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Factors Associated with Contingency Management Adoption among Opioid Treatment Providers Receiving a Comprehensive Implementation Strategy

Sara J. Becker, Ph. D.^a, Lourah M. Kelly, M.A.^{a,b}, Augustine Kang, M.Sc.^a, Katherine Escobar, B.A.^a, and Daniel Squires, Ph.D.^a

^aCenter for Alcohol and Addictions Studies, Brown University, 121 South Main Street, Providence, RI 02903, USA

^bDepartment of Psychology, Suffolk University, 73 Tremont St Boston, MA 02108, USA

Abstract

Background—Contingency management (CM) is an evidence-based behavioral intervention for opioid use disorders (OUDs); however, CM adoption in OUD treatment centers remains low due to barriers at patient-, provider-, and organizational-levels. In a recent trial, OUD treatment providers who received the Science to Service Laboratory (SSL), a multi-level implementation strategy developed by a federally-funded addiction training center, had significantly greater odds of CM adoption than providers who received training as usual. This study examined whether CM adoption frequency varied as a function of provider socio-demographic characteristics (i.e., age, race/ethnicity, licensure) and perceived barriers to adoption (i.e., patient-, provider-, organization-level) among providers receiving the SSL in an opioid treatment program.

Methods—Thirty-nine providers (67% female, 77% Non-Hispanic White, 72% with specialty licensure, M age = 42 [SD = 11.46]) received the SSL, which consisted of didactic training, performance feedback, specialized training of internal change champions, and external coaching. Providers completed a comprehensive baseline assessment and reported on their adoption of CM biweekly for 52 weeks.

Results—Providers reported using CM an average of nine 2-week intervals (SD = 6.35). Hierarchical multiple regression found that providers identifying as younger, Non-Hispanic White, and without addiction-related licensure all had higher levels of CM adoption frequency. Higher

Corresponding Author: Sara Becker, Brown University School of Public Health, Box G-S121-5, Providence, RI 02912, USA, Tel: (401) 863-6604, sara_becker@brown.edu.

Declaration of Interest

The authors do not have any conflicts of interest to report.

Author Contributions

Sara Becker was responsible for conceptualizing this paper and the mixed-methods analytic plan, served as an independent qualitative coder, and took the lead on manuscript preparation. Lourah Kelly conceptualized the quantitative analysis plan and wrote the analytic plan and results. Katherine Escobar served as an independent qualitative coder and was responsible for reference management. Augustine Kang served as the qualitative consensus coder and drafted the methods section. Daniel Squires was PI of the original study, led the development of the SSL implementation strategy, and led original data collection. All co-authors reviewed, edited, and approved this manuscript.

perceived patient-level barriers predicted lower levels of CM adoption frequency, whereas provider- and organization-level barriers were not significant predictors.

Conclusions—The significant effect of age on CM adoption frequency was consistent with prior research on predictors of evidence-based practice adoption, whereas the effect of licensure was counter to prior research. The finding that CM adoption frequency was lower among racially/ethnically diverse providers was not expected, and suggests that the SSL may require adaptation to meet the needs of diverse opioid treatment providers. Entities using the SSL may also wish to incorporate a more explicit focus on patient-level barriers.

Keywords

opioid treatment; contingency management; implementation; barriers

Opioid-use disorder (OUD)-related overdoses and deaths have reached epidemic proportions in the United States,¹ creating an urgent need for effective OUD treatments.² Contingency management (CM) is an evidence-based OUD intervention that provides motivational incentives (e.g., vouchers or gift cards) to reinforce specific treatment-related behaviors (e.g., treatment attendance, negative toxicology screens).³ It has demonstrated effectiveness when delivered alone³ and in combination with pharmacotherapy,⁴ with large effect sizes. CM has also been found to be effective when delivered by front-line OUD providers,^{6–8} making it a prime candidate for implementation across community-based OUD centers.

Unfortunately, CM has proven challenging to transfer to and sustain in community settings.⁹ Surveys of front-line treatment providers suggest that under 10% use CM.¹⁰ Documented barriers to CM delivery span the patient-level (e.g., patients' difficulty paying for treatment, insufficient demand for incentives),¹¹ provider-level (e.g., lack of awareness, philosophical objections to incentives, turnover),^{12, 13} and organizational-level (e.g., time constraints, insufficient funding for incentives).^{14–16} For these reasons, strategies to promote CM implementation must address barriers across multiple levels.

In a recent trial,¹⁷ we found that a comprehensive implementation strategy called the Science-to-Service Laboratory (SSL) was more effective than training as usual (TAU) in promoting CM adoption across OUD centers. The SSL was developed by the New England Addiction Technology Transfer Center (ATTC), a federally-funded training center, and consists of didactic training, performance feedback, specialized training of internal change champions, and external coaching. Didactic training and performance feedback are specifically designed to address provider-level barriers, whereas internal change champions and external coaching are intended to address organizational-level barriers. Relative to TAU providers, providers whose centers received SSL had 3.6 times greater odds of adopting CM than TAU providers over a 12-month period.

Our prior study indicated that the SSL was a promising approach to promoting CM adoption in OUD centers. However, questions remained as to factors influencing SSL effectiveness. Specifically, it was unknown whether the SSL's effect on CM adoption varied as a function of factors shown to influence receptiveness to evidence-based interventions in general^{18, 19} and CM in particular:^{13, 16, 20} namely, provider socio-demographics (i.e., provider licensure,

¹³ years of experience,^{13, 20} age,¹⁸ sex,²⁰ race/ethnicity)²⁰ and perceived implementation barriers (i.e., patient-,²⁰ provider,^{16, 20} organizational-level).^{16, 20} Thus, we examined whether these factors predicted CM adoption frequency among providers receiving the SSL. Multiple prior studies found that provider educational attainment^{13, 16, 19, 20} and years of experience^{13, 20} predicted more favorable views towards CM. None of these studies specifically examined the effect of age; however, a prior study focused on behavior therapy found that younger providers were more likely to use manuals than older providers.¹⁸ Based on these studies, we hypothesized that more experienced, younger providers with specialty licensure would demonstrate higher levels of CM adoption frequency. We also predicted that providers reporting more patient-level barriers would demonstrate lower levels of CM adoption frequency, since the SSL did not explicitly address these barriers. We did not expect provider sex or race/ethnicity to be significant predictors, as prior literature failed to find significant effects of these factors on receptivity to CM.²⁰

Methods

Treatment program

Study activities were based within a comprehensive OUD program with locations in Rhode Island and Maine.¹⁷ The program provided various outpatient services for OUD patients, including medication-assisted treatment, individual, family, and group counseling. In the two years before recruitment, the program coordinated 28 trainings that focused generally on organizational procedures (e.g., hiring practices, record keeping, reporting critical incidents, grievances), assessment strategies (e.g., suicide identification, vital signs) and provider education about addiction (e.g., DSM-IV, ASAM criteria). Only one prior training focused on a specific evidence-based intervention (i.e., buprenorphine) and none focused on behavioral treatment models.

Recruitment

Clinical directors were invited to nominate staff for participation during a quarterly leadership meeting. To qualify, staff had to have been employed for at least 3 months with active caseloads. Clinical directors nominated 51 eligible treatment providers, who were mailed resource packets describing the study: packets included return-addressed, stamped postcards indicating interest in participation. Providers were given explicit assurances that participation was voluntary and would not affect their employment. Forty-six providers (90%) returned reply cards. Of the 46 providers, 39 (85%) provided informed consent. All procedures were approved by the University institutional review board.

Implementation Protocol

The implementation protocol was the SSL^{17, 22} and the evidence-based CM intervention was Petry's model targeting patient attendance via escalating prize draws.^{23, 24} The SSL began with a half-day didactic CM workshop, which covered: evidence supporting CM, introduction to the CM protocol, and behavioral reinforcement principles. After the didactic portion, staff practiced designing CM protocols to reinforce session attendance; the workshop leader provided immediate performance feedback on practice exercises.

Following this training, providers received another half-day workshop focused on CM implementation. Workshop topics included: defining evidence-based practice, reviewing organizational change theory, and outlining how CM would be implemented within usual clinic procedures. Each clinical unit ($n=7$) identified an internal change champion to lead implementation efforts. Change champions received a more intensive 4-day training focused on principles and theories of organizational change, leadership decisions related to CM adoption, and strategies to integrate CM into existing operating procedures. Finally, staff and change champions had access to a Master's-level external technology transfer specialist (TTS) with over 20 years' experience managing OUD centers. The TTS held separate monthly conference calls with change champions and staff to troubleshoot barriers to CM adoption. The TTS was responsible for coordinating ongoing collaborative problem solving activities such as moderation of an online community bulletin board and scheduled forums to discuss CM implementation. Informal TTS support was provided by request.

Measures

Provider characteristics—At baseline, providers completed a self-report measure recording their own biological sex (i.e., male vs. female); licensure (i.e., attained specialty addictions license vs. never attained); years of addiction treatment experience (i.e., less than 5 vs. 5+); age (continuous); and race/ethnicity (i.e., Non-Hispanic White vs. other).

CM Adoption—Providers completed a biweekly assessment asking the number of patients with whom they had used reinforcers over the past two weeks. Providers who reported using reinforcers with at least one patient were coded as adopters in that 2-week interval. For each provider, we tabulated the number of 2-week intervals in which CM adoption was reported, with values ranging from 0 to 26.

Barriers to Adoption—Each 2-week interval, providers were asked an open-ended question about reasons why they had not implemented CM. Provider responses about perceived barriers were coded by two independent raters into three categories: patient-level; provider-level; organization-level. Patient-level barriers included obstacles related to patient flow or perceived demand (e.g., lack of admissions, insufficient patient willingness.). Provider-level barriers encompassed issues related to staff time, attitudes, or qualifications (e.g., vacation/leave, CM attitudes/misgivings, staff turnover). Organizational-level barriers included concerns associated with organizational support of CM (e.g., time, funding, leadership support). For each provider, the total number of patient, provider, and organizational barriers was tabulated, with values ranging from 0 to 26.

Data Analytic Plan

Variable distributions, mean group differences, and bivariate associations were examined prior to modeling. Assumptions related to normality were met for all provider variables; however, our three barriers variables were skewed and kurtotic. Because prior work demonstrates that regression is robust to violations of normality,²⁵ we conducted analyses with untransformed data. Replication of analyses with transformed variables yielded an identical pattern of results with regards to direction and statistical significance of effects.

Study hypotheses were tested via two-step hierarchical regression predicting CM adoption frequency. We entered provider characteristics into the first step (i.e., biological sex, age, years of experience, race/ethnicity, licensure). Number of patient, provider, and organizational barriers reported per provider were entered into the second step to test if these barrier types predicted CM adoption frequency over and above provider characteristics. Effect sizes of parameter estimates were interpreted using recommendations by Cohen.²⁶

Results

Sample Characteristics

The 39 providers were predominantly female (66.7%, $n=26$), Non-Hispanic White (76.9%, $n=30$), and 42 years of age ($M=41.95$, $SD=11.46$, Range=20–62) on average. Roughly two-thirds of providers had a current or past specialty license in addiction (71.8%, $n=28$) and 51.3% ($n=20$) had 5 or more years of experience. Providers reported using CM about nine 2-week intervals ($M=9.05$, $SD=6.35$) or roughly 18 weeks. Bivariate correlations revealed small to moderate relationships among the provider characteristics that did not preclude multivariate regression (all r^2 's < .55; see Table 1). CM adoption frequency was significantly related to non-white race ($r=-.38$, $p < .05$) and frequency of reporting patient-related barriers ($r=-.37$, $p < .05$).

Perceived Barriers

Providers reported 301 barriers: 52 patient-level; 106 provider-level; and 143 organization-level. The most frequent perceived patient-level barrier was a lack of “appropriate” patients. Common provider-level barriers were staff turnover, vacation/leave, and insufficient staff. The most often cited organization-level barriers were insufficient funding, lack of organizational support, and insufficient time to prepare for implementation. Average number of barriers was 5.0 ($SD=6.2$), with a range from 0 to 25. Of total barriers, 141 (47%) were “repeat mentions” (i.e., provider experienced the same barrier over multiple time intervals). Inter-rater agreement among unique mentions was excellent: 98.9% provider-level, 87.8% provider-level, 94.7% organization-level.

Hierarchical Linear Models Predicting CM Adoption Frequency

Step 1 of the hierarchical regression was significant, $F(5, 33)=3.02$, $p < .05$ and accounted for 31% of the variance. Provider biological sex ($\beta=.08$, $p=.65$) and years of experience ($\beta=.11$, $p=.58$) did not significantly predict CM adoption frequency. By contrast, younger age ($\beta=-.33$, $p=.01$), Non-Hispanic White race/ethnicity ($\beta=.43$, $p=.01$), and not having attained a specialty license ($\beta=.40$, $p < .05$) all significantly predicted greater CM adoption frequency; these effects were moderate in size.

Step 2 was significant, $F(8, 30)=2.91$, $p < .05$ and accounted for 44% of the variance in CM adoption frequency. Neither the number of provider- nor organizational-level barriers predicted CM adoption frequency. However, consistent with our hypothesis, fewer patient-level barriers ($\beta=-.36$, $p < .05$) significantly predicted CM adoption frequency, with a moderate effect size.

Discussion

This study builds upon extant literature on the implementation of evidence-based OUD treatment, by identifying factors that predicted the effectiveness of a comprehensive implementation strategy on CM adoption frequency. Consistent with hypotheses and prior studies,¹⁸ the SSL had a larger effect on CM adoption with younger providers. Of note, the significant effect of age was above and beyond the influence of provider experience, which was not a significant predictor. Counter to prior studies,^{13, 16, 20} we found that providers *without* a specialty license had higher CM adoption frequency. This discrepancy might reflect our focus on specialty addictions licensure as opposed to advanced educational attainment more generally. Alternately, the discrepancy might reflect our focus on actual CM adoption, relative to prior studies' focus on CM receptivity. It is plausible that providers with specialty degrees might be more receptive to CM in principle, yet slower to change their actual behavior. Taken together, our results suggest that younger providers without specialty licensure represent a particularly attractive target for CM implementation. One possible explanation for this finding could be that younger, unlicensed providers might be less likely to have entrenched approaches to treating OUD patients and therefore might be less resistant to adopting new interventions.

Our finding that the SSL's effectiveness did not vary as a function of biological sex was consistent with hypotheses. By contrast, we did not expect that the SSL would have a greater effect among Non-Hispanic White providers, raising concerns about the applicability of the comprehensive implementation strategy among racially/ethnically diverse providers.

Analyses of provider-reported barriers confirmed the hypothesis that the SSL would be less effective among providers that perceived more patient-level barriers, perhaps due to the SSL's explicit focus on provider- and organization-levels. Of note, the most common patient-level barrier was lack of "appropriate clients": this could reflect actual recruitment challenges, insufficient patient demand, or provider misperceptions about CM's applicability. Further research is warranted to unpack the nature of this barrier.

Results should be interpreted within the context of limitations. First, CM adoption frequency was based on provider self-report without objective verification. Second, we examined biological sex, race/ethnicity, years of experience and licensure attainment as dichotomous variables. Future investigations should examine the effect of non-binary gender, racial/ethnic identification, years of experience, and stages of licensure attainment to better understand the impact of provider-level factors on CM adoption. Similarly, we used a broad coding scheme for perceived barriers based on the level of focus (e.g., patient-, provider-, organization), and did not consider specific barriers (e.g., financial, time, attitudes). Finally, this study applied the SSL to promote CM adoption frequency among OUD patients. Additional research is needed to determine if the effects of provider age, licensure, and patient-level barriers found here would generalize to implementation of other evidence-based interventions in other settings.

Despite these limitations, this was the first analysis of predictors of a comprehensive implementation strategy's effectiveness among OUD treatment providers: even with broad

categories, such analyses are critical to determine for whom and under which conditions implementation strategies are likely to be most effective. These analyses are common in the treatment literature, but relatively rare in the implementation literature. Findings suggest that the SSL strategy, which is currently being used by federally-funded addiction training centers, may require adaptation for racially/ethnically diverse providers, older providers, and those with specialty licensure. In addition, training entities using the SSL may benefit from a more explicit focus on patient-level barriers.

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Table 1

Sample Provider Characteristics

Variable	1	2	3	4	5	6	7	8	9
1. Age	-	-.54***	.13	.41*	.51**	-.14	.08	-.09	.13
2. Gender		-	-.13	-.20	-.25	-.03	-.24	-.03	.01
3. Race/ethnicity			-	.07	.41**	.25	.41*	.09	-.38*
4. Addiction licensure				-	.30	-.22	.07	.19	-.27
5. 5+ Years in Addiction Field					-	.08	.11	.28	-.04
6. Patient barriers						-	-.03	0.0	-.37*
7. Provider barriers							-	-.11	-.06
8. Organizational barriers								-	-.06
9. CM adoption									-
Mean (Standard Deviation)	41.95 (11.45)	66.7% (n = 26)	76.9% (n = 30)	46.7% (n = 28)	51.3% (n = 20)	1.21 (2.54)	.92 (2.53)	2.64 (4.31)	9.05 (6.35)
Range	20-62	0-1	0-1	0-1	0-1	0-10	0-14	0-21	0-23

Note:

p < .001,

**
p < .01,

*
p < .05

Table 2
 Hierarchical Regression Examining Provider Characteristics and Barriers to Implementation on Provider CM Adoption Frequency

Variable	B	SE(B)	β	F	R ²	R ²
Step 1: Provider Characteristics						
Sex	1.03	2.29	.08			
Race	-6.43	2.38	-.43*			
Age	.19	.11	.33*			
Licensure Attainment	-5.53	2.22	-.40*			
5+ Years in Addiction Field	1.34	2.32	.11			
				3.02*	.31	.31
Step 2: Barriers to Implementation						
Patient Barriers	-.89	.38	-.36*			
Provider Barriers	.21	.40	.08			
Organizational Barriers	.07	.23	-.05			
				2.91*	.44	.12

Note.

* $p < .05$ Sex, Race, licensure attainment, and years in addiction field were dichotomized.