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Patterns of buprenorphine use and risk for re-arrest among highly vulnerable opioid-involved women released from jails in rural Appalachia

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Medication-assisted treatment (MAT) is effective for individuals with opioid use disorder [1–4], and enhancing access to MAT is a suggested strategy to reduce unmet treatment need, particularly in rural areas [5]. Rural areas of Kentucky have been disproportionately impacted by adverse opioid-related consequences [6–8], due to high opioid prescribing [9,10] and limited resources for treatment [11].

Among criminal justice populations, MAT is used sporadically, and those in re-entry are unlikely to receive MAT [12–14]. There are significant gaps in the literature on MAT use among women in the correctional system, especially those in rural communities. Rural women suffer distinct health disparities [15] and have limited access to treatment resources [16,17]. The shortage of community MAT providers in rural settings [18,19] likely contributes to significant unmet need for treatment, use of diverted buprenorphine [20], and may potentiate relapse and recidivism among women in re-entry.

Although MAT delivery in criminal justice settings protects against return to opioid use [21], the data on benefit to recidivism and re-arrest are mixed [22–23]. To our knowledge, the *illicit* use of buprenorphine post-release has not been explored with respect to re-arrest. This paper examines patterns of buprenorphine use, both licit and illicit, and uptake of health services as correlates for re-arrest within 3 months of release among opioid-involved women in Appalachian Kentucky.

METHODS

The parent study is a randomized controlled trial testing two evidence-based approaches to HIV/HCV risk reduction: a prevention education-focused HIV risk reduction intervention (NIDA Standard) and an enhanced, individualized motivational interviewing intervention for risk reduction (MI-HIV) for high risk women in rural jails. As part of the trial, participants

were randomly selected from three rural Appalachian Kentucky jails between 2012 and 2015. Random selection and screening procedures have been described elsewhere [24], which yielded a final sample of 400 participants. Study eligibility included: 1) moderate risk (scores 4+) of substance abuse based on the NIDA-modified Alcohol, Smoking and Substance Involvement Screening Test for any drug; 2) self-reported sexual risk behavior in the 3 months before incarceration; and 3) residing in a designated Appalachian county before incarceration. Trained interviewers administered standardized face-to-face interviews in a private room in the jail. Follow-up interviews occurred at 3 months post-release. Participants were paid \$25 for each interview. All study procedures were approved by the university IRB and protected under a federal Certificate of Confidentiality.

Participants who reported moderate to severe opioid-involvement on the NM-ASSIST, and who were asked specific questions on patterns of licit and illicit buprenorphine use (N=188), were included in this analysis. The primary outcome variable for this analysis was re-arrest within 3 months of release from jail, which was self-reported. Three-month follow-up data were available for 91.5% of participants (N=172).

Bivariate logistic regression analyses examined predictors of re-arrest within 3 months post-release, including: baseline demographics (age, insurance status, health problems, number of days incarcerated, county of incarceration; intervention assignment); substance use (baseline opioid ASSIST scores, any drug injection in follow-up period, days high on any drug during the follow-up period and days illicitly used buprenorphine); adverse drug consequences (overdose, withdrawal symptoms in follow-up period); services availability (healthcare and drug treatment); and reported services use (regular source of healthcare, history of buprenorphine prescription at baseline, enrolled in substance use treatment in follow-up period, prescribed medication assisted treatment in follow-up period). Controlling for intervention assignment and jail site, a multivariate logistic regression model was used to examine covariates that were associated with re-arrest at the .05 level in the bivariate analyses. We examined collinearity diagnostics among our predictor variables in the multivariate model; all had VIFs below 2.5. Data analyses were conducted using SPSS.

RESULTS

The sample had a mean age of 33.1, all were White, and 77% had health insurance coverage at baseline. 60% reported buprenorphine use in the month prior to baseline arrest; 78.6% of whom were using illicitly. None were receiving MAT in the jail setting at baseline.

At 3-month follow-up, 39 (22.7%) had been re-arrested; 9 (5.2%) reported receiving formal MAT during follow-up, all of which was with buprenorphine. Significant risk factors for re-arrest included: number of days high in follow-up period (OR=1.017), injecting in follow-up period (OR=3.51), number of *illicit* buprenorphine days in follow-up period (OR=1.014), and withdrawal symptoms (OR=2.825) in the follow-up period. The sole protective factor was having a regular source of healthcare at follow-up (OR=.270). In the multivariate regression model, the presence of a regular healthcare source was the sole significant predictor of remaining arrest-free within the 3 month follow-up period (AOR=.221).

DISCUSSION

Given the prevalence of problematic opioid use in the Appalachian region of Kentucky, and the challenges of treatment delivery in re-entry and in rural communities, we examined risk factors for re-arrest among opioid-involved women in rural areas post-release from jail. The proportion receiving MAT during follow-up was 5.2%, suggesting barriers to uptake of evidence-based treatment among rural women. Although our sample is small, it is notable that none of the study participants reporting MAT uptake had been re-arrested by 3 months. Drug use frequency and severity measures were independently associated with re-arrest within three months of release in the bivariate analyses, including use of diverted buprenorphine during follow-up, which was reported by nearly 23% of the sample. Although there are some indications that buprenorphine use outside of formal channels may have beneficial effects by reducing illicit substance use [25,26], our data on illicitly obtained buprenorphine indicate no protective effect.

Our data have limitations that should be considered, including reliance on self-report and uncertainty regarding the temporal ordering of some of the events of interest (e.g. experiencing withdrawal symptoms) as they may have conceivably occurred either pre- or post-arrest. Several of the independent variables we examined demonstrated relatively weak associations with re-arrest, and warrant further study.

Importantly, a regular source of healthcare was the most robust predictor of remaining arrest-free in the initial re-entry period for opioid-involved women in our rural setting. Consistent care from a healthcare professional offers therapeutic benefit and a support structure, provides the opportunity to appropriately address pain and other physical health problems that may drive substance use, and may be associated with better access to MAT and other needed services. For underserved rural women challenged by economic instability, non-specialized healthcare settings may represent the most viable access and delivery points for MAT. Our findings support the need for greater integration of MAT into diverse care settings, including primary care, rural health centers, and federally qualified health centers, to meet demand for evidence based treatment in rural areas [27].

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Table 1.

Logistic Regression Models Predicting Re-Arrest by 3 Month Follow-Up among Opioid-involved Women Incarcerated in Rural Jails

Bivariate Models	No Re-arrest N=133 n (%)	Re-arrest N=39 n (%)	Odds Ratio	95% CI
Demographics				
Age (SD) <i>mean</i>	33.8 (8.8)	30.5 (7.4)	0.95	0.91, 0.99
Health insurance coverage, past 90 days at baseline	102 (76.7%)	31 (23.3%)	1.18	0.49, 2.83
Health problem interference, past 90 days at baseline	46 (83.6%)	9 (16.4%)	0.58	0.25, 1.30
Days incarcerated, at baseline (SD) <i>mean</i>	62.3 (65.7)	55.8 (69.2)	1.00	0.99, 1.00
County of incarceration, at baseline				
Leslie	41 (74.5%)	14 (25.5%)	ref	
Laurel	46 (76.7%)	14 (23.3%)	1.27	0.52, 3.10
Perry	46 (80.7%)	11 (19.3%)	1.43	0.58, 3.50
Intervention assignment				
NIDA Standard	64 (74.4%)	22 (25.6%)	ref	
NIDA Standard + MI	69 (80.2%)	17 (19.8%)	0.72	0.35, 1.47
Substance Use				
ASSIST street opioid score, at baseline <i>mean(SD)</i>	12.5 (15.6)	12.3 (15.5)	1.00	0.98, 1.02
ASSIST prescription opioid score, at baseline <i>mean(SD)</i>	31.2 (10.4)	29.9 (10.8)	0.99	0.96, 1.02
Any drug injection, at follow-up	22 (16.5%)	16 (41.0%)	3.51	1.60, 7.70
Days high, at follow-up (SD) <i>mean</i>	14.9 (30.3)	37.3 (41.1)	1.02	1.01, 1.03
Illicit buprenorphine days, at follow-up <i>mean (SD)</i>	9.2 (24.7)	21.9 (35.4)	1.01	1.003, 1.03
Substance-related problems				
Drug overdose, at follow-up	0 (0.0%)	1 (2.6%)	-----	-----
Withdrawal symptoms, at follow-up	20 (60.6%)	13 (39.4%)	2.83	1.25, 6.40
Services availability				
Healthcare facilities available ¹ , at follow-up <i>mean(SD)</i>	7.5 (2.1)	6.8 (2.6)	0.96	0.84, 1.11
Drug treatment available ² , at follow-up <i>mean(SD)</i>	0.83 (1.19)	0.77 (1.31)	1.20	0.94, 1.53
Services use				
Regular source of healthcare, at follow-up	65 (89.0%)	8 (11.0%)	0.27	0.12, 0.63
Ever prescribed buprenorphine, at baseline	33 (73.3%)	12 (26.7%)	1.35	0.61, 3.00
Substance treatment, at follow-up	31 (86.1%)	5 (13.9%)	0.48	0.17, 1.34
MAT, at follow-up	9 (100.0%)	0 (00.0%)	-----	-----
Multivariate Model³				

Bivariate Models	No Re-arrest N=133 n (%)	Re-arrest N=39 n (%)	Odds Ratio	95% CI
Intervention assignment			0.75	0.34, 1.67
County of incarceration				
	Laurel		0.69	0.23, 2.02
	Perry		1.04	0.40, 2.69
Age			0.97	0.92, 1.02
Any drug injection			1.06	0.32, 3.57
Days high			1.01	1.00, 1.03
Illicit buprenorphine days			1.01	0.99, 1.02
Withdrawal symptoms			1.93	0.58, 6.41
Regular source of healthcare			0.22	0.08, 0.61

Notes:

¹ Range 0–10;

² Range 0–3;

³ Adjusted Odds Ratios, controlling for county and intervention group assignment.