity for interrupting potentially adverse sequelae of drug use in moderate-risk populations. However, neither Saitz et al. (Saitz et al., 2014) nor Roy-Byrne et al. (Roy-Byrne et al., 2014) found brief intervention to be effective in reducing these kinds of outcomes, or even drug use for that matter. In addition to other trials of brief intervention, it is also useful to compare rates of PREMIS events in this sample to those in the broader US population. For example, in 2012, the rate of hospital stays per 1,000 population in the US was 78.9 for patients ages 18-44, 108.8 for patients ages 45-64, and 260.9 for patients ages 65-84 (Weiss & Elixhauser, 2014) – considerably lower than the rate of hospital stays in the current sample.

The present study found a significant association between baseline drug problem severity and hospitalization as measured by the Global ASSIST score, a composite measure of overall illicit drug problems. To our knowledge, the Global ASSIST score in particular has not been examined in association with health care utilization or other downstream PREMIS outcomes. This prospective relationship between drug problem severity and subsequent hospitalization is an important finding that supports the utility of the ASSIST as a research instrument, and again suggests an opportunity (though not an effective approach) for intervention. On the other hand, it is somewhat surprising that this relationship was not evident for any of the other PREMIS outcomes. Moreover, the extent to which hospitalizations were specifically related to drug use (either directly or indirectly) could not be discerned, thus limiting the ability to draw firm conclusions. It is also important to note that the ASSIST's score range was naturally compressed in our sample by virtue of the trial's inclusion criteria, which specified moderate-risk illicit drug use with no high risk use of any

substance except tobacco. It is likely that the global ASSIST score would have been more strongly predictive of PREMIS outcomes in a more heterogeneous sample. However, patients with moderate-risk drug use are thought to be the population that is most clinically appropriate for brief intervention services. Future research on brief interventions in primary care should examine the natural and post-intervention trajectories of patients with respect to hospitalization and other PREMIS events in greater detail. Such events would also figure prominently in analyses of cost-benefits, for those brief interventions that demonstrate efficacy.

Brief intervention research in primary care settings that has recruited all participants with risky drug use (consistent with the broad-based approach of the SBIRT model) have found a preponderance of marijuana users compared to those using opioids, stimulants or other drugs. This is not surprising given the prevalence of marijuana use in the population relative to other drugs (Substance Abuse and Mental Health Administration (SAMHSA), 2013). However, the data from this study do not support the hypothesis that participants with only marijuana misuse would have fewer PREMIS events relative to those with other substance misuse. One possible explanation for this finding is that perhaps differences in consequences between marijuana and other drug use (such as opioids, cocaine, amphetamines, etc.) become manifest only at higher risk thresholds. Alternatively, this result could be a function of our use of ASSIST scores as an inclusion criterion. Because the ASSIST is weighted heavily for consequences of use, this may have resulted in a more homogenous sample (i.e., despite heterogeneity in types drugs used, all participants by definition had substance misuse at a moderate-risk level). Nevertheless, a few drug-specific differences emerged in bivariate comparisons, whereby participants with risky opioid use were more likely to be hospitalized, those with risky cocaine use were more likely to be incarcerated, and those with risky alcohol use were more likely to report driving while impaired.

It is worth emphasizing that the consideration of PREMIS outcomes should not be viewed as replacing or in any way undermining the importance of patients' clinical improvement, which remains paramount in the evaluation of health services for substance misuse. Nevertheless, PREMIS events should come into play in the evaluation of policies and initiatives that are justified on the basis of their ability to impact not only substance use but its broader consequences. PREMIS measures in studies of drug misuse and dependence are of interest from both a public health and an economic perspective. Drug abuse is known to contribute substantially to disease burden (Degenhardt & Hall, 2012) and to drive a number of societal costs including health care and criminal justice expenses (Birnbaum et al., 2011; Ettner et al., 2006; Leider, Dhaliwal, Davis, Kulakodlu, & Buikema, 2011; Mark, Woody, Juday, & Kleber, 2001; Zarkin et al., 2012). Yet, the U.S. Preventive Health Services Task Force considers there to be inadequate data to recommend screening and brief intervention for illicit drug use in primary care (U.S. Preventive Services Task Force, 2008). Aside from measuring reductions in drug use itself, future studies of brief intervention should consider tracking PREMIS events as well. These events could be classified by their likelihood of association with substance use, much as serious adverse events are rated in relation to their likelihood of association with a clinical trial protocol (e.g., not related, possibly related, probably related, definitely related). That said, making causal attributions between substance use and various downstream outcomes is challenging. Substance use problems can exert a

range of direct and indirect impacts on physical health and health behavior, in some cases perhaps even working to reinforce a broader array of risk factors and feeding back to higher-level risk regulators and social determinants of health (Glass & McAtee, 2006).

4.2 Limitations

The study has a number of limitations. First, all participants received some kind of brief intervention, and therefore it could not be determined whether brief intervention had any impact on the PREMiS measures. Second, data were gathered by self-report. Given that the data were collected under confidential conditions and there were no contingencies on the responses to the interviewer, there is reason to believe that responses were relatively accurate as most of the PREMiS measures would be memorable events (e.g., hospitalization, incarceration). Third, with the obvious exception of DUI, the extent to which the PREMiS events were directly related to substance use was not determined. Finally, the study sample consisted of patients with moderate-risk illicit drug use. Extrapolating beyond this sample to low-risk or high-risk users is not warranted. However, individuals with moderate-risk use are a key target population of brief intervention, and would drive much of the public health impact and cost-benefit profile of the SBIRT model.

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Highlights

- This sample of community health center patients with moderate-risk drug misuse who received one of two brief interventions (BIs) as part of a randomized clinical trial reported a high level of hospital and emergency care, injury, missed work, and driving under the influence (DUI) of substances.
- There were no significant differences based on type of BI received.
- Participants with marijuana misuse only were not at lower risk of experiencing negative events than participants with other types of drug misuse.
- Higher drug problem severity at baseline was prospectively associated with hospitalization.

Table 1

Participant characteristics by type of drug misuse at baseline: marijuana only vs. other drugs.

	Type of Drug Misuse at Baseline		<i>p-value</i>
	<i>Marijuana only (n= 173)</i>	<i>Other drug(s) (n= 129)</i>	
Female	50%	43%	.19
Hispanic Ethnicity	39%	55%	.005
White Race	93%	86%	.045
Age (mean, SD)	39.4 (15.6)	33.8 (13.1)	.001
Education (in years; mean, SD)	12.5 (2.0)	12.4 (2.2)	.79
Employed (full-time or part-time)	42%	38%	.52
Married	24%	22%	.72

Note: Differences are tested using likelihood-ratio χ^2 tests of independence (categorical variables) or independent-samples t-tests (continuous variables).

Table 2

Potential radiating effects of misusing substances (PREMiS): Recent history and study period.

	Recent History (past 3 months)			Study Period (12 months)		
	<i>Prevalence</i>	<i>Mean Days (SD)</i>	<i>Cumulative Events</i>	<i>Prevalence</i>	<i>Mean Days (SD)</i>	<i>Cumulative Events</i>
Hospitalization	7%	0.40 (4.37)	121	19%	1.32 (4.86)	399
ED utilization	18%	0.29 (0.76)	87	33%	0.55 (1.09)	166
Injury	27%	2.70 (9.57)	814	39%	6.02 (16.85)	1818
Incarceration	4%	0.23 (2.11)	70	8%	0.92 (5.14)	278
Missed work	29%	2.09 (7.97)	456	52%	4.83 (11.82)	729
DUI	38%	<i>Not assessed</i>		50%	<i>Not assessed</i>	

Note: *N* = 302 except for missed work days, which was assessed only for participants who reported employment (*N* = 218 employed at baseline and 151 continuously employed through follow-up). Cumulative events represent total event days for the sample over each respective time period.

Table 3

12-month prevalence of PREMIS measures, by type of risky drug use at baseline.

	Hospitalization	ED utilization	Injury	Incarceration	Missed Work	DUI
ASSIST score in moderate-risk range (substance categories can overlap)						
Alcohol (n= 82)	21%	35%	41%	11%	48%	60% *
Marijuana (n= 266)	19%	32%	41%	9%	50%	51%
Cocaine (n= 60)	22%	30%	37%	17% *	47%	53%
Amphetamine-type stimulants (n= 38)	29%	39%	34%	11%	53%	39%
Sedatives (n= 37)	24%	41%	46%	11%	67%	59%
Opioids (n= 62)	29% *	42%	42%	8%	62%	47%
Type of drug misuse at baseline						
Marijuana only (n=173)	16%	32%	39%	6%	49%	49%
Other drug (n= 129)	22%	35%	39%	11%	56%	51%

Note:

* $p < .05$; All substance categorizations based on moderate-risk ASSIST scores at baseline. P-values are from likelihood-ratio χ^2 tests of independence.

Table 4

Logistic regression models of PREMiS measures.

	Hospitalization		ED utilization		Injury		Incarceration		Missed Work		DUI	
	OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Variables of Interest												
Computerized BI (ref= In-Person BI)	1.80 (0.97 - 3.35)		1.03 (0.62 - 1.72)		0.98 (0.60 - 1.61)		1.18 (0.51 - 2.76)		1.36 (0.63 - 2.92)		1.10 (0.65 - 1.86)	
Baseline drug problem severity (Global ASSIST score)	1.02* (1.00 - 1.04)		1.01 (0.99 - 1.02)		1.01 (0.99 - 1.02)		1.02 (0.99 - 1.04)		1.03 (1.00 - 1.05)		1.00 (0.99 - 1.02)	
Control Variables												
Female (ref= Male)	2.04* (1.08 - 3.83)		1.84* (1.09 - 3.11)		1.71* (1.03 - 2.84)		0.71 (0.29 - 1.74)		1.61 (0.73 - 3.53)		0.58* (0.34 - 0.98)	
Hispanic (ref= not Hispanic)	0.73 (0.39 - 1.36)		1.27 (0.76 - 2.13)		0.79 (0.48 - 1.30)		1.07 (0.46 - 2.48)		0.56 (0.26 - 1.21)		0.97 (0.57 - 1.65)	
Age (in years)	1.01 (0.99 - 1.03)		1.00 (0.99 - 1.02)		1.02 (1.00 - 1.03)		0.99 (0.96 - 1.02)		0.97* (0.94 - 1.00)		0.99 (0.97 - 1.00)	
Recent history of event (ref= no)	3.44* (1.33 - 8.89)		4.82*** (2.55 - 9.10)		4.14*** (2.40 - 7.15)		3.03 (0.71 - 12.93)		5.24*** (2.24 - 12.28)		8.31*** (4.72 - 14.63)	

p<0.001

**

p<0.01

*

p<0.05. OR= Odds Ratio; CI= 95% Confidence Interval. N= 302 except for "Missed work" which includes only the 135 participants who reported continuous employment over the entire study period and prior 3 months. Recent history of event refers to reporting the event in the past 3 months at baseline. DUI= Driving under the influence of alcohol or drugs by self-report.