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Short communication

Effectiveness of prize-based contingency management in a methadone maintenance program in China

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ABSTRACT

Background: Methadone maintenance treatment (MMT) has been successfully scaled up nationally in China. However, the program faces problems of poor attendance and high rates of continued drug use. We assessed whether a contingency management (CM) intervention implemented by MMT clinic staff could improve treatment attendance and drug abstinence.
Methods: Eight MMT clinics in Guangdong province were randomly selected and divided into two groups. A total of 126 participants (55 in urban clinics and 71 in rural clinics) received CM during a 12-week trial, 120 participants (83 in urban clinics and 37 in rural clinics) received usual treatment (UT). Participants in the CM group had the opportunity to draw for prizes contingent on attending treatment daily and testing negative for morphine. Clinic- and individual-level outcomes were compared between the intervention and control groups.
Results: The retention rate and negative urine testing rate were 14.2% ($P = 0.010$) and 10.7% ($P < 0.001$) higher in the CM group compared to the UT group, respectively. Compared with participants who received UT, CM participants missed on average 7.3 fewer ($P = 0.008$) visits and were 1.91 (95% CI: 1.53–2.39) times more likely to submit a negative urine sample. All clinic- and individual- level effects of the intervention were observed at rural clinics, but the difference in retention rate between urban CM and UT clinics was not significant.
Conclusion: Although the frequency of monitoring and value of the incentives in this study was lower than in previous studies, the CM intervention significantly improved attendance and reduced drug use in China.

1. Introduction

Drug abuse in China has increased dramatically since the 1980s, when China adopted an open-door policy, and has rapidly spread nationwide (Qian et al., 2006). The number of drug users soared from 70,000 in 1990 to over 3.5 million in 2011 (Qian et al., 2006; Hser et al., 2011), of which two-thirds are injection drug users (IDU; Bao and Liu, 2009). Injection drug use is one of the primary modes of HIV transmission in China. In 2011, approximately 28.4% of the estimated 780,000 people living with HIV in China were estimated to be IDU (Ministry of Health of the People's Republic of China, 2012).

In response to the growing severity of the HIV epidemic, methadone maintenance treatment (MMT) was piloted in eight cities in China in 2004. Since then, the MMT program has been scaled up nationwide. By 2011, a total of 716 clinics serving more than 332,900 drug users had been established across the country (Ministry of Health of the People's Republic of China, 2012). However, our previous studies found that treatment retention, attendance and abstinence from drugs among MMT participants were poor (Chen et al., 2009, 2012), and most MMT clinics do not offer counseling or other behavioral interventions (Gill and Okie, 2007).

Prized-based contingency management (CM) is a behavioral intervention that has been successfully used to improve treatment retention, attendance and abstinence among MMT participants in some countries (Lussier et al., 2006). CM is based on operant conditioning theory (Lewis, 2008), which holds that behaviors

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are maintained depending upon the consequences following those behaviors, and that positive reinforcement of behaviors increases the probability that they will re-occur. Randomized control studies in western countries have demonstrated that participants in drug treatment who received reinforcement contingent upon abstinence were more likely to initiate and maintain abstinence from addictive substances (Higgins et al., 1994; Schottenfeld et al., 2005). Furthermore, participants who received CM reinforcement for attendance remained in treatment longer (Lewis, 2008).

To address the problem of poor treatment retention, attendance and opioid use in Chinese MMT clinics, Hser et al. applied prize-based CM in a randomized controlled study in China (Hser et al., 2011). The study demonstrated the effectiveness of CM in improving retention and reducing on-going drug use in a Chinese setting. However, the frequency of the CM intervention, three times per week, was relatively high for Chinese MMT clinics, which suffer from limited resources and staff. In the current study, we adapted a prize-based CM protocol developed in the United States (NIDA, 1998), which uses a once per week intervention, for use in the Chinese community-based MMT program. We assessed the effectiveness of prize-based CM in improving treatment attendance and reducing drug use by comparing prize-based CM to standard MMT for the treatment of opioid dependent participants.

2. Methods

2.1. Study sites

Our study took place in Guangdong province, where the MMT program was first initiated in 2006 (He et al., 2010). At the time this study was carried out in 2011, there was no clinic providing CM to participants. Eight clinics were selected by a three-step stratified random sampling procedure. First, the 50 MMT clinics established in Guangdong before 2010 October were divided into two groups based on whether the one-year retention rate was above or below the median. Second, four clinics (two urban and two rural) were selected randomly from each group. Finally, we randomized the two urban clinics and the two rural clinics in each group into CM or usual treatment.

2.2. Participant

All participants newly enrolled in the eight MMT clinics between May 15, 2011 and January 15, 2012 were eligible for the study if they met the following criteria: (a) current opioid dependence according to the International Classification of Diseases-10 (ICD-10; WHO, 2010), (b) age 20 years or older, (c) residence in the area/city where the MMT clinic was located (as required by current Chinese policies) and (d) willingness to participate and provide informed consent. A total of 255 MMT participants met the criteria. Nine were excluded from the data analysis because they did not provide any urine samples. The final sample included 246 participants, 126 of whom were in the CM group (55 in urban clinics and 71 in rural clinics) and 120 in the UT group (83 in urban clinics and 37 in rural clinics). The study protocol was approved by the Institutional Review Board of the Sun Yat-sen University School of Public Health.

2.3. Study procedures

2.3.1. Study timeline. The study protocol lasted 12 weeks. Participants were considered terminated from the study 84 days after enrollment. According to national guidelines, participants need to visit a MMT clinic daily. Participants who did not visit a clinic for 15 consecutive days were considered drop-outs.

2.3.2. Urinalysis procedures. All participants were asked to provide a urine sample biweekly throughout the 12-week study, for a total of seven urine samples (baseline and six follow-ups). All urine samples were tested immediately using an immunogold labeling technique (Shanghai Rongsheng Biotech Co., Ltd.) that detects morphine.

2.3.3. Usual treatment. All participants were expected to ingest a methadone dose daily. If a participant tested positive for morphine during biweekly urine testing, the clinic staff encouraged the participant to stop using the related drugs. If the participants experienced any medical issues, the staff referred them to necessary treatment services.

2.3.4. Prize-based CM procedures. In order to adapt prize-based CM to the Chinese setting and improve the feasibility and acceptability of the intervention, we conducted qualitative research prior to the intervention. We revised the research protocol according to the feedback and suggestions from MMT staff members and participants.

The primary aim of the CM intervention was to incentivize participants to take methadone daily, and the secondary aim was to incentivize participants to abstain from drug use. Participants assigned to the prize-based CM group received the UT as described above. In addition, they had the opportunity to draw for prizes once per week. The prizes were vouchers that could only be redeemed to pay for treatment (according to the national guidelines, each participant is required to pay 10 yuan (US$1.6) per day for MMT). The prize container contained 500 balls with 50.0% yielding no prize, 41.8% yielding prizes worth 5 yuan (US$0.8), 8.0% worth 10 yuan (US$1.6) and 0.2% worth 100 yuan (US$16). In the current study, the "prize" was used to reimburse the charge for treatment. We used this term to be consistent with the CM literature (Sindelar et al., 2007; Ghitza et al., 2008).

Each participant received a certain number of draws according to their attendance and abstinence during the study period. Participants earned one draw for each negative urine test. Additionally, participants received draws for seven consecutive days of taking methadone according to an escalating scale. In the first week, a participant who attended seven consecutive days of MMT was eligible to earn one draw for attendance. In the second week, if the participant continued to have uninterrupted attendance, he or she was eligible to earn two draws for attendance that week. The number of draws that the participant was eligible to earn continued to increase to 12 in the twelfth week as long as the participant had uninterrupted attendance. However, if a participant had an unexcused absence or a positive urine test, the number of draws he or she was eligible to earn was reset to one and then he or she had to follow the original escalating rule. Participants who notified staff of an expected missed visit could be excused. In total, participants could earn up to 84 draws if they visited the MMT clinic for 84 days (78 draws) and submitted 6 negative urine specimens (6 draws).

2.4. Outcome measures

The MMT clinicians recorded participants' baseline demographic characteristics and daily doses of methadone during the 12-week study. Mean dosage of methadone was defined as the average amount (mg) of methadone the participant took per day. Treatment attendance (individual-level outcome) was defined as the number of days participants took the required daily dosage of methadone. Retention rate (clinic-level outcome) was calculated as the percentage of participants who had not dropped out of the study by 84 days after enrollment. Drug use during treatment was examined using the following outcome measures: (1) number of negative urine samples (individual-level outcome), defined as the number of negative urine tests a participant had during the 12-week protocol. (2) negative urine testing rate (clinic-level outcome), defined as the proportion of urine samples that were negative for morphine among all samples taken at the clinic. Negative urine testing rate was a clinic-level variable measuring the drug abstinence of all participants in the clinic.

In addition to the demographic survey, two additional scales were used: the Zung Self-rating Depression Scale (SDS; Zung, 1973) and the Zung Self-rating Anxiety Scale (SAS; Zung, 1971). We used the SDS and SAS as assessments of depressive and anxiety states, respectively. SDS and SAS tabulate scores from 25 to 100, with depression or anxiety indicated by a score of above 50.

2.5. Analysis

Baseline characteristics and outcomes were compared between the CM group and the UT group both overall and stratified by urban/rural areas. Group comparisons for demographic characteristics, retention rate, treatment attendance, and negative urine samples were made using *t* tests for continuous variables and Fisher's exact tests for dichotomous variables. For binary variables that repeated over time (negative urine testing rate), the analysis was conducted using generalized estimating equations (GEE; Liang and Zeger, 1986). Since no significant differences in demographic characteristics were observed among the groups, the covariates included in the GEE model were variables for the clinic code and injection drug use before enrollment. Results of GEE are reported as odds ratios (ORs) with 95% confidence intervals (CIs), indicating the likelihood that participants in the prize-based CM group had different probabilities of submitting negative urine samples compared to UT participants. All statistical analyses were performed using SAS 9.3 (SAS Institute Inc., Cary, NC, USA).

3. Results

3.1. Baseline characteristics

The mean age of MMT participants was 38.1 years (standard deviation: 5.7). Most participants were male (92.3%), unmarried (55.7%), and unemployed (72.6%). Only 16.3% of participants had completed middle school. Most participants (89.4%) had injected drugs before enrollment. 74.4% and 68.6% of participants reported depression and anxiety, respectively. The average