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# The cost-effectiveness of prize-based and voucher-based contingency management in a population of cocaine- or opioid-dependent outpatients

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ABSTRACT

*Objective:* To evaluate the cost-effectiveness of using prize-based and voucher-based contingency management (CM) as additions to standard treatment for cocaine- or heroin-dependent outpatients in community treatment centers.
*Methods:* This cost-effectiveness analysis is based on a randomized clinical trial conducted at three community-based outpatient psychosocial substance abuse treatment clinics. A total of 142 cocaine- or heroin-dependent outpatients were randomly assigned to one of three treatment conditions: standard treatment (ST), ST with prizes (prize CM), or ST with vouchers (voucher CM) for 12 weeks. The primary patient outcome was the longest duration of confirmed abstinence (LDA) from cocaine, opioids and alcohol during treatment. Unit costs were collected from the three participating clinics. Resource utilizations and patient outcomes were obtained from the clinical trial. Incremental cost-effectiveness ratios (ICERs) and acceptability curves were used to evaluate the relative cost-effectiveness of the interventions.
*Results:* Based on the ICERs and acceptability curves, ST is likely to be the most cost-effective intervention when the threshold value to decision makers of lengthening the LDA during treatment by 1 week is less than approximately $166, and prize CM is likely to be the most cost-effective intervention when the threshold value is greater than approximately $166.
*Conclusions:* Prize CM was found likely to be the most cost-effective intervention over a comparatively wide range of threshold values for lengthening the LDA during treatment by 1 week. However, additional studies with alternative incentive parameters are required to determine the generalizability of our results.


## 1. Introduction

This study analyzes the cost-effectiveness of two types of contingency management (CM) interventions, voucher CM and prize CM, implemented within a randomized clinical trial. The clinical trial was conducted at three outpatient psychosocial substance abuse treatment clinics and included 142 cocaine- or heroin-dependent subjects randomly assigned within each clinic to one of three treatment conditions: standard treatment (ST), ST with vouchers (voucher CM), or ST with prizes (prize CM). Subjects earned reinforcement for (1) testing abstinent from cocaine, opioids, and alcohol, and (2) completing goal-related activities. Although none of the clinics in the trial had methadone treatment available, approximately one out of five subjects were methadone maintained, receiving that treatment at another clinic. Petry et al. (2005) analyzed patient outcomes from the trial but did not report on the cost-effectiveness of treatments.

In voucher CM, participants receive vouchers, typically exchangeable for goods and services, contingent on the desired behaviors. In contrast, participants in prize CM earn chances to win prizes, typically ranging in value from $0.80 to $80, contingent on the desired behaviors. Both voucher and prize CM have been shown to be highly effective with a wide range of substance use disorders (Lussier et al., 2006; Prendergast et al., 2006).

Despite the strong evidence base for both types of CM interventions, these interventions have not been adopted widely in the United States or elsewhere (Ritter and Cameron, 2007). One major hindrance to wider adoption of CM interventions is that not much is known about their cost-effectiveness (Carroll and Rounsaville, 2003; Petry, 2000). At issue is whether the additional expense associated with CM is cost-effective in terms of the additional value gained. Said differently, because both types of CM can increase costs to a financially constrained treatment system, either directly through voucher/prize incentives or indirectly by increasing length of stay, a key issue is whether the additional costs of the interventions are justifiable. Without knowing the cost-effectiveness of using CM in general, or prize CM vs. voucher CM in particular, policymakers have little guidance in determining whether the additional expenditures on either of these interventions are

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worthwhile investments. Unfortunately, few studies have examined the cost-effectiveness of CM in general, and no studies have examined the relative cost-effectiveness of prize CM vs. voucher CM.

In this study, incremental cost-effectiveness ratios (ICERs) and acceptability curves are used to define ranges of values over which each intervention would be considered likely to be the most cost-effective for improving outcomes during treatment of cocaine- or heroin-dependent patients in outpatient psychosocial substance abuse treatment clinics. The emphasis on cost-effectiveness is important for policy decisions related to the future expansion of CM interventions. In addition to increasing the evidence base for the cost-effectiveness of CM in general, to our knowledge this is the first study to shed light on the relative cost-effectiveness of prize CM vs. voucher CM. This study also adds to the growing literature on the cost-effectiveness of well-defined empirically validated treatments and interventions for substance use disorder (Barnett et al., 2001; Cartwright, 1998, 2000; French et al., 1996; Olmstead et al., 2007a,b; Sindelar et al., 2007a,b; Zarkin et al., 2005).

## 2. Methods

Cost-effectiveness analyses of prize CM and voucher CM were conducted using patient outcomes and resource utilization data collected by the original effectiveness trial (Petry et al., 2005). To these we added cost data obtained from the clinics where the trial took place. Methods and results of the effectiveness study are described in the main report of study design and outcomes (Petry et al., 2005) and are thus summarized only briefly below, followed by a description of the analytical methods used for the cost-effectiveness analyses.

The randomized clinical trial evaluated the efficacy of prize and voucher CM coupled with standard treatment as compared to standard treatment only in each of three community-based outpatient psychosocial substance abuse treatment (SAT) clinics located in Hartford and Waterbury, Connecticut, USA. Individuals entering into treatment at the clinics were enrolled in the study between April 2001 and July 2002. The study intervention lasted 12 weeks. Patients were eligible for the study if they met past-year Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) criteria for cocaine or opioid dependence. Study participation was voluntary and participants provided written informed consent as approved by the University's Institutional Review Board. Study procedures were an adjunct to standard services and did not affect these services. In both CM conditions, reinforcement escalated with increasing durations of abstinence, and reinforcement was provided for abstinence and completion of goal-related activities. The final study sample comprised 142 cocaine- or heroin-dependent patients who were randomly assigned to either standard treatment, standard treatment plus prize CM, or standard treatment plus voucher CM. Random assignment was conducted at each site independently using an urn randomization procedure (Stout et al., 1994). Although methadone treatment was unavailable at the clinics in the trial, approximately one out of five subjects were methadone maintained, receiving that treatment at another clinic and requiring supplemental psychosocial treatment for substance use that was not being adequately addressed in the methadone clinics.

The sample size (about 40 per group) was estimated from effect sizes of studies that used lower-cost CM procedures (Petry et al., 2004). No significant differences between treatment conditions were found on any of the patient demographic, substance use or psychosocial functioning variables measured at baseline, with one exception—patients in the ST condition were slightly older than the other groups (by about 4 years). Not surprisingly, the average number of weeks that patients were retained in treatment differed across the conditions, with patients in both CM conditions retained in treatment significantly longer than their ST counterparts. Within each treatment condition, no significant differences across clinics were found on the average number of weeks patients were retained in treatment.

### 2.1. Treatments

*2.1.1. Standard treatment (ST).* Standard treatment was similar at all three sites and consisted of intensive outpatient (IOP) care comprising primarily group therapy (up to 5 h/day, 4 days/week) for 2–4 weeks, depending on need, followed by gradual reductions in care. However, the average duration and timing of ST care varied across the clinics. Specifically, one clinic offered ST care from 10 a.m. to 1 p.m. (3 h) with one 15-min and one 30-min break; another clinic offered ST care from 11:30 a.m. to 3:30 p.m. (4 h) with two 30-min breaks; and the final clinic offered ST care from 9 a.m. to 12 p.m. (3 h) with two 10-min breaks. All patients submitted breath samples for alcohol and urine specimens that were screened for opioids and cocaine. These samples were submitted 3 days/week during Weeks 1–3, 2 days/week during Weeks 4–6 and 1 day/week during Weeks 7–12, for a total of up to 21 samples submitted over the 12-week treatment period. Samples were collected on days that patients were scheduled to attend the clinic.

Patients in the ST group also met one-on-one with a research assistant for 15 min each week to discuss educational topics, including health and drugs, depression, AIDS, and stress management. These individualized meetings were designed to control for the personalized attention associated with activity selection in the CM conditions (see below).

*2.1.2. Voucher CM.* Participants assigned to the voucher CM condition received the same treatment as described above (with the exception of the weekly 15-min educational sessions). They also received vouchers according to a two-track incentive system that provided reinforcement for both abstinence and completion of goal-related activities. Voucher amounts started at $1.00 with submission of the first negative specimen (specimens had to be negative for all three substances—cocaine, opioids and alcohol) and increased by $1.50 for submission of each consecutive negative specimen. A $10 bonus was available each week for submission of all negative specimens during that week. Voucher amounts were reset to $1.00 with submission of a positive specimen, refusal to submit a specimen, or an unexcused absence. Patients also received vouchers for completing activities related to their treatment goals. Each week patients selected three specific activities related to their long-term goals (e.g., completing a GED course application, making or attending a physician's appointment) to complete in the upcoming week. Accepted verifications (e.g., receipts and brochures) of agreed upon activities were also listed on weekly activity contracts. A $3 voucher was earned for each activity completed and verified. Completing all activities in a week resulted in a $10 bonus and a $1 increase in the voucher amount available for each activity completed in the subsequent week. Failure to complete all activities within a week reset the voucher amount to $3.

In total, patients could earn up to $882 in vouchers if they submitted all 21 negative specimens ($456) and completed all 36 activities ($426). Participants could spend vouchers on virtually any item and were usually used for clothing, transportation, electronic equipment, movie theater passes, and gift certificates for food. Requested voucher items were purchased and provided to patients at their next scheduled visit; patients in this condition were also able to select items stocked in the prize cabinet (see below) for immediate exchange of vouchers for tangible items.