Published in final edited form as:
Addiction. 2007 September ; 102(9): 1463–1471. doi:10.1111/j.1360-0443.2007.01913.x.

Cost-effectiveness of prize-based contingency management in methadone maintenance treatment programs

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Abstract

Aim—To determine if prize-based contingency management (CM), which has been shown to improve treatment outcomes over usual care (UC) alone, is cost-effective.

Design—A cost-effectiveness study of a multi-site clinical trial. Data on the outcome measures came from the original effectiveness trial. Cost data were gathered by clinic survey specifically for this cost-effectiveness analysis.

Setting—Six methadone maintenance community clinics participating in the National Drug Abuse Treatment Clinical Trials Network.

Participants—Participants were recruited from six methadone maintenance community treatment programs. The study sample consisted of 388 participants: 190 in the UC condition and 198 in the CM condition. Participants were randomized at each site to either the UC or the CM condition based on the presence of stimulants (cocaine, amphetamine or methamphetamine) and opioids in their baseline urine sample.

Intervention—Prize-based contingency management added to usual care.

Measurements—Longest duration of abstinence (LDA), number of stimulant-negative urine samples and costs of treatment.

Findings—Compared to usual care, the incremental cost of using prize-based CM to lengthen the LDA by 1 week was $141 [95% confidence interval (CI), $105–$193]. The incremental cost to obtain an additional stimulant-negative urine sample was $70 (95% CI, $53–$117).

Conclusions—By comparing this study to a companion study, we found that adding prize-based CM to usual care may be more cost-effective in methadone maintenance clinics than in counseling-based drug-free clinics.

Keywords

Acceptability curve; clinical trials network; contingency management; cost-effectiveness analysis; longest duration of abstinence; methadone maintenance; multi-site; substance abuse; treatment outcomes

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INTRODUCTION

Contingency management (CM) has emerged as a highly effective evidence-based practice that is being used to treat a variety of different addictions. Evidence suggests that higher incentives engender greater reductions in drug use [1,2]. Traditional voucher-based CM interventions can cost thousands of dollars per patient [3], so cost is seen as a key impediment to widespread implementation. Prize-based CM has the promise of lower costs compared to vouchers and has been shown to be effective and feasible to implement in community clinics [4–9]. The cost-effectiveness of prize-based CM is a central question to address. Few studies have analyzed the cost-effectiveness of CM and only two studies, by Sindelar *et al*. [10] and Olmstead *et al*. [11], have analyzed the cost-effectiveness of prize-based CM in community settings. The Olmstead *et al*. study assessed a companion National Drug Abuse Treatment Clinical Trials Network (CTN) multi-site trial that focused on out-patient psychosocial clinics, and Sindelar *et al*. studied the cost-effectiveness of two levels of potential payouts in prize-based CM in two out-patient clinics. In this study, we analyzed empirically whether prize-based CM is a cost-effective addition to methadone maintenance treatment in community clinics. This study was designed to expand a growing literature on the cost-effectiveness of substance abuse treatment [10–17].

The data on outcomes and resource use came from a CTN randomized clinical trial of the effectiveness of prize-based CM in six community-based out-patient methadone maintenance treatment programs across the United States [9]. Data on unit costs came from a survey of clinics that we conducted during the trial. Stimulant abusers (388) were assigned randomly within each clinic to the two treatment arms, usual care (UC) at the clinic and prize-based CM [9]. The primary target drugs in the trial were cocaine, amphetamine, methamphetamine and alcohol. CM was found to be effective in reducing stimulant use. This paper assessed whether the extra costs are worthwhile in terms of the additional effectiveness. The average total prize payout to clients in the trial was $130, which is lower than many other CM designs. However, prize winnings accounted for only a portion of the incremental costs that are incurred in implementation. We accounted for other incremental costs, including testing, counseling, administration of the prize system and overheads.

Our emphasis on value per dollar spent on treatment is important for policy decisions related to the future expansion of CM. Our results are likely to be widely generalizeable, inasmuch as the clinics included in the CTN study encompass considerable variation in usual care content, patient mix and geographic location.

METHODS

We conducted cost-effectiveness analyses of prize-based CM using patient outcomes and resource utilization data collected by the CTN effectiveness study in methadone maintenance clinics [9]. To this information, we added data from a cost survey that we administered to each of the clinics participating in the effectiveness study. In this section, we briefly summarize the effectiveness paper and then describe our methods for the cost-effectiveness analyses.

Effectiveness study—overview

The Peirce *et al*. study [9] assessed the effectiveness of prize-based CM in community-based methadone maintenance clinics within the CTN. UC was compared to UC plus CM in this 12-week study. Stimulants and alcohol were the primary target drugs and opioids were the secondary target drugs. Participants were recruited from six methadone maintenance community treatment programs. The study took place from 2001 to 2003 and had 190 participants in the UC condition and 198 in the CM condition. Participants were randomized

at each site to either condition based on the presence of stimulants (cocaine, amphetamine or methamphetamine) and opioids in their baseline urine sample. There were no differences between groups at baseline. Prizes were stored on-site to increase the immediacy of positive feedback for submitting clean urine samples. Immediate feedback is one factor that has been shown to enhance the effectiveness of treatment [2].

Urinalysis—Participants in both groups were to provide two urine samples per week on non-consecutive days throughout the 12-week study. All urine samples were tested immediately using a testing system (OnTrak TesTcup 5 system; Roche Diagnostics, Indianapolis, IN, USA) that detects amphetamine, methamphetamine, cocaine, tetrahydrocannabinol and morphine. (The term 'opioids' is used to refer to all drugs that test positive in the morphine assay; this did not include methadone.) Breath samples were also tested for alcohol (≥ 0.01 g/dl) using a desktop or hand-held breathalyzer.

Usual care—All participants were expected to receive their methadone dose daily and to attend individual and group counseling as required by each clinic (from three times per week to once per month). Participants were praised if they tested negative, encouraged to try again otherwise and encouraged to seek additional help from a counselor as needed.

Contingency management—Those in CM drew for prizes from a prize bowl each time they tested negative for the primary drugs. The number of draws was based on their test results and the number of draws increased by one for each week in which all submitted samples tested negative for the primary target drugs. The number of draws earned was reset to a single draw after an unexcused absence or submission of a sample positive for one of the primary target drugs. A large prize was awarded when a participant first achieved 2 consecutive weeks of abstinence. Participants testing negative for all primary target drugs could earn two bonus draws if his or her urine sample was also negative for opioids, but the number of bonus draws did not escalate. The prize bowl contained 500 chips with 50.0% yielding no prize, 41.8% yielding prizes worth about $1, 8.0% yielding prizes worth about $20 and 0.2% (one of 500) worth about $100. Each clinic decided upon and purchased its own set of prizes within the retail value guidelines. Participants in CM won about $130 per person on average over the study period.

Cost-effectiveness analysis

Incremental cost-effectiveness analysis was used in this study because it is the appropriate method to assess CM that adds costs incrementally to UC [18,19]. To calculate incremental cost-effectiveness ratios (ICERs), for each of the study participants we multiplied the resources used (e.g. number of tests and counseling sessions) by the unit costs found from our cost survey. Data on resources used came from the original effectiveness study. Five of the 388 participants were excluded due to missing data on resource use, so our final sample size was 383. From these data we calculated the total variable cost for each participant in each arm of treatment. The incremental cost of prize-based CM over the cost of UC was then compared to the incremental effectiveness.

Costs were calculated from the perspective of the clinic and included only those costs that vary by treatment condition, including overhead. Costs assessed included expenditures related to counseling sessions, urine and breath sample testing and the prize system. Labor costs included fringe benefits where appropriate (one of the six clinics did not provide fringe benefits). All labor costs were multiplied by the overhead rate reported for each clinic. We included overhead costs because implementation would probably require additional long-term costs. We conducted sensitivity analysis by varying the apportionment of overhead to

treatment because there is inherent uncertainty with respect to how overhead should be attributed.

Incremental costs of prize-based CM

Unit costs—Unit cost data were collected by surveys administered to each clinic in the study. Research associates at each clinic were given detailed instructions and asked to complete the survey using information from the Chief Financial Officer, Chief Executive Officer, lead counselors and/or accountants. Clinics were each paid $100 to encourage participation, and all clinics returned completed surveys.

Unit counseling costs—Unit counseling costs measured the average per-participant cost of a counseling session and were estimated for individual and group therapies. These unit costs included the time spent by the counselor both in treatment (51 minutes) and in administration (e.g. writing notes after the session) and were prorated by the average number of patients in a session.

Unit testing costs—Unit testing costs measured the average cost per urine and breath test and included material costs (breathalyzer tubes and urine test cups) and time spent by staff administering the test.

Unit prize system costs—Prize system costs comprised three components: drawing session costs, prize costs and costs of administering the prize system (e.g. taking inventory of prizes, shopping for prizes and restocking the system). Unit drawing costs measured the average cost of a drawing session; this was the time spent by staff administering each drawing valued at counselor salary plus fringe benefits and overhead. Unit prize costs were the value of prizes won during the drawing sessions and were assumed to be $0 for ‘good job’, $1 for ‘small’, $20 for ‘large’ and $100 for ‘jumbo’. Costs of administering the system were calculated based on clinic answers to questions about the amount of time spent per week by staff taking inventory, purchasing and restocking the prizes for the CM condition; this time was then valued at counselor salary plus fringe benefits and overhead. We measured unit administrative costs as the administrative cost per prize won, not including ‘good jobs’, which did not contribute to the need for restocking.

Resources used—In order to calculate the total variable costs, we multiplied the above calculated unit costs by the number of units of each resource used. Resource utilizations for each participant were obtained from the effectiveness study [9]. Data on the number of each of the following were collected: counseling sessions of each type (i.e. individual and group), urinalysis tests, drawing sessions for prizes and prizes won of each value. Variable costs per participant were then estimated straightforwardly by multiplying unit costs by corresponding resource utilizations.

Finally, the incremental cost of prize-based CM compared to UC was estimated by subtracting the average per-participant cost of the UC group from the average per-participant cost of the prize-based CM group.

Incremental cost-effectiveness analysis

We conducted incremental cost-effectiveness analyses (ICEA) to answer the question of value per dollar spent on prize-based CM over UC. The primary patient outcome used in the ICEA was the LDA from primary target drugs. LDA was defined as the longest span of consecutive weeks in which all samples delivered under the twice-weekly testing schedule indicated abstinence from primary target drugs.

The LDA was chosen as the primary patient outcome for the ICEA because (i) the escalating draw feature of the incentive condition was designed specifically to reinforce long durations of abstinence, and (ii) the LDA achieved during treatment is among the best predictors of improved outcomes at follow-up periods [2,7,9,20,21]. As a check on the robustness of our results, we also considered the secondary outcome 'number of stimulant-negative urine samples'.

For each of these patient outcome measures, we calculated incremental cost-effectiveness ratios (ICERs). The ICER is the incremental cost divided by the incremental effect. We used incremental costs estimated as described above and incremental effects obtained from the original effectiveness study. The ICERs measure the incremental cost of using the prize-based CM intervention, compared to UC, to produce an extra unit of effect for each of the patient outcomes.

Bootstrapping (with 1000 replicates) was used to estimate confidence intervals for each of the ICERs and to produce an acceptability curve for LDA [22]. The acceptability curve illustrates the statistical uncertainty due to using a single sample and provides policy relevant information [22–24]. Finally, we conducted sensitivity analyses on several key parameters to assess how the ICERs would likely change if prize-based CM had been implemented under alternative, realistic conditions reflecting current prices.

RESULTS

Results from the effectiveness study

The results from the Peirce *et al*. effectiveness study showed that drug use was improved significantly for those in CM over the UC group. The longest duration of abstinence (LDA) was more than twice as long for CM compared to UC, and the number of negative urine samples was 60% higher for CM as compared to UC (see Table 1). Given that sample characteristics were similar across the treatment arms, the differences in patient outcomes were due probably to the prize-based CM intervention. Because length of stay in methadone maintenance is typically longer than 12 weeks, differences in retention were not anticipated —and were not found—between the two groups [9].

Incremental costs of prize-based CM

Unit costs were estimated following the methods described above using the data collected by the cost survey administered to the clinics in the original effectiveness study. Table 2 presents the weighted average of the unit costs, where the average was taken across all clinics and weighted by the sample size at each clinic. The average per-participant cost of a group counseling session was $3.78 (the low cost is due to an average of 10.35 patients sharing the total cost of the group session). The average cost of an individual counseling session was $18.89. The average testing cost of $17.50 included the labor cost of testing ($5.71) as well as the material costs of the urine sample test cups ($11.57) and breathalyzer tubes ($0.22). The unit cost to conduct a drawing session was $1.75, and the average administrative cost (including inventorying, shopping and restocking) per monetary prize (i.e. not the 'good jobs') was $3.46.

Resource utilizations per participant were obtained from the effectiveness study and are summarized in Table 3. On average, compared to the UC group, participants in the prize-based CM group attended slightly fewer individual and group counseling sessions, although the difference was not statistically significant. As expected, the CM group submitted significantly more urine samples. Participants in the prize-based CM group had an average of 8.2 drawing sessions over the course of the trial, resulting in an average of 21.4 good job

chips, 18.8 small prizes, 4.2 large prizes and 0.19 jumbo prizes; this rate is consistent with the distribution of chips in the bowl.

Table 4 presents the average variable cost per participant for both prize-based CM and UC participants, as well as the incremental costs of prize-based CM compared to UC. Participants in the prize-based CM group incurred slightly lower counseling costs, slightly higher testing costs and significantly higher prize costs. The aggregate cost of CM was greater than that of UC, as expected. Total variable costs were, on average, $591 and $366 per participant in the CM and UC groups, respectively, giving an incremental cost of CM over UC of $225.

Incremental cost-effectiveness of prize-based CM

Column 1 of Table 5 presents ICERs for the comparison of prize-based CM with UC. These ICERs were calculated using incremental effects from Table 1 and incremental costs from Table 4. Compared to UC, the incremental cost of using prize-based CM to lengthen the LDA by 1 week was $141 [95% confidence interval (CI), $105–193], while it was $70 (95% CI, $53–117) to obtain an additional stimulant-negative urine sample. Because the outcomes were measured in different units, the ICERs cannot be interpreted directly and compared.

Acceptability curves help to provide policy-relevant information and to assess statistical uncertainty of ICERs due to the use of a single sample [22–24]. Figure 1 shows the acceptability curve associated with the ICER for the LDA. The acceptability curve assesses the likelihood that an intervention will be ‘acceptable’ to decision-makers across a large set of alternative, hypothetical values of an additional unit of outcome. This allows decision-makers to use their own criterion of value for the outcome and determine from the curve the likelihood that CM would be selected as the best alternative given the value placed on the outcome. For example, if the threshold value to extend the LDA by 1 week were $114, then the prize-based CM intervention would be only 10% likely to be cost-effective. On the other hand, if the threshold value to extend the LDA by 1 week were $169, then the prize-based CM intervention would be 90% likely to be cost-effective.

To calculate the acceptability curve, we developed new samples (‘bootstrapped samples’) by drawing random selections (with replacement) from our study sample. Specifically, we bootstrapped 1000 samples of the same size as our current study sample. When bootstrapping, we used the study sample distribution of variable costs and outcomes to allow for the positive correlation between incremental costs and incremental effects. These ‘bootstrapped samples’ were assumed to approximate the population of interest. Using the bootstrapped information on pairs of incremental effectiveness and incremental cost we calculated 1000 ICERs, one for each of the newly drawn samples. We then determined the percentage of the bootstrapped ICERs that would be ‘acceptable’ or selected in a policy framework using successively larger willingness to pay (WTP) values for the outcome. We subsequently plotted the proportion of our 1000 bootstrapped samples that would be acceptable for each of the WTP values. These data produced the acceptability curve found in Fig. 1. Uncertainty is portrayed through the proportion of the samples that produced an outcome that would be acceptable to society for a given WTP value. Intuitively, as seen in Fig. 1, as the threshold value of an additional week of LDA increases, CM becomes increasingly more likely to be cost-effective, even though it adds incremental costs.

Because there is not a well agreed-upon value or societal willingness to pay for LDA (or any other outcome from substance abuse treatment), we selected a wide range of alternative societal WTP values. The threshold value could be determined through the political process, by surveying society’s willingness to pay or by assessing the resources saved to society through less crime, spread of disease, higher labor market productivity, etc. that would

accrue to reduced drug use. As a single threshold value has not been established, the acceptability curve plots the likelihood of acceptance across a range of alternative values. Policy-makers and other decision-makers can asses the value that they place on the outcome and determine the desirability of the new treatment.

Sensitivity analysis

Sensitivity analyses were conducted focusing on alternative costs and outcomes that might exist if the effectiveness trial had been implemented in 2006 on a larger, more realistic scale. Three scenarios were modeled that make different assumptions about (i) the testing frequency in the usual care group and associated treatment effects (i.e. the trial tested patients twice as often as is typical in usual care, and less frequent testing would result in lower costs and possibly worse treatment outcomes (due to reduced feedback) in the usual care group), (ii) the unit cost of administering the prize system (which might be lower due to economies of scale from a larger-scale implementation) and (iii) allocation of overhead (which might be lower inasmuch as not all elements of overhead vary proportionally with staff (e.g. clinic director, water for the lawn, etc.). In addition, in all scenarios we used the current price of the test cups, which is $4.80 (e.g. EZ Split Key 5-Panel Test Cup, Medical Disposables, Fort Lauderdale, FL, USA), instead of the older, higher price.

To determine the sensitivity of the ICERs to a wide range of underlying assumptions, scenario 1 made assumptions that were unfavorable to CM, scenario 2 made assumptions that were probably the most realistic and scenario 3 made assumptions that were favorable to CM. ICERs are presented for the three scenarios, and these ICERs are compared to the base case which corresponds to actual implementation of the trial. The specific assumptions made in each of the scenarios follow. In scenario 1, we assumed that (i) the usual care group is tested half as often as in the trial but retains 100% of their patient outcomes, (ii) full-scale implementation of CM has no effect on the unit cost of administering the prize system and (iii) the full overhead rate is applied to labor costs. In scenario 2, we assumed that (i) the usual care group is tested half as often but retains 100% of their patient outcomes, (ii) full-scale implementation of CM reduces the unit cost of administering the prize system by 50% and (iii) one-half of the overhead rate is applied to labor costs. In scenario 3, we assumed that (i) the usual care group is tested once per week and retained 85% of their patient outcomes, (ii) full-scale implementation of CM reduces the unit cost of administering the prize system by 75% and (iii) one-quarter of the overhead rate is applied to labor costs.

Columns 2–4 of Table 5 present the results of the sensitivity analysis. For example, the ICER for the patient outcome LDA ranged from a low of $115 in scenario 3 to a high of $183 in scenario 1, with the most realistic scenario ($156) the closest to the base case ($141). Similar qualitative relationships held for the ICER for an additional stimulant-negative urine sample.

DISCUSSION

We found that prize-based CM provided better patient outcomes than UC, but required additional costs. The key policy issue is whether the additional cost is worthwhile in terms of outcomes produced. Compared to UC, the incremental cost of using prize-based CM to increase the longest duration of continuous stimulant and alcohol abstinence by 1 week was $141, and the incremental cost of using prize-based CM to obtain an additional stimulant-negative urine sample was $70. Whether the extra expenditure is worthwhile depends upon the value placed on these outcomes. This is a key consideration—the ICERs can only be interpreted in the context of a threshold value. The sensitivity analyses also highlighted the need to know the threshold value of outcomes. Unfortunately, the literature has not produced

such values for the patient outcomes in this study nor for other direct outcomes from substance abuse treatment.

To provide policy-relevant data, we presented an acceptability curve for the LDA. The acceptability curve shows decision makers the likelihood that prize-based CM would be cost-effective for a large range of threshold values; it can be used in combination with the decision-makers' evaluation of the value of outcomes. The value would probably be based both on society's altruism towards drug users and society's benefit from the associated reductions in crime, spread of contagious diseases, reduced reliance on welfare, etc. [25,26]. Using only the benefit of averted crime, for example, we estimated a minimum threshold value. One study reported the per-offense cost of a robbery (involving force or the threat of force) and a theft (without force or the threat of force) at $48 095 and $1583, respectively [11]. Based on the acceptability curve in Fig. 1, if decision-makers believed that extending the LDA by 1 week would reduce the probability of a single robbery over time by at least 0.4% (i.e. 169 of 48 095) or of a single theft by at least 11% (i.e. 169 of 1583), then prize-based CM would be 90% likely to be cost-effective due to avoided costs of crime alone. Inasmuch as averted crime is only one of the many potential benefits of a reduction in substance abuse, this illustrative example provides a conservative estimate of the likelihood that CM would be considered cost-effective. The advantage of the acceptability curve is that it provides information on the likelihood that CM is cost-effective under alternative assumptions about the value of an additional unit of effect.

In a previous report, we conducted an ICEA of a companion CTN study of prize-based CM that was carried out in eight 'drug-free' (DF) psychosocial counseling clinics [11]. The incremental effect of prize-based CM on patient outcomes was similar between the two trials: 3.0 and 3.2 additional stimulant-negative urine samples in the DF and MM trials, respectively, due to CM. Similarly, the incremental gain in LDA due to prize-based CM was, on average, 1.7 weeks and 1.6 weeks in the DF and MM trials, respectively. However, it cost more to add prize-based CM in the DF trial than in the MM trial largely because the DF-CM group was more likely to abstain from drugs, and therefore won more prizes, than did those in the MM group ($213 versus $130, respectively). Given the similar incremental gains in outcomes, but the higher incremental cost of CM in the DF trial, the ICER for extending the LDA by 1 week was $258 and $141 in the DF and MM trials, respectively, and the ICER for obtaining an additional stimulant-negative urine sample was $146 and $70 in the DF and MM trials, respectively. Care must be used in comparing these ICERs. Holding all else constant, it may be more cost-effective to add CM in MM clinics than in DF clinics, but the populations are different and the value of a day abstinent may vary across the groups. Also, it may be that CM passes the threshold and is cost-effective in both settings.

The present study can also be compared to Sindelar *et al*.'s study [10], which conducted an ICEA of an effectiveness study comparing lower and higher potential prize payout CM arms to usual care in two out-patient clinics. The actual payout in the lower-cost prize arm was $36 and it was $68 for the higher payout arm. The ICEA study found that the lower prize payout arm was not cost-effective compared to the higher payout arm. The ICER calculated comparing the higher payout arm to UC showed that it cost $74 to extend the LDA by 1 week. The primary reason for the lower ICER in the earlier paper is that the higher payout arm of CM increased LDA by 2.4 weeks, which is greater than in the current case, and the prize payout was considerably lower.

The present study has several strengths. It was based on a multi-site clinical trial with diverse client and clinic traits, had a large sample size and relied on objective indicators of patient outcomes [9]. Additionally, we presented sensitivity analyses and an acceptability curve to aid decision-makers. The ICERs estimated in the present study can be used as

thresholds for future studies. Finally, the ability to compare to a similar ICEA study offered additional insight into the results.

There are also limitations. The ICERs may not generalize to populations using other types of drugs or to other clinic types. Although LDA is considered one of the preferred outcome indicators in evaluating treatment effectiveness, it is possible that the value of an incremental gain in LDA may vary across treatment populations and treatments. Another limitation is that the testing protocol in the effectiveness study was more frequent than typically occurred for usual care in most of the clinics and may have reduced differences between groups in both testing costs and patient outcomes. However, sensitivity analyses provided insights into this issue. Finally, without consensus threshold values for patient outcomes, the ICERs and acceptability curves are unable to provide a singular answer as to whether CM is a worthwhile addition to usual care. Nevertheless, policy makers can use the ICERs and acceptability curves in combination with their own assessment of the value of patient outcomes to guide decisions.

This study addressed the important question of whether prize-based CM was a cost-effective addition to UC in methadone maintenance programs. Because CM has been shown to be effective, cost-effectiveness analysis of CM interventions is critical because CM adds costs to UC. Empirical analyses are needed to help policy makers decide whether CM is worth the extra expense. This paper helps to build an empirical basis for these important decisions.

Acknowledgments

The authors gratefully acknowledge research support from the National Institute on Drug Abuse (grant numbers R01-DA14471, U10DA13034, R01-DA13444, R01-DA016855, R01-DA14618, R01-DA018883, K23DA015739, P50-DA09241 and P50-AA03510). We thank Maxine Stitzer Ph.D and the National Drug Abuse Treatment Clinical Trial Network for use of the MIEDAR clinical trial data.

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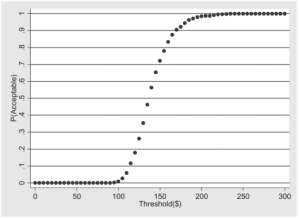

Figure 1.
Acceptability curve for longest duration abstinent (LDA)—base case

Table 1

Average and incremental patient outcomes.[†‡]

	CM (n = 195)	UC (n = 188)	CM – UC
Longest duration of abstinence (weeks)	2.8 (4.0)	1.2 (1.9)	1.6*
Number of stimulant-negative urines	8.7 (8.7)	5.5 (6.6)	3.2*

CM = prize-based contingency management; UC = usual care.

*P-value < 0.05.

†Values represent means and standard deviations (parentheses) and are based on a sample comprising 383 participants in the original trial (five of the 388 participants in the original trial were excluded in the present study due to missing data).

‡Information on effectiveness is calculated using data from the trial described in Peirce *et al*. [9].

Table 2

Average unit costs of resources at clinics (n = 383).*

	Unit cost ($/unit)
Counseling†	
Group	3.78 (0.71)
Individual	18.89 (4.23)
Testing‡	
Materials	11.79 (0.34)
Labor	5.71 (2.57)
Incentives	
Drawing§	1.75 (0.28)
Good job	0.00 (0.0)
Prize: small	1.00 (0.0)
Prize: large	20.00 (0.0)
Prize: jumbo	100.00 (0.0)
Restocking¶	3.46 (1.41)

*Values represent means and standard deviations (parentheses). Unit costs are averaged across all sites and weighted by sample size at each site. All labor includes fringe benefits and overhead.

†$ per participant per session. Includes session time plus administrative time (e.g. taking notes). Prorated by average number of session participants.

‡$ per test. Includes both alcohol and drug testing.

§$ per drawing session. Includes time to administer drawing.

¶$ per prize won. Includes time to inventory, shop and restock prizes (typically conducted weekly, prorated by number of prizes won).

Table 3

Average and incremental resources consumed per participant.[†]

	CM (n = 195)	UC (n = 188)	CM – UC
Counseling sessions			
Group	4.3 (7.2)	5.3 (8.8)	−1.0
Individual	4.3 (3.8)	4.9 (5.1)	−0.6
Tests	15.6 (6.6)	14.2 (6.3)	1.4*
Incentives			
Drawing sessions	8.2 (8.2)	0	8.2*
Good jobs	21.4 (29.1)	0	21.4*
Prizes-small	18.8 (25.5)	0	18.5*
Prizes-large	4.2 (6.4)	0	4.2*
Prizes-jumbo	0.19 (0.5)	0	0.19*

CM = prize-based contingency management; UC = usual care.

*P-value < 0.05.

†Values represent means and standard deviations (parentheses).

Table 4

Average and incremental variable cost per participant.[†]

	CM (n = 195) ($)	UC (n = 188) ($)	CM – UC ($)
Counseling			
Group	15 (23)	20 (36)	−5
Individual	81 (73)	93 (93)	−12
Subtotal	96 (77)	113 (116)	−17
Testing	275 (130)	253 (131)	22
Incentives			
Drawing	14 (15)	0	14*
Prizes[‡]	130 (185)	0	130*
Restocking	76 (115)	0	76*
Subtotal	220 (300)	0	220*
Total	591 (410)	366 (206)	225*

CM = prize-based contingency management; UC = usual care.

*P-value < 0.05.

[†]Values represent means and standard deviations (parentheses). Average variable costs were determined by first estimating the variable cost of each participant using that participant's resource utilization and clinic-specific unit costs, and then averaging across all participants in each condition.

[‡]Includes the single large prize awarded when participants in prize-based CM first achieved two consecutive weeks of abstinence from primary target drugs (i.e. cocaine, amphetamine, methamphetamine, alcohol). Approximately one-third (n = 72) of the participants in prize-based CM qualified for this prize.

Table 5

Incremental cost-effectiveness ratios—base case and sensitivity analyses.

	Base case * ($)	Scenario 1 † ($)	Scenario 2 ‡ ($)	Scenario 3 § ($)
Cost of extending LDA by 1 week	141 (105–193)	183	156	115
Cost of an additional negative urine	70 (53–117)	92	78	51

LDA = longest duration abstinent during study.

*Base case corresponds to actual implementation of the original trial. 95% confidence intervals in parentheses.

†Unfavorable scenario assumes (1) $4.80 test cups (the unit cost of test cups averaged $11.57 in the trial), (2) usual care group gets tested half as often (0.75 times per week) but retains 100% of their patient outcomes, (3) full-scale implementation has no effect on the unit cost of administering the prize system and (4) full overhead rate is applied to labor costs.

‡Realistic scenario assumes (1) $4.80 test cups, (2) usual care group gets tested half as often (0.75 times per week) but retains 100% of their patient outcomes, (3) full-scale implementation reduces the unit cost of administering the prize system by 50% and (4) one-half (50%) of the overhead rate is applied to labor costs.

§Favorable scenario assumes (1) $4.80 test cups, (2) usual care group gets tested once per week and retains 85% of their patient outcomes, (3) full-scale implementation reduces the unit cost of administering the prize system by 75% and (4) one-quarter (25%) of the overhead rate is applied to labor costs.