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The effectiveness of ultra-low magnitude reinforcers: Findings from a “real-world” application of contingency management

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ABSTRACT

Background: Research has consistently found contingency management (CM) to be an effective tool in increasing desired patient behaviors in substance use disorder (SUD) treatment. Despite the strong evidence for the effectiveness of this intervention, practical issues and the cost of implementing CM in treatment programs have been significant barriers to adoption.

Objectives: To evaluate the impact of a CM program designed and implemented by university-affiliated methadone clinic staff to increase patient group attendance. The CM program consisted of a weekly raffle for patients attending clinician-led group counseling and/or in-clinic Methadone Anonymous (MA) groups in which slips with patient ID#s were entered and one ID slip was drawn per week with a fee credit for a dose of methadone (\$15) as the prize.

Methods: The CM program continued for 12 months. Group attendance was tracked before, during, and after CM implementation as part of ongoing clinic service utilization monitoring.

Results: Following the implementation of CM, attendance at any clinician-led or MA groups increased significantly from baseline to month 1 ($X^2 = 5.78$, $p < 0.05$) but this increase was not sustained beyond month 6. Analysis of attendance by type of group revealed that clinician-led group attendance did not increase significantly but there was a significant increase in in-clinic MA group attendance from baseline to month 1 ($X^2 = 20.27$, $p < 0.001$), which was sustained through the 12-month implementation period ($X^2 = 11.21$, $p < 0.001$) and through 3 months post-implementation ($X^2 = 14.73$; $p < 0.001$).

Conclusions: A low-cost, simple CM intervention implemented by clinic staff was associated with significant increases in the target behavior of increasing group attendance.

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1. Introduction

Contingency management (CM) is an evidence-based intervention for patients with substance use disorder (SUD). Research has found that CM interventions are effective in increasing abstinence (Abbott, Weller, Delaney, & Moore, 1998; Petry, Alessi, Barry, & Carroll, 2015; Petry, Alessi, & Ledgerwood, 2012; Sigmon et al., 2015; Silverman et al., 1996), treatment engagement (Brigham, Winhusen, Lewis, & Kropp, 2010; Kidorf et al., 2013; Montgomery, Carroll, & Petry, 2015; Petry & Carroll, 2013), medication adherence (Chen et al., 2013; Kidorf et al., 2013), and in meeting other treatment goals (Wang et al., 2014). A number of CM strategies exist, ranging from a set payment for each incidence of a desired behavior, to increasing payment with increasing consecutive incidences, to the “fishbowl” method in which patients earn chances to draw for prizes. While a number of behavioral

principles must be considered in designing a CM intervention (see Stitzer & Petry, 2006; Walter & Petry, 2015 for detailed discussions), both clinicians and non-clinicians can execute the intervention successfully with training and support (Fitzsimons, Tuten, Borsuk, Lookatch, & Hanks, 2015; Stanger, Ryan, Scherer, Norton, & Budney, 2015).

Many early studies of CM as an SUD treatment were conducted in methadone programs. Initial research evaluated natural reinforcers in the treatment environment (Bigelow, Stitzer, & Liebson, 1984; Stitzer & Bigelow, 1978; Stitzer et al., 1977) to determine whether positive reinforcement for meeting treatment goals was more effective than punishing undesired behaviors such as continued drug use (Iguchi, Stitzer, Bigelow, & Liebson, 1988). Investigators demonstrated that abstinence from opioids and other illicit drugs could be increased by providing take-home doses to reward drug-free urines (Iguchi et al., 1988; Stitzer, Bickel, Bigelow, & Liebson, 1986). Later research expanded the application of CM to other settings, substances, and target behaviors. CM has been utilized as a primary intervention (Brigham et al., 2010; Brooner et al., 2004; Budney, Higgins, Delaney, Kent, & Bickel, 1991; Elk, Mangus, Rhoades, Andres, & Grabowski, 1998; Elk et al., 1994; Higgins et al., 1991; Higgins & Heil, 2015; Ledgerwood, Arfken, Petry, & Alessi, 2014; Rhodes et al., 2003; Sigmon et al., 2015), as well as in

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combination with other pharmacotherapies and psychosocial interventions (Aklin et al., 2014; Carroll, Sinha, Nich, Babuscio, & Rounsaville, 2002; Carroll et al., 2006; Griffith, Rowan-Szal, Roark, & Simpson, 2000; Holtyn et al., 2014) to increase abstinence and treatment utilization.

Additional research has evaluated the effectiveness of various types (Brooner et al., 2007; Chen et al., 2013; Olmstead & Petry, 2009; Petry, Alessi, Hanson, & Sierra, 2007) and magnitudes (Peirce et al., 2006; Petry & Martin, 2002; Petry & Roll, 2011; Petry et al., 2004, 2015; Sigmon & Stitzer, 2005) of reinforcers. Two of the most-frequently studied types of reinforcers are 1) voucher-based incentives, in which the desired behavior results in receiving a voucher that is redeemable for merchandise (for example, a retail gift card); and 2) prize-based incentives (also known as the “fishbowl method”) in which performing the desired behavior results in the opportunity to draw a slip from a container that either has no value or indicates a prize in one of several value-tiers (e.g., “small”, “medium”, “jumbo”, etc.). Evidence generally suggests that CM outcomes are significantly associated with the magnitude of the reinforcer (Petry & Roll, 2011), although it is important to note that magnitudes of reinforcers reported in the literature correspond, in part, to the magnitude of the behavior change to be rewarded. Most of the reported efficacious magnitudes for voucher-based CM have been in the range of \$900–\$3000 per 12-week treatment episode (Epstein, Hawkins, Covi, Umbricht, & Preston, 2003; Rawson et al., 2002; Silverman, Chutuape, Bigelow, & Stitzer, 1999; Silverman et al., 1996); however, Sigmon et al. (2015) found that lower-magnitude voucher earnings (\$362.50 and \$570) were effective in increasing initial and sustained smoking abstinence. Effective magnitudes reported for prize-based CM are typically lower than for voucher-based CM (Peirce et al., 2006; Petry & Martin, 2002; Petry, Martin, & Simcic, 2005; Petry et al., 2007). Petry et al. (2015) demonstrated that offering a lower-magnitude prize-based CM of \$300 was as effective as offering higher magnitude (\$900) prize-based or voucher-based strategies. However, an evaluation of a prize-based CM offering a value of \$80 was found to be ineffective, suggesting that there may be a threshold value to be met in order for the intervention to be helpful (Petry et al., 2004). The cost of implementing CM has been a particularly challenging barrier to implementation given the underfunding of many treatment programs. The “fishbowl method” of prize-based CM was developed specifically to address that concern (Peirce et al., 2006; Petry & Martin, 2002). Several researchers have focused on developing additional creative strategies to reduce the overall cost of the intervention while maintaining its effectiveness (Budney et al., 2015; Fitzsimons et al., 2015). One such strategy significantly reduced the overall cost by implementing a raffle drawing in which the names of a few compliant patients were drawn from a pool of all compliant patients; their raffle prize was an opportunity to then draw from a prize bowl in which most prizes were valued at \$1, but contained a few \$20-value prizes and one “Jumbo” prize (Ledgerwood, Alessi, Hanson, Godley, & Petry, 2008; Petry & Carroll, 2013).

In addition to cost, several other barriers to implementing CM in clinical practice have been identified, including lack of familiarity, ideological issues, concerns about the sustainability of the behavior changes once the CM ends, and concerns about the potential for causing gambling problems (Carroll, 2014; Kirby, Benishek, Dugosh, & Kerwin, 2006; Petry, 2010; Petry, Kelley, Brennan, & Sierra, 2008; Petry et al., 2006; Roll, Madden, Rawson, & Petry, 2009). Other practical issues raised include the need to adjust clinic procedures, such as increasing the frequency of urine collection, as well as the time and staff training required to set up and administer complex reinforcement schedules (Carroll, 2014; Kirby et al., 2006; Petry, 2010; Roll et al., 2009). To address attitudinal and training barriers, dissemination activities have occurred at a national level (Petry, DePhilippis, Rash, Drapkin, & McKay, 2014), including the Promoting Awareness of Motivational Incentives (PAMI) blending initiative developed through a partnership between the National Institute on Drug Abuse (NIDA), Substance

Abuse Mental Health Services Administration (SAMHSA), and the Addiction Technology Transfer Center Network (ATTC), which provided extensive training of trainers and free, ready-to-use CM materials (<http://www.bettertxoutcomes.org/bettertxoutcomes/PAMI.html>). In addition, some studies suggest that implementation strategies involving the collaboration between researchers and providers may increase the adoption readiness of program staff and management (Hartzler, 2015; Hartzler, Jackson, Jones, Beadnell, & Calsyn, 2014); nevertheless, the ability to manage logistics associated with feasibility and sustainability remained an important factor in clinic implementation. While training and research collaboration can be helpful in increasing familiarity with CM and addressing ideological issues, the barriers of cost and staffing burden still need to be addressed to ensure sustainability.

The present paper describes a low cost, simple CM intervention developed and implemented by the staff of a methadone program to increase patient group attendance. Previous investigators have examined the use of prize-based CM for group attendance, implemented by clinic staff, within the context of a research study performed in community treatment settings. Ledgerwood et al. (2008) conducted a study at 4 drug-free clinics utilizing a CM strategy that combined raffle drawing and prize-based CM to reduce the weekly expected cost of the intervention. In this intervention, names of compliant patients were placed in a bowl and 5 names were drawn; those 5 patients then had an opportunity to draw from a prize bowl in which all 100 slips represented a small, large, or jumbo prize. Two other studies by Walker et al. (2010) and Sigmon and Stitzer (2005) assisted clinics to implement prize-based CM clinic-wide while collecting data via standard clinic tracking procedures; in the Walker study, one site reduced the cost of CM by implementing the combined raffle/prize CM approach while the Sigmon and Stitzer study reduced costs by utilizing smaller-value prizes for an average maximum award of \$160. These community treatment program-based studies demonstrated significantly greater group attendance during the time period in which the CM intervention was in effect. The present paper is relatively unique in providing the results of a CM intervention designed and implemented by clinic staff without research support.

2. Methods

2.1. Treatment program

Group attendance records collected by a methadone clinic affiliated with the University of Cincinnati were submitted for statistical analysis. The clinic receives no public funding; instead, it is funded through patient self-pay, in which all program services are received as part of a \$15 daily dosing fee. It has an average daily census of approximately 450 individuals receiving methadone dosing, individual and group counseling, case management, patient-led Methadone Anonymous (MA) 12-step groups, and medical services. The staff includes experienced physicians boarded in addictions, registered nurses, licensed/certified chemical dependency counselors, and licensed mental health professionals. All members of the psychosocial team, including 7 counselors, 1 case manager, and the clinical supervisor, facilitate clinician-led groups. Two members of the psychosocial team who have significant 12-step experience serve as mentors to the MA chairpersons, meeting with them monthly to provide support and to assist in addressing any emergent facilitation issues. The program operates 6 days per week, and all patients receive 1 take-home dose per week; additional take-home doses may be earned as part of the clinic's phase program which considers both time in treatment and compliance with individual treatment plans, including abstinence from use of alcohol and illicit drugs. Clinic patients are drawn from within an approximately 35-mile radius, encompassing 3 contiguous states of which 2 are among the top 5 in recent U.S. heroin overdose deaths (Higgins, Wong, Badger, Ogden, & Dantona, 2000). In general, patients are White non-Hispanic (approximately 94%), between the ages of 25 and 44 (approximately

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