Current Trends of Psychotherapeutic Approaches with Addiction

Contingency Management for Methamphetamine Use Disorder:
Literature Review and Implementation Considerations

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Abstract

Methamphetamine is a highly addictive stimulant associated with myriad health and societal harms, and its use has increased sharply over the last two decades. There are currently few effective treatments for methamphetamine use disorder (MUD). Contingency management (CM) is an evidence-based behavioral therapy that uses positive reinforcement to support drug abstinence. CM is highly effective for treating MUD but lacks broad adoption. There are many barriers to implementing CM, most notably the lack of a legal reimbursement pathway in federally funded health programs. Using the RE-AIM framework and the Consolidated Framework for Implementation Research (CFIR), this research seeks to identify the vital elements, necessary stakeholders, and viable policy levers to implement CM in Medicaid.

Keywords: methamphetamine use disorder, contingency management, implementation science, RE-AIM, CFIR, Medicaid

Definitions

Inner Setting: A domain within CFIR recognized as an active interacting facet of implementation. Consists of the following constructs: structural characteristics, networks and communications, culture, implementation climate, and readiness for implementation.

Outer Setting: A domain within CFIR associated with constructs including cosmopolitanism, external policies and incentives, patient needs and resources, and peer pressure.

Natural Implementation: Emergent, adaptive, or self-organizing spread of innovation.
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Background

**Methamphetamine Use Disorder**

Methamphetamine is a powerful and highly addictive stimulant drug that affects the central nervous system (National Institute on Drug Abuse, n.d.). Although methamphetamine is legally available by prescription (i.e., Desoxyn®) to treat attention deficit hyperactivity disorder, most methamphetamine used in the US is produced and distributed illicitly (SAMHSA, 2020). As of 2020, approximately 15 million people in the US aged 12 and older reported using illicit methamphetamine in their lifetime, with 2.5 million using the drug in the last year, and 1.7 million in the last month (Jones et al., 2020; SAMHSA, 2020). Methamphetamine use is associated with a myriad of health harms, including psychosis and other mental health disorders, cardiovascular and renal dysfunction, infectious disease transmission, and overdose (Jones et al., 2020).

Few effective treatment options exist for methamphetamine use disorder (MUD) (Courtney & Ray, 2014). Unlike other substance use disorders (SUD), such as opioid use disorder, there are no pharmacologic treatments for MUD (Glass et al., 2020). Currently, MUD treatment is limited to psychosocial interventions such as cognitive-behavioral therapy, motivational interviewing, relapse prevention therapy, and community reinforcement approach (Courtney & Ray, 2014; Glass et al., 2020; McGovern et al., 2004; Shearer, 2007; Vocci & Montoya, 2009). Twelve-Step programs such as Narcotics Anonymous are also commonly used for MUD, despite the lack of evidence supporting the efficacy of these programs as a standalone treatment for this particular population (Courtney & Ray, 2014; Donovan & Wells, 2007; Galanter et al., 2013; Shearer, 2007).
Contingency Management

Contingency management (CM) is one such evidence-based practice that is appropriate for treating MUD but has not been widely adopted. CM is a behavioral therapy that provides positive reinforcement (e.g., prizes, vouchers) for a targeted behavior such as abstinence from substance use (Oluwoye et al., 2020; Petry et al., 1998). The “fishbowl method” is one of the most well-known and widely-used methods of CM (Oluwoye et al., 2020; Petry, 2000; Petry & Martin, 2002). Participants who provide a negative drug test result (e.g., via urine drug test) draw a token from a fishbowl for a chance of winning a prize equal to the value of the token, generally ranging from “good job,” “small,” “large,” or “jumbo” (i.e., $0, $1, $20, $100) (Oluwoye et al., 2020; Petry, 2000; Petry & Martin, 2002). CM can also be conducted using the voucher method, where patients can earn vouchers exchangeable for retail items contingent on objective evidence of recent drug abstinence (Higgins et al., 1991, 1993, 2019).

CM is supported by a robust evidence base spanning three decades of research and is highly effective in supporting methamphetamine abstinence (Andrzejewski et al., 2001; Brown & DeFulio, 2020; De Crescenzo et al., 2018; DePhilippis et al., 2018; Higgins et al., 1991, 2000, 2019; Kaminer et al., 2014; Kropp et al., 2017; Lee & Rawson, 2008; McDonell et al., 2013, 2017; McGovern et al., 2004; Oluwoye et al., 2020; Petry, 2000, 2006, 2011; Petry et al., 2000, 2014, 2017; Petry & Martin, 2002; Prendergast et al., 2006; Rash, Alessi, et al., 2017; Rash et al., 2020; Rash, Stitzer, et al., 2017; Rash & DePhilippis, 2019; R. A. Rawson et al., 2006; Roll et al., 2006; M. L. Stitzer & Vandrey, 2008; M. Stitzer & Petry, 2006; Walter & Petry, 2016). Despite solid evidence of effectiveness, few clinicians use CM in clinical practice (McGovern et al., 2004; Oluwoye et al., 2020). Furthermore, Medicaid and other large health insurers refuse to reimburse for CM due to legal concerns (Glass et al., 2020). Policymakers and clinicians
opposing CM cite moral objections to compensating patients for drug abstinence (Kirby et al., 2006; Petry, 2010). This report seeks to review the published CM literature, identify barriers and challenges to CM implementation by applying relevant implementation science frameworks, and determine potential avenues for future research that would support greater CM implementation, especially within state Medicaid programs.

**Applied Implementation Frameworks**

Published literature most commonly utilizes the RE-AIM framework in the context of CM for MUD. RE-AIM, which describes the Reach, Effectiveness or Efficacy, Adoption, Implementation, and Maintenance of an intervention, was developed as an evaluative framework to identify health promotion interventions’ translatability and public health impact (RE-AIM, n.d.). Elements of other implementation science models and frameworks, including the Consolidated Framework for Implementation Research (CFIR), Diffusion of Innovations in Service Organizations, and the Expert Recommendations for Implementing Change (ERIC), are also referenced where applicable (Brownson et al., 2012; CFIR, n.d.; Greenhalgh et al., 2004).

**Reach**

Policymakers and clinicians have not fully embraced the implementation of CM on a state or national scale. Early application of CM for SUD has been in relatively small pilot programs in select states, including Vermont, New Hampshire, and West Virginia (Higgins et al., 2019; McGovern et al., 2004; R. Rawson et al., 2000; R. A. Rawson et al., 2006). Therefore, the ability of CM to reach appropriate target populations for MUD, considered actors within the Outer Setting, defined by CFIR, was limited (CFIR, n.d.). In subsequent years, CM research has expanded to include the Clinical Trials Network studies, which aided in increasing the generalizability of CM by including a more representative sample of populations affected by
SUD (Rash & DePhilippis, 2019). As a result of the Clinical Trials Network studies, CM has been applied in multiple demographic and treatment-related settings, and has been shown to improve outcomes regardless of race, gender, age, income, and housing status, as well as in those with comorbid SUD (Rash & DePhilippis, 2019). Additional details on CM treatment outcomes are included in the Effectiveness section below.

Unlike individual state pilot programs, CM for SUD has had the most significant reach through large-scale implementation by the Department of Veterans Affairs (VA) (Brown & DeFulio, 2020; Petry et al., 2014). In 2011, VA leadership reported that despite the robust evidence base supporting the efficacy of CM, only about 1% of patients treated in the VA system received this type of treatment in the prior year (Higgins et al., 2019; Petry et al., 2014). As a result, VA leadership called for the nationwide implementation of CM in all VA intensive outpatient treatment programs (Higgins et al., 2019). The directive also recognized the need for additional support in training providers in CM methods as well as funding support, and the VA provided support in both areas (Higgins et al., 2019). In the five years following the directive, CM was implemented in 94 sites, expanding the reach of CM within the VA system (Higgins et al., 2019; Petry et al., 2014).

CM is effective in special patient populations such as men who have sex with men; however, there is a lack of evidence in other special populations, such as transgender individuals (Brown & DeFulio, 2020). Additionally, people experiencing homelessness have an increased risk of SUD, including MUD (Padwa et al., 2021). CM is an effective treatment for MUD in people experiencing homelessness, but only 55% of publicly-funded treatment programs reported using CM in 2019 (Padwa et al., 2021). The Adoption section below includes additional details about CM in publicly funded health programs.
Although CM is widely effective across patient populations and clinical settings, subject matter experts emphasize that CM should only be implemented in environments where enhanced drug testing would not lead to punitive effects (Petry et al., 2014). For example, patients under legal supervision for which urinalysis results are shared with legal authorities are likely to be penalized if their CM samples test positive (Petry et al., 2014). Additionally, some residential treatment programs have no-tolerance policies on substance use (Petry et al., 2014). Patient participating in CM could lose their housing if their urine samples test positive (Petry et al., 2014). Further research is needed to determine if justice-involved patients and those in residential treatment programs can be treated for SUD using CM without incurring penalties.

**Effectiveness**

Despite being one of the most effective treatments for SUD, only 10-20% of clinicians use CM in clinical practice (McGovern et al., 2004; Oluwoye et al., 2020). CM is based on operant conditioning principles (Glass et al., 2020; Petry et al., 2017). Evidence indicates that CM stimulates the dopamine-activated reward pathway in the brain in a similar mechanism to drugs, alcohol, and tobacco (Higgins et al., 2019). The brain’s reward pathway is heavily influenced by reinforcements, which is one of the main contributors to addiction (Edwards, 2016; Higgins et al., 2019). By providing positive reinforcements for drug abstinence, CM aims to stimulate the brain’s reward pathway, making the decision to abstain from drug use easier and more habitual.

Quantitative, qualitative, and mixed-method studies alike have demonstrated the effectiveness of CM in reducing tobacco, alcohol, cannabis, and illicit drug use, including methamphetamine (Kaminer et al., 2014; Kirby et al., 1998; Lussier et al., 2006; McDonell et al., 2013, 2017; Oluwoye et al., 2020; Petry, 2000; Petry & Martin, 2002; Roll et al., 1996, 2006). A
recent systematic review found that CM is highly effective for supporting methamphetamine abstinence, leading to higher utilization of other treatments and medical services and reductions in risky sexual behavior (Brown & DeFulio, 2020). Multiple meta-analyses have studied the impact of CM on SUD treatment outcomes and have found consistent medium effect sizes (Cohen’s d [d] = 0.41-0.68), with CM yielding larger effects (d = 0.58) compared to cognitive behavioral therapy (d = 0.28) or relapse prevention (d = 0.32) (Rash & DePhilippis, 2019).

One notable gap in the literature is that few studies evaluate CM for supporting long-term methamphetamine abstinence (Brown & DeFulio, 2020). A recent meta-analysis found that CM led to significant improvements in drug abstinence at 3-months post-treatment but not at 6-months post-treatment (Sayegh et al., 2017). Longer-term drug abstinence likely would be supported by the maintenance of drug abstinence contingencies, especially if these contingencies were better integrated into patients’ lives (Brown & DeFulio, 2020). One proposed integration method is to provide drug abstinence contingencies within the workplace (Silverman et al., 2012). Additional aspects of CM maintenance are discussed in the Maintenance section below.

**Adoption**

Challenges related to CM implementation adoption arise from actors in both the Outer and Inner Settings, as defined in CFIR (CFIR, n.d.). A fundamental challenge to CM implementation identified in the literature is the adoption of CM by substance use treatment providers (Inner Setting) (Brown & DeFulio, 2020). Providers have been limited in adopting CM by restrictions imposed by state and federal health insurers (Outer Setting). Historically, Medicaid and other health insurers have been unwilling to reimburse for CM because federal and state laws make it illegal to provide CM to many patients (Glass et al., 2020). Under federal statute 42 USC §1320a–7b, incentives such as those provided in CM can be considered
kickbacks or inducements when they exceed nominal monetary values (American Society of Anesthesiologists, n.d.; Cornell Law School, n.d.; Glass et al., 2020). The Department of Health and Human Services Office of the Inspector General (*Outer Setting*) imposes annual limits on incentives to Medicare and Medicaid beneficiaries at a maximum monetary value of $75 (Department of Health and Human Services, 2016; Glass et al., 2020). States have similar laws limiting the annual monetary amount of incentives available through state-funded health insurance plans (e.g., $100 annually for Washington State Medicaid) (Glass et al., 2020). These laws are intended to prevent fraud, waste, and abuse in state- and federally-funded health insurance programs and provide a mechanism to penalize providers that try to induce patients to access services (e.g., unnecessary use) or direct patients towards a specific treatment program or health insurance plan (Glass et al., 2020).

Recent Medicaid policy changes allow incentives to promote healthy behaviors (Vulimiri et al., 2019). In a 2019 analysis by Vulimiri and colleagues, at least 18 states and nearly all Medicaid managed care organizations (MCOs), all actors within the CFIR *Outer Setting*, reported experimenting with beneficiary incentive programs targeting health-promoting behaviors (Vulimiri et al., 2019). Adopting these programs is partly driven by recognizing that health outcomes are often affected more by behavioral choices than by health care services (Vulimiri et al., 2019). These incentive programs have targeted a wide variety of health behaviors, including health care use (e.g., preventive visits, immunizations), smoking cessation, diabetes management, and weight loss (Vulimiri et al., 2019). Notably absent from this list is the adoption of incentive programs for promoting illicit drug abstinence. These programs encourage positive health behaviors by awarding incentives such as gift cards, prizes, or reduced cost-sharing (Vulimiri et al., 2019). These incentives are identical or similar to those employed in CM
or SUD. Vulimiri and colleagues report that states have implemented beneficiary incentive programs through various policy mechanisms such as §1115 waivers, state plan amendments, federal grants, and MCO partnerships (Vulimiri et al., 2019). However, the authors omit any mention of legal concerns regarding using monetary incentives to promote positive health behaviors, which is a central concern with the adoption of CM.

Despite these policy flexibilities, many states are hesitant to reimburse for CM for SUD in their Medicaid programs. However, California recently became the first state to bridge this gap. In July 2021, California Governor Gavin Newsom signed a state budget that included funding for a CM pilot program from July 2022 to March 2024 (Lekhtman, 2022; The Associated Press, 2021). Separately, a bill (SB 110) passed in the legislature that would have ensured permanent coverage of CM under the state’s Medicaid program (Medi-Cal) (Lekhtman, 2022). The Governor vetoed this bill, citing that it was premature and that the state should evaluate the CM pilot before implementing a permanent change (Lekhtman, 2022). The pilot program was approved by the Centers for Medicare & Medicaid Services (CMS) in December 2021 under the state’s §1115 waiver (Lekhtman, 2022). The pilot will be part of the Drug Medi-Cal Organized Delivery System, which uses Medicaid matching funds to expand SUD treatment to include a spectrum of evidence-based approaches (Lekhtman, 2022). If the pilot is successful, the California approach may serve as a blueprint for implementing CM for SUD in other state Medicaid programs through Natural Implementation as defined by the Diffusion of Innovations in Service Organizations (Greenhalgh et al., 2004). If enough states successfully implement CM via §1115 waivers or other policy authorities, perhaps this could convince CMS to reconsider the parameters of their anti-kickback statute to allow for the use of monetary or prize-based incentives for CM in the Medicaid program.
Implementation

Aside from legal constraints, factors restricting the implementation of CM in clinical and community-based SUD treatment settings include limited funding for CM-associated urine tests and reinforcements, little provider understanding and knowledge of CM, a lack of practical implementation tools, and few documented implementation strategies in a real-world setting (Oluwoye et al., 2020).

A crucial factor in the successful implementation of CM is disseminating information regarding CM methods during provider training (Oluwoye et al., 2020). Trainings typically cover content on the basic principles and foundations of CM, including the presentation of previous and current research, CM procedures (e.g., prize draws), fidelity, and typical implementation issues (Oluwoye et al., 2020). Training is usually conducted in person, can be targeted to individuals or groups, and can be categorized in 1 of 4 ways: low intensive training, high fidelity training, or computer-assisted training (Oluwoye et al., 2020). Both low intensive and high fidelity training are effective, and organizations can choose which approach best meets their needs when resource constraints are an issue (Oluwoye et al., 2020). However, training with greater attention to fidelity yields better results and higher provider satisfaction (Oluwoye et al., 2020). Computerized assistance can be a helpful adjunct to traditional training (Oluwoye et al., 2020).

To address barriers to training and funding, the VA supported four regional in-person trainings for clinical leaders and providers from VA intensive outpatient treatment programs or similar settings (Petry et al., 2014). Trainings provided a forum to disseminate CM evidence, methods, and best practices and included didactic components, demonstrations, and group exercises (Petry et al., 2014). Additionally, each program that supported 50 or more patients
during 2010 was given implementation support funds in amounts dependent on the number of patients treated (Petry et al., 2014). A total of 108 treatment programs across 21 Veterans Integrated Service Networks were eligible for and received funding (Petry et al., 2014). Funding ranged from $4,800 to $26,700 per program, with most programs receiving $5,000 (Petry et al., 2014).

In a systematic review of 24 studies, Oluwoye and colleagues identified three strategies for effective CM implementation: high intensive, collaborative design, and consultation-driven (Oluwoye et al., 2020). The high intensive strategy is the New England Addiction Technology Transfer Center Science to Service Laboratory strategy and involves didactic trainings by a CM expert and nine months of additional support and trainings from a technology transfer specialist (outside the organization) and an internal innovation champion (inside the organization) (Oluwoye et al., 2020). The collaborative design strategy involves four steps: engaging organizational leadership to identify a target population and behavior; 4 30-minute consultative planning meetings with onsite implementation leaders; identification of a start date for CM; and initial implementation of CM for 90 days (Oluwoye et al., 2020). The consultation-driven strategy is the large-scale implementation strategy taken by the VA system in 2011, which included training workshops, pre-implementation planning calls with stakeholders, and expert feedback on design and implementation approaches (Oluwoye et al., 2020). All three implementation strategies were effective, and organizations could choose which method best met their needs concerning resource and time constraints (Oluwoye et al., 2020). While providers were highly satisfied with each approach, some noted a desire for more flexible staff time to support CM implementation (Oluwoye et al., 2020).
Maintenance

Evidence indicates that once CM has been implemented, staff and administrator attitudes towards CM are positive; a strong reinforcer in maintaining this intervention (Oluwoye et al., 2020). Periodic refresher trainings or “booster” sessions for providers also play a significant role in successful intervention maintenance through the reaffirmation of CM procedures (Oluwoye et al., 2020). Two fundamental challenges to maintaining a CM program after implementation are continued costs of the intervention and staff workload burden (Oluwoye et al., 2020). Although several studies have demonstrated that CM is a cost-effective, evidence-based practice for promoting drug abstinence with an economic benefit, cost remains one of the most significant barriers to CM implementation and maintenance (Oluwoye et al., 2020). One option for freeing up funding in low-resource settings could be the de-implementation of current practices that have no utility, do not have a significant impact on substance use behaviors, or do not address mechanisms of change (Oluwoye et al., 2020). De-implementing these ineffective practices could also alleviate provider burden of implementing CM (Oluwoye et al., 2020). It is also important to monitor fidelity in the maintenance phase to ensure that CM is being conducted most effectively (e.g., improving client outcomes) and for continued acceptability and buy-in from staff, providers, and other stakeholders (Oluwoye et al., 2020).

Given that CM has predominantly been implemented in small, short-duration pilot programs and clinical trials, it may be possible that there is insufficient practical experience in long-term CM program maintenance. Additional studies of CM should assess program maintenance, fidelity, and stability in the long term.

Potential Areas for Growth
Though numerous studies have been conducted on the effectiveness of CM and best practices for implementation, few studies have used implementation science frameworks to guide their design, dissemination, and implementation (Oluwoye et al., 2020). The evidence for CM primarily consists of feasibility and efficacy studies. Additional primary studies are needed to assess the real-world implementation of CM thoroughly. These studies should use different designs, such as hybrid models with both implementation and effectiveness considerations (Oluwoye et al., 2020). Currently, only two such studies exist: Hagedorn and colleagues (Hagedorn et al., 2014), which uses the RE-AIM framework, and Hartzler and colleagues (Hartzler et al., 2014), which uses a conceptual framework developed by Procter and colleagues (Oluwoye et al., 2020; Proctor et al., 2011). The implementation framework, or “working taxonomy,” developed by Proctor and colleagues assesses eight implementation outcomes: acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration, and sustainability (Proctor et al., 2011). This framework shares similarities with the domains included in the RE-AIM framework (RE-AIM, n.d.).

Literature also indicates that additional resources need to be developed for community-based substance use programs interested in implementing CM. Nancy Petry, whose research is a cornerstone in CM methods and implementation, created a checklist for organizations interested in designing CM programs (Petry, 2000). This checklist may serve as a helpful foundation for future structured guides or readiness assessments including obtaining a funding source, assessing the costs and benefits of implementation, and building the infrastructure to support and sustain CM financially (Oluwoye et al., 2020). Such a guide should also be informed by implementation science frameworks such as RE-AIM and implementation strategies from ERIC (Brownson et al., 2012; RE-AIM, n.d.). ERIC implementation strategies such as conducting readiness
assessments to identify barriers and facilitators, developing a formal implementation blueprint, and developing and implementing tools for quality monitoring are strategies that are particularly applicable to the _Adoption_ and _Maintenance_ domains of the RE-AIM framework (Brownson et al., 2012; RE-AIM, n.d.).

Finally, there is a lack of published literature regarding the policy conditions necessary for successfully implementing CM for SUD, especially within Medicaid. As previously described, there is a plethora of evidence illustrating the effectiveness of CM for supporting drug abstinence, improving attendance in other drug treatments, and other patient-relevant outcomes. However, this type of evidence is insufficient by itself to prompt the widespread implementation of CM. Furthermore, few studies have evaluated the implementation of CM through a formal implementation science lens, using relevant theoretical frameworks. Perhaps what is needed to support the further study and practice of CM implementation is a systematic evaluation of the policy conditions (e.g., facilitators) necessary for CM implementation. These facilitators could arise from numerous organizational, structural, and legal domains. This analysis should also include a review of CM implementation experiences from pilot programs that serve Medicaid beneficiaries.

**Conclusion**

Given the persistence of MUD in the US population, the lack of drug therapies to treat MUD, and the substantial evidence base supporting the effectiveness of CM to treat MUD, broader implementation of CM is warranted. Future research should ascertain the barriers and challenges to CM implementation through an implementation science lens and use these findings to identify potential policy levers to promote greater adoption, particularly amongst state Medicaid programs.
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