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The impact of psychostimulant use on office based buprenorphine treatment retention

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Abstract

Background Over a million people have died from overdose since 1999, over 600,000. of which involved opioids. Treatment options that focus on overdose prevention are desperately needed and buprenorphine treatment is a form of opioid prevention if provided in a harm reduction setting. Co-morbid opioid and stimulant use disorders have increased at a higher rate than other co-morbid combinations between 2011 and 2019. The objective of this study was to identify the effects of psychostimulant use on buprenorphine treatment retention.

Methods We conducted an analysis of a cohort of 143 individuals with opioid use disorder that initiated treatment in a low-threshold, urban office based opioid treatment (OBOT) clinic located in Nashville Tennessee between 2018 and 2020. Retention was measured at 1, 3, and 6-months. Logistic regression was used to identify differences between people who tested positive for stimulants and people who did not.

Results The majority of the patients were white (83%), male (64%), unhoused (59%) and uninsured (70%). There was moderate psychostimulant use in the sample with 19% testing positive for cocaine and 13% testing positive for methamphetamine at baseline. Patients testing positive for cocaine prior to their six month retention point had 0.279 lower odds of being retained in treatment. Further, testing positive for either cocaine or methamphetamine resulted in 0.284 and 0.258 odds of retention at 3 and 6-months respectively.

Conclusion This study examined the impact of stimulant use on retention in buprenorphine treatment within a low-threshold OBOT clinic. Our findings differ from previous research that reported significant decreases in retention among methamphetamine users. Instead, results suggest that patients using psychostimulants can be effectively retained in care within a low-resource, low-threshold setting, though increased clinical engagement may be beneficial for those testing positive for cocaine or methamphetamine. Given the limited access to buprenorphine treatment, these findings underscore the urgent need for expanded, accessible treatment models that can effectively serve individuals with co-occurring stimulant use.

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Introduction

Over a million people have died from overdose since 1999, over 600,000 of which involved opioids from [1]. During this time, overdoses have risen yearly [2–4]. The opioid epidemic has been characterized as unfolding in a series of waves, with the current iteration being the fourth. This wave is characterized by continuing rises in overdoses involving fentanyl, a much more potent opioid, and the rebounding prevalence of psychostimulant use [5]. Co-morbid opioid and stimulant use disorders have increased at a higher rate than other combinations between 2011 and 2019 [6]. Fatal overdoses involving both stimulants and opioids have also skyrocketed, with a recent State Unintentional Drug Overdose Reporting System (SUDORS) report indicating nearly one third of all overdose deaths in 2019 involved both psychostimulants and opioids [7]. This rise has also been seen in non-fatal overdoses, with a 49.9% annual growth in the number of non-fatal overdoses involving both stimulants and opioids from 2006 to 2016 [8, 9].

Buprenorphine was developed to expand opioid use disorder (OUD) treatment in primary care settings and reduce overdose rates, while also serving as an alternative to the highly regulated methadone system [10, 11]. This approach aimed to shift the burden of care from specialty clinics, which were overwhelmed by the growing opioid epidemic. However, buprenorphine remains largely restricted to specialty settings with an emphasis on abstinence-based treatment rather than overdose reduction. While long-term recovery options are essential, expanding harm reduction-focused treatment is equally critical. Many providers cite limited resources, distrust of people who use drugs (PWUD), and concerns about primary care integration as barriers to buprenorphine prescribing [12]. In response, low-threshold buprenorphine clinics have emerged to address these gaps. Jakubowski and Fox define low-threshold treatment as [1] same-day treatment entry [2], a harm reduction approach [3], flexibility in care delivery, and [4] availability in non-traditional settings [13]. Research indicates these clinics achieve similar retention rates as traditional substance use disorder programs [14, 15]. Low-threshold models prioritize accessibility, flexibility, and reduced barriers to entry, making them less resource-intensive than specialty clinics while frequently offering primary care services—a crucial need for PWUD, who often lack access to routine healthcare [16–19]. However, an unresolved question in the literature is whether low-threshold clinics are effective settings for treating more complex cases, such as individuals with co-occurring stimulant (cocaine and methamphetamine) use.

There is a growing body of research on buprenorphine retention and stimulant use, with multiple studies highlighting the negative impact of methamphetamine use on retention in buprenorphine treatment. Tsui et al. (2023) found that among rural populations, individuals using methamphetamine were less likely to initiate or remain on medications for opioid use disorder (MOUD), including buprenorphine [20]. Similarly, Tsui et al. (2020) reported that methamphetamine use was associated with decreased retention in buprenorphine treatment, suggesting that co-occurring stimulant use may introduce additional barriers to long-term engagement [21]. Krawczyk et al. (2021) examined national treatment patterns and found that patients with co-occurring stimulant use, particularly methamphetamine, had lower retention rates in outpatient specialty settings [22]. Additionally, Sweeney et al. (2022) found that cocaine use was significantly associated with reduced retention in primary care-based buprenorphine treatment, further reinforcing concerns about stimulant use as a predictor of treatment dropout [23].

The opioid crisis remains a national emergency, with an estimated 9.2 million Americans misusing opioids in 2021 [24]. Despite the urgent need, buprenorphine access remains limited, with only one in four people who need treatment receiving it [25]. Expanding access is essential [26–29]. The 2022 National Survey on Drug Use and Health reported that almost 4% of U.S. adults- over 9 million people- needed opioid use disorder (OUD) treatment [30]. Low-threshold buprenorphine clinics, which require fewer resources and offer more flexibility, may help increase treatment access and retention while also improving primary care access for people who use drugs [31, 32]. However, because low-threshold models often reduce reliance on supportive services (e.g., case management, counseling), it is unclear if individuals with co-occurring stimulant use benefit similarly to those without. Given the potential of low-threshold buprenorphine treatment to expand care access and the limited research on treating OUD among individuals using stimulants, we sought to examine the impact of stimulant use on buprenorphine treatment outcomes. Specifically, our study aims to determine differences in buprenorphine retention at one, three, and six months between people who use stimulants and those who do not. Findings from this research may provide critical guidance on the effectiveness of low-threshold buprenorphine treatment for individuals with co-occurring stimulant use.

Materials and methods

We conducted an analysis of a cohort of individuals with opioid use disorder that initiated treatment in an urban academic medical center, low-threshold, office based opioid treatment (OBOT) clinic. The clinic provides naloxone to every patient and focuses on reduction in use not specifically abstinence. Participants in the study completed baseline, one-, three-, and six-month follow up

interviews, and additional data on treatment retention and urine drug screen analysis were extracted from medical records. All participants provided written informed consent to begin enrollment into the study. The project was approved by the Meharry Medical College Institutional Review Board.

Setting

This study was conducted in Nashville, Tennessee from August 2018 to February 2020 at a low-threshold, primary care clinic designed to meet the health needs of people who use drugs (PWUD). The project was funded by a grant from the Office of Minority Health. At the time, the clinic was staffed by two Drug Abuse Treatment Act (DATA)-waivered family medicine physicians, a medical assistant, a peer recovery support counselor, and a licensed alcohol and drug addiction counselor (LADAC) who also served as the clinic manager. While individual and group counseling, as well as recovery support, were available at every visit, participation was not mandatory.

During the first month, patients attended weekly appointments for buprenorphine induction, **a** comprehensive physical examination, HIV and HCV testing, naloxone distribution, and contraceptive counseling. After induction, patients transitioned to monthly physician visits, accompanied by either a peer recovery counselor or the LADAC. Monthly urine drug screens were conducted per Office-Based Opioid Treatment (OBOT) requirements. Patients who continued drug use or struggled with appointment adherence were encouraged to increase visit frequency with the LADAC, peer counselor, and/or physician. Termination from care was rare and typically occurred only in cases of medication diversion or threats toward staff.

Participants

Participants entered care via self-referral and referral from neighboring syringe services programs as well as through one on-campus and three additional emergency departments. The only inclusion criterion for the study was current opioid use disorder as evaluated by a physician. We excluded any patients that were pregnant at baseline, but they were retained in the study if they became pregnant during their time in the study. Any patient with transaminase levels five times greater than normal was also excluded from the study. We did not exclude participants for other drug use or psychiatric disorder, as the care provided in the clinic was often the only care available to uninsured and indigent patients. In cases where additional services were necessary the peer counselor and LADAC operated as case managers with support from the medical assistant. Table 1 below provides a description of the study participants.

Table 1 Characteristics of patients receiving buprenorphine in low threshold OBOT ($N = 143$)

Do not have health insurance	**70.0%**	
Gender		
Female	35.8%	
Male	64.2%	
Race		
White	82.5%	
Other Race	17.5%	
Unhoused	58.7%	
Age	Median: 37	Mean: 39.1

Data collection

Survey data were collected using a research assistant-administered REDCap survey [33]. Demographic and socio-economic information were obtained from the survey, while patient outcomes and urine drug screen (UDS) results were extracted from medical records. Baseline data were collected during the patient's initial encounter, with stimulant use data derived from ongoing UDS results. Appointment attendance data were tracked longitudinally to assess retention and engagement in care.

Outcomes

The primary outcome of interest was treatment retention, assessed at multiple time points. Retention was measured dichotomously (yes = 1, no = 0) based on whether the patient met the following criteria: (1) remained in treatment and (2) attended all scheduled appointments or rescheduled and completed the appointment within 30 days. Retention and urine drug screen (UDS) data were retrospectively extracted from eClinicalWorks, the electronic health records system.

Statistical analysis

Bivariate models were first conducted to examine associations between urine drug screen (UDS) results and each retention time point. Multivariate logistic regression was then used to assess the relationship between psychostimulant use and buprenorphine treatment retention, with covariates including psychostimulant use, housing status, age, gender, race, and insurance status. Psychostimulant use data were collected via UDS at baseline and monthly thereafter. Patients were classified as unhoused if they had been without a primary residence in the past six months, including living on the street, in shelters, hotels/motels, or temporarily with family or friends.

Age was calculated from baseline data, and missing values were imputed using the sample median age of 37 years. Given the predominance of white participants, race was dichotomized as white and non-white. Both regression models incorporated the same covariates. There were no missing data for race, retention, or UDS

Table 2 Psychostimulant use and buprenorphine treatment retention ($N = 143$)

Psychostimulant Use			
	One Month	Three Months	Six Months
Cocaine	18.9%	4.9%	4.20%
Methamphetamine	13.3%	7.7%	3.5%
Either Cocaine or Methamphetamine	29.4%	10.5%	7.7%
Retention in Buprenorphine Treatment			
One Month	60.1%		
Three Month	34.3%		
Six Month	31.5%		

results. Patients were classified as stimulant users in two ways: (1) any positive UDS between retention points (e.g., between months 0–1, 1–3, and 3–6) and (2) any positive UDS prior to the retention point.

All statistical analyses were performed using Stata Statistical Software: Release 17 (StataCorp LLC, College Station, TX).

Power analysis and study sensitivity

A power analysis was conducted to assess whether the study's sample size ($N = 143$) was sufficient to detect a statistically significant difference in buprenorphine retention between stimulant users and non-users. Given the observed retention rates (60.1% at one month, 34.3% at three months, and 31.5% at six months), the estimated effect size for the primary analysis was based on the absolute difference in retention between groups. Assuming a two-tailed test with $\alpha = 0.05$ and a power of 80% (0.80), a sample size of approximately 200 participants per group (total $N \approx 400$) would be required to detect a 26% point difference in retention rates.

While the study sample is smaller than this estimate, the available data still provide valuable insights into real-world retention trends in a low-threshold buprenorphine treatment setting, particularly among populations that are often excluded from large clinical trials. Moreover, the magnitude and direction of observed retention differences remain clinically relevant, even if some findings did not reach statistical significance. The results contribute critical preliminary data on the feasibility of retaining patients with co-occurring stimulant use in buprenorphine treatment, informing future research with larger, multi-site samples.

This limitation is considered in the interpretation of results, and findings should be viewed as hypothesis-generating, providing a foundation for future work on retention strategies in harm reduction-focused treatment models.

Table 3 Bivariate logistic regression: drug use between retention time points

	Cocaine		
	Odds Ratio	p-value	95% Confidence Interval
One Month Retention	0.658	0.331	0.283–1.529
Three Month Retention	2.696	0.207	0.579–12.564
Six Month Retention[1]	-	-	-
	Methamphetamine		
One Month Retention	0.702	0.474	0.266–1.852
Three Month Retention	1.105	0.879	0.307–3.974
Six Month Retention	0.534	0.580	0.058–4.919
	Either Cocaine or Methamphetamine		
One Month Retention	0.554	0.112	0.267–1.148
Three Month Retention	0.955	0.936	0.307–2.966
Six Month Retention	0.200	0.131	0.025–1.613

Table 4 Bivariate logistic regression: drug use prior to retention point

	Cocaine		
	Odds Ratio	p-value	Standard Error
Three Month Retention	0.351	0.072	0.112–1.097
Six Month Retention	0.279	0.049*	0.078–0.992
	Methamphetamine		
Three Month Retention	0.708	0.537	0.237–2.116
Six Month Retention	0.817	0.719	0.273–2.450
	Either Cocaine or Methamphetamine		
Three Month Retention	0.284	0.010**	0.109–0.738
Six Month Retention	0.258	0.009**	0.093–0.716

*$p < .05$ **$p < .01$ ***$p < .001$

Results

Among the 143 individuals included in the study, the median baseline age was 37 years. The majority identified as male (64.2%) and white (82.5%), with nearly 70% uninsured and 58.7% experiencing homelessness. Stimulant use was moderately prevalent, with 18.9% testing positive for cocaine, 13.3% for methamphetamine, 2.8% for both, and 70.6% never testing positive. Buprenorphine retention rates were 60.1% at one month ($n = 86$), 34.3% at three months ($n = 49$), and 31.5% at six months ($n = 45$).

Table 2 presents retention outcomes when stimulant use was measured as any positive test since the prior time point. No statistically significant associations were observed, and zero patients who tested positive for cocaine between months three and six remained in treatment.

Table 3, 4, 5 and 6 examines retention when stimulant use was defined as any prior positive test before the assessment point. This approach did not change the one-month retention model. However, patients testing positive prior to the six-month retention point had 0.188 lower odds of retention at six months ($p = .032$, CI: 0.767–1.049). Methamphetamine use was not significantly associated with retention at any time point. When combining both cocaine and methamphetamine use, patients had

Table 5 Multivariate logistic regression: drug use between retention time points

	Cocaine		
	Odds Ratio	p-value	95% Confidence Interval
One Month Retention	0.697	0.417	0.291–1.668
Three Month Retention	1.910	0.472	0.328–11.127
Six Month Retention[1]	-	-	-
	Methamphetamine		
One Month Retention	0.688	0.476	0.246–1.922
Three Month Retention	1.038	0.961	0.234–4.607
Six Month Retention	0.723	0.782	0.724–7.225
	Either Cocaine or Methamphetamine		
One Month Retention	0.593	0.181	0.276–1.274
Three Month Retention	0.926	0.908	0.254–3.383
Six Month Retention	0.241	0.191	0.286–2.034

[1] No patients were retained that tested positive for cocaine at this time point

Note: Covariates include housing status, age, gender, race, and insurance status

Table 6 Multivariate logistic regression: drug use prior to retention point

	Cocaine		
	Odds Ratio	p-value	Standard Error
Three Month Retention	0.284	0.59	0.767–1.049
Six Month Retention	0.188	0.032*	0.041–0.866
	Methamphetamine		
Three Month Retention	0.550	0.351	0.157–1.931
Six Month Retention	0.587	0.399	0.170–2.028
	Either Cocaine or Methamphetamine		
Three Month Retention	0.244	0.010**	0.083–0.715
Six Month Retention	0.196	0.006**	0.062–0.623

*$p<.05$ **$p<.01$ ***$p<.001$

Note: Covariates include housing status, age, gender, race, and insurance status

0.010 lower odds of retention at three months ($p=.010$, CI: 0.083–0.715) and 0.196 lower odds at six months ($p=.006$, CI: 0.062–0.623).

Discussion

Major findings & interpretation

This study examined the impact of psychostimulant use on buprenorphine retention within a low-threshold OBOT clinic, a treatment model designed to reduce barriers to care for people with opioid use disorder (OUD). Our findings suggest that cocaine use prior to the six-month follow-up was associated with significantly lower odds of retention, whereas methamphetamine use alone was not significantly associated with decreased retention rates. However, when combining cocaine and methamphetamine use, we observed significantly lower odds of retention at both three- and six-months.

These findings contribute to a growing body of research on buprenorphine retention among individuals with co-occurring stimulant use. Prior studies have found that methamphetamine use is associated with decreased retention in buprenorphine treatment, particularly in specialty treatment settings with more behavioral health resources [21, 22]. However, our study observed a smaller retention gap between methamphetamine users and non-users, aligning with previous findings that lower-threshold treatment models may mitigate retention disparities [13]. This suggests that treatment models emphasizing harm reduction and flexibility may be effective in retaining patients with stimulant co-use.

Cocaine use, on the other hand, appears to have a more pronounced impact on retention over time, as previous studies have also reported greater treatment attrition among cocaine users [23]. Our study reinforces this association, particularly at later retention time points. Given the increasing prevalence of polysubstance use involving opioids and stimulants in the U.S., these findings highlight the need for tailored interventions that address stimulant co-use in buprenorphine treatment.

Comparison to existing literature

Unlike previous research that found better retention outcomes for stimulant users in high-resource treatment settings [34], our study suggests that low-threshold OBOT settings may provide comparable retention rates despite limited funding, only one physician and one behavioral health provider. This aligns with studies showing that accessibility and flexibility—key features of low-threshold care—may be more important determinants of retention than intensive behavioral interventions alone [13].

Notably, our study challenges prior findings that methamphetamine use is a consistent predictor of poor buprenorphine retention [21, 22]. The discrepancy may be due to differences in study populations and treatment settings. Many previous studies focused on specialty addiction treatment programs, whereas our findings reflect real-world retention patterns in a lower-resource primary care-based OBOT model. Future research should investigate whether low-threshold models may be uniquely effective for patients with co-occurring stimulant use by reducing barriers to care that contribute to early dropout.

Clinical implications

The opioid epidemic has entered a "fourth wave" marked by increasing stimulant involvement in overdoses [5]. Given this trend, it is critical to evaluate whether existing treatment models are effective for individuals with co-occurring stimulant use. Our findings suggest that low-threshold OBOT clinics can successfully retain patients with stimulant co-use, even in the absence of intensive behavioral health services. However, additional interventions targeting cocaine use—such as contingency management or enhanced peer support—may be needed to improve retention rates among this subgroup.

Furthermore, expanding low-threshold OBOT programs is essential for increasing buprenorphine access in regions where traditional treatment models remain inaccessible [26, 28]. Given that only one in four individuals who need buprenorphine receive it [25], alternative care models that successfully retain high-risk populations—including those with polysubstance use—must be prioritized in public health efforts.

Limitations

This study has several limitations. First, data were collected from a single site within an academic medical center, which may limit generalizability to other primary care settings. Additionally, at the time of data collection, the clinic was newly operational and experiencing staffing challenges, which may have impacted patient retention rates. Second, all drug use measures relied on urine drug screens (UDS). While UDS provides an objective measure of use, cocaine and methamphetamine remain detectable for only about three days, potentially underestimating overall stimulant use in the population.

Statistical power considerations

A power analysis using the PS Power and Sample Size Calculator estimated that a larger sample size (approximately 400 participants) would be needed to detect moderate differences in retention rates at conventional significance levels ($\alpha = 0.05$, power = 0.80). The current sample ($N = 143$) was smaller than this estimate, which may limit the ability to detect small-to-moderate effects, particularly at the 3-month and 6-month retention points. However, despite these limitations, the observed trends in retention and stimulant use provide valuable preliminary insights, particularly in a real-world, low-threshold clinical setting, where research is often limited due to practical challenges in recruitment and follow-up.

Importantly, this study contributes novel findings on the feasibility of retaining patients with co-occurring stimulant use in low-threshold buprenorphine treatment models, a population often excluded from research and clinical trials. The retention rates observed in stimulant users were comparable to those in prior research on low-threshold treatment, suggesting that real-world low-resource clinics can successfully retain these patients despite concerns about stimulant use as a predictor of dropout. Moreover, while statistical power limitations may have impacted our ability to detect some differences, the direction and magnitude of observed trends remain clinically relevant, warranting further investigation in larger studies.

Future research should expand sample sizes across multiple low-threshold clinics to increase power and confirm findings. Additionally, incorporating longitudinal designs with enhanced retention strategies (e.g., contingency management, peer navigator engagement) may improve follow-up and provide more robust conclusions regarding stimulant use and buprenorphine treatment retention.

Next steps and public health impact

A key takeaway from this study is that stimulant use—particularly cocaine use—was associated with treatment attrition at later time points, reinforcing the need for targeted interventions. As a next step, we plan to evaluate a contingency management intervention to determine whether financial incentives for stimulant-negative urine drug screens improve retention outcomes. We will also examine whether increased peer counselor engagement and motivational interviewing techniques enhance long-term buprenorphine retention among stimulant users.

From a public health perspective, these findings underscore the importance of expanding low-threshold OBOT programs, particularly in regions experiencing high rates of polysubstance use and opioid-related overdoses. Given that low-threshold models maintain comparable retention rates despite limited behavioral health resources, increasing access to these clinics could help close the buprenorphine treatment gap and improve outcomes for individuals with co-occurring stimulant use.

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Author contributions

RE, SM, LB, PP, LG, & RLC all provided substantial contributions to the writing and preparation of this manuscript. RE, PR, KB, VS analyzed and interpermeated the data. RE, LB, & RLC developed the idea and framework for this manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The project was approved by the Meharry Medical College Institutional Review Board.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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