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Use of Vouchers to Reinforce Abstinence and Positive Behaviors among Clients in a Drug Court Treatment Program

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Abstract

In response to growing numbers of drug offenders cycling in and out of the criminal justice system without treatment for underlying drug problems, the judicial system has increasingly adopted drug courts as a strategy to divert these offenders from incarceration to supervised drug treatment. Our aim was to determine if drug court treatment effectiveness could be improved using contingency management, in the form of twice-weekly vouchers, to reinforce abstinence and positive behaviors for 163 clients over 26 weeks. We found no significant differences in outcomes among the study groups, although the Treatment Plan Group that received reinforcement for positive behaviors showed a trend toward poorer performance. We suspect that the influence of the judge within the courtroom had a stronger impact on drug court clients' attitudes, drug use behaviors and other outcomes than the relatively low-value vouchers awarded as part of the treatment protocol.

Keywords

drug court treatment; contingency management; voucher-based reinforcement therapy; experimental design

1. Introduction

1.1 Drug Courts

Drug courts arose within the context of the multiple efforts at all government levels—federal, state, and local—to carry out a “war on drugs” in the 1980s. Fed in large part by an expanding crack cocaine epidemic and the public’s perception that illicit drug use represented the nation’s most formidable criminal justice problem, all levels of government, as well as the private sector, began pursuing a zero-tolerance drug policy against any form of illicit drug use. In addition,

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federal and state legislatures passed laws that substantially reduced the ability of judges to exercise discretion when sentencing defendants convicted of drug-related offenses (Inciardi, McBride, & Rivers, 1996). These circumstances placed a heavy burden on state and federal courts by subjecting more individuals to arrest and prosecution and on federal and state correctional systems by increasing prison and jail populations beyond capacity—conditions that continue to exist today. According to the Bureau of Justice Statistics (BJS), in 2002, 68% of jail inmates met substance abuse or dependence criteria (BJS, 2005a). The number of adults arrested for drug abuse violations increased steadily over the past two decades, from 708,400 in 1984 to 1,745,712 in 2004, an increase of 246% (BJS, 2005b).

Beginning about 1990, drug courts became an increasingly popular response by the judicial system to deal with this growing number of offenders with drug abuse problems who cycled in and out of the criminal justice system and who frequently received little or no treatment for their drug problems. Although there were previous diversion programs for drug-abusing offenders (e.g., Treatment Alternatives to Street Crime, expedited processing of drug offenders), drug courts introduced a new model for dealing with this population. This model includes early identification and referral of drug-involved defendants to community-based treatment following arrest or conviction, a specialized court docket, close integration of judicial supervision and treatment, a nonadversarial approach, frequent monitoring by the judge for compliance with treatment, use of graduated sanctions and rewards, and frequent drug testing (see Huddleston, Freeman-Wilson, Marlowe, & Roussell, 2005 for a description of the current status of drug courts nationwide).

Although most research on drug courts has suffered from weak evaluation designs, some consistent findings have emerged from the data that have been reported (Belenko, 2001; Government Accountability Office [GAO], 2005). Most consistent is the finding that drug courts are better able to closely supervise drug offenders in the community than other forms of community-based supervision, such as probation or TASC (Belenko, 2001). In addition, a recent report summarizing drug court evaluations from the Government Accountability Office (2005) indicated that drug courts show consistent reductions in recidivism, but that results for other outcomes, particularly drug use, are mixed.

While the judge is likely a central feature in the effectiveness of the drug court model (Marlowe, Festinger, & Lee, 2004), the treatment provided to drug court clients is also important. The treatment programs associated with drug courts vary widely in their approach and quality, but most of them are outpatient drug-free programs that use some combination of psychosocial treatment, drug testing, self-help groups, and group and individual counseling. The effectiveness of such programs might be enhanced by incorporating a structured protocol with a strong evidence base, such as contingency management.

1.2 Contingency Management

Contingency management (CM) interventions are based on a robust theoretical and empirical body of literature that supports the position that drug use is a form of operant behavior in which drugs have reinforcing effects that are not adequately controlled by the potential reinforcing effects of other activities (e.g., Bigelow & Silverman, 1999; Higgins, 1997). As such, the likelihood of using drugs, and of continuing to use drugs, is influenced by the environmental context in which drug use occurs. Specifically, the availability of alternative (non-drug) reinforcers should decrease drug use if they are available at sufficient magnitude and if they are delivered according to a schedule that helps maintain continuous abstinence (Carroll, Lac, & Nygaard, 1989; Higgins, Bickel, & Hughes, 1994; Higgins, et al., 1999; Nader & Woolverton, 1991). Several literature reviews and meta-analyses have found CM to be a highly effective treatment for drug abuse disorders, particularly in its ability to establish and maintain continuous abstinence during treatment (Higgins & Silverman, 1999; Lussier, Heil, Mongeon,

Badger, & Higgins, 2006; Prendergast, Podus, Finney, Greenwell, & Roll, 2006; Silverman, 2004). The reinforcers commonly used in CM studies include cash, methadone take homes, methadone dosage increases, vouchers, and increased privileges (Prendergast, et al., 2006).

Voucher-Based Reinforcement Therapy (VBRT) is a procedure in which clients receive “vouchers” for the provision of biological samples (urine or breath) that indicate no recent drug use or for the performance of other behaviors (Higgins, Alessi, & Dantona, 2002; Higgins, Budney, Bickel, Hughes, Foerg & Badger, 1993; Higgins, Budney, Bickel, Foerg, Donham & Badger, 1994; Lussier, et al., 2006). The vouchers are withheld when the biological sample indicates recent drug use. Once earned, clients can exchange vouchers for goods or services that are compatible with the development of a drug-free lifestyle. In a recent meta-analysis, Lussier and colleagues found that the use of VBRT to target abstinence from drug use is effective with a variety of primary drugs and with an average effect size (r) of .32 (Lussier, et al., 2006).

One concern about the broader application of VBRT in non-research settings is whether abstinence from illicit drug use continues once the reinforcement procedures are discontinued. In real world settings, the use of CM to promote abstinence would be in effect for a finite period of time. Once the contingencies are removed, will drug use resume? Research has indicated that there is reason for concern about the durability of abstinence achieved through contingent reinforcement. For example, several studies have found that when reinforcement for abstinence from drug use was discontinued, there was a return to drug use, although not necessarily to baseline levels (Schumacher et al., 2002; Silverman et al., 1996; Stitzer, Bigelow, & Leibson, 1980; Stitzer, Bigelow, Leibson, & Hawthorne, 1982).¹

To address this concern, several investigators have changed the basic “vouchers-for-drug-free-urines” paradigm to a procedure in which contingencies are applied to the development of new, prosocial alternative behaviors that are (in principle) incompatible with illicit drug use. An extensive body of experimental research demonstrates that reinforcing an alternative, competing behavior can be a powerful strategy in reducing the frequency of a target behavior (Leitenberg, Rawson, & Bath, 1970; Rawson & Leitenberg, 1973; Petry, Tedford, & Martin, 2001)). One method for systematically implementing this strategy with illicit drug users is to specify behaviors that are incompatible with illicit drug use (e.g., family activities, new hobbies, employment) and to use CM procedures to increase the frequency of these “competing” behaviors. The rationale is that the reinforcement of prosocial, nondrug-related behaviors is necessary to initiate new behaviors and that the naturally occurring reinforcing consequences of these behaviors will help to sustain abstinence when the CM procedure is discontinued.

The use of CM procedures to increase the frequency of competing behaviors to cocaine use was evaluated within a methadone maintenance program (Iguchi, Belding, Morral, Lamb, & Husband, 1997), where receipt of vouchers was contingent upon the completion of behavioral assignments as outlined in a mutually agreed upon treatment plan. These treatment plan activities consisted of achievable, incremental behavioral tasks that were incompatible with continued illicit drug use (e.g., employment interview, attending a parenting class, attending school, joining an exercise group). Successful completion of a treatment plan activity as documented by confirmatory evidence (e.g., attendance slip signed by a teacher) resulted in delivery of the voucher. This voucher-for-treatment-plan-activity procedure was compared with a voucher-for-drug-free-urine-sample procedure. The study results indicated that reinforcement of treatment plan activities produced a modest reduction in illicit drug use. This

¹It should be noted, however, that other treatment approaches also suffer from this diminution of the during-treatment effect once the client leaves treatment.

reduction in positive urine samples was significantly superior to the no-voucher and to the drug-contingent-voucher group. In addition, the treatment plan condition produced a sustained reduction in illicit drug use following discontinuation of the CM procedure, whereas drug-contingent vouchers did not. Additional evidence of sustained treatment benefits from treatment plan contingencies is reported in Morral, Iguchi, and Belding (1999).

CM researchers have encouraged the integration of CM procedures into real world treatment programs, including programs designed for individuals involved in the criminal justice system. In a manual published by the National Institute on Drug Abuse (Budney & Higgins, 1998), the authors suggested the use of CM with a wide range of illicit drug user populations, including offenders, as part of a community reinforcement approach. Similarly, in a review of the applications of CM procedures, Crowley (1999) encouraged the use of CM with criminal justice populations. Despite these recommendations, there is limited information to evaluate the effectiveness of CM with the substance-abusing offender population.

The aim of this study was to determine the effectiveness of the use of vouchers to reinforce abstinence and positive behaviors among clients participating in a drug court treatment program. The study was a partial replication of the study by Iguchi and colleagues (1997), but with three main differences. The present study (1) took place in a drug-free outpatient program (rather than in a methadone program) with (2) clients who were participating in a drug court and whose (3) primary drug of choice was mainly methamphetamine (rather than heroin). It should be noted that this study was not a direct evaluation of the effectiveness of drug court procedures, but rather an evaluation of a specific approach (i.e., contingency management) designed to enhance the outcomes of clients participating in a drug court treatment program.

2. Materials and Methods

2.1 Study Setting: Rancho Cucamonga Drug Court Treatment Program

The study took place among drug court clients in the Rancho Cucamonga Drug Court in San Bernardino County, California. Defendants are eligible to be accepted into the drug court program if they are at least eighteen years old, have a history of drug use, have had no more than three prior non-violent, non-drug felony convictions, and do not have a concurrent charge of driving under the influence of alcohol or drugs, possession for sale, and/or transportation of drugs. To be admitted to the drug court program, defendants enter a guilty plea to the charge, which is withdrawn if they successfully complete treatment. Drug court participants pay \$10 per week toward their treatment (\$520 if they complete the full year of treatment). Monitoring of participants' performance in treatment occurs at a weekly case conference that includes the drug court judge and representatives from the superior court, the district attorney's office, the public defender's office, the probation department, the sheriff's department, and the treatment program.

During the different treatment phases (see below), participants appear before the drug court judge either weekly, bi-weekly, every three weeks, or monthly, depending on the phase of treatment that they are in. The judge reviews their progress, sentences those with positive drug tests to a weekend in jail, imposes community service for other program lapses, hands out certificates for those moving from one treatment phase to the next, and generally provides encouragement for good performance and warnings for poor performance. All drug court clients are referred to a treatment program that uses a cognitive-behavioral treatment protocol developed by the Matrix Institute on Addictions (Obert, McCann, Marinelli-Casey, Weiner, Minsky, Brethen, & Rawson, 2000). Treatment for drug court clients is designed to last for 52 weeks and is delivered in four phases, plus an additional six months in an aftercare phase. For clients who comply with program requirements and demonstrate satisfactory progress, program intensity decreases over the phases. By contrast, for individuals who exhibit unsatisfactory

progress as defined by positive drug tests or poor attendance, the judge may require continued stay at a particular phase or may move the client back to a more intensive phase. For more serious cases, the judge may order the client to participate in jail or residential treatment for up to a month. The four phases of the Matrix treatment program in place at the time of the study are described below.

Phase I of treatment consists of attendance at the program five days per week for 13 consecutive weeks. During this phase, the client participates in individual counseling sessions and treatment groups. Participants also receive HIV education and referrals. Each participant is required to attend three recovery meetings per week of Alcoholics Anonymous, Narcotics Anonymous, or other self-help group outside of program hours. Participants are randomly tested twice a week for illicit drugs and alcohol. Participants appear in court once a week. In Phase II, participants reduce their treatment program attendance to three days per week for 13 weeks. Court appearances, drug testing, and recovery meeting attendance continue as before. During Phase III, required attendance drops to two times per week for 13 weeks. Recovery meeting attendance continues as before, but drug testing drops to twice per month on randomly selected days. Participants are strongly encouraged to find a job during this phase. Court appearances are reduced to every two weeks. During Phase IV, required attendance drops to one day per week for 13 weeks. Required attendance at recovery meetings remains at three per week. Random drug testing is conducted once a month. With the exception of those caring for children full-time, participants are required to be employed or in school before graduation. Participants appear in court every third week. Drug Court treatment participants who complete Phase IV attend a graduation ceremony, at which time the judge, treatment counselors, and family and friends recognize their successful completion of the program. Upon graduation, they are formally discharged from the treatment program and from drug court supervision, the criminal charges related to their entrance to drug court are dismissed, and they voluntarily attend aftercare.

2.2 Subjects

A total of 163 subjects were enrolled into the study between April 19, 2000 and June 19, 2003. Two were excluded from analysis because they withdrew from the study, and three were excluded because their baseline interview was incomplete, leaving 158 subjects in the analysis. Of these, 122 (77%) were able to be reached for the 6-month end-of-treatment follow-up interview. (See Figure 1 for flow of clients through the study.) Subjects were predominately white male methamphetamine users, who had never been married, and had a mean age of 32. Subjects reported an average of 10 arrests at baseline. (See Table 1 for more details of subject baseline characteristics.)

2.3 Study Design

All defendants who were accepted into drug court and who were admitted to the Matrix treatment program were eligible to participate in the study. Eligibility criteria for entrance into the study were the same as those for admission to drug court treatment, as indicated above. Subjects participated in the voucher intervention over six months, that is, during Phases I and II, the most intensive phases of the drug court treatment program. The UCLA Institutional Review Board and the Friends Research Institute Institutional Review Board approved the procedures and the informed consent form for the study. Research staff described the study to treatment clients, obtained their consent to participate, conducted a baseline interview, and then randomly assigned them to one of the four groups:

Standard Treatment Group. All participants in the study received the standard treatment offered in the Matrix drug court program, as described above. Participants

assigned to the Standard Treatment Group received standard treatment and no additional services or intervention.

In the other three groups, clients received vouchers for demonstrating certain behaviors. In all groups, each voucher was worth \$10.00. Clients redeemed vouchers for goods or services that were consistent with recovery and had the choice of receiving the monetary value of their vouchers as gift cards (e.g., grocery, gasoline, discount store, movie tickets), applied to their drug court fees, or applied to special requests (e.g., lawnmower repair, purchase of pet). Clients could save up vouchers to get larger gift card amounts. Once a request for a voucher exchange was made, research staff would supply the gift card or other item in approximately one working day. (For more information on voucher exchange procedures and categories of items for which vouchers were exchanged, see Roll et al., 2005).

Drug Testing Group. Participants in the Drug Testing Group received a voucher for each urine specimen that tested negative for unauthorized drugs (opiates, cocaine, methamphetamine, benzodiazepines, marijuana, and alcohol via breathalyzer test) at the next testing session. Each participant was randomly tested twice each week during the intervention, for a maximum total of \$20 per week.

Treatment Plan Group. Participants in the Treatment Plan Group could receive up to two vouchers each week (maximum total of \$20 per week) for completing treatment plan tasks that were clearly defined and verifiable. Clients were required to verify their treatment plan activities through receipts, appointment slips, ticket stubs, photocopies of job applications, timesheets from work, church bulletins, and other similar paper documentation. When necessary, research staff made phone calls to verify activities.

Combined Group. Participants in the Combined Group could earn vouchers for submitting negative drug specimens (two per week) and for completing two specific treatment plan tasks per week (maximum total of \$40 per week). Both target behaviors—abstinence and treatment plan tasks—were reinforced through vouchers, but the two behaviors were reinforced independently. That is, Combined Group participants could earn vouchers for completing treatment plan tasks even if they tested positive; similarly, vouchers for negative drug tests could be earned despite failure to complete a treatment plan task.

The drug court judge was blind to the group assignment status of clients. Although there is a chance the judge may have become aware of a client's study group during court sessions, it is unlikely, however, because project staff attended nearly all of the weekly drug court sessions and did not report this protocol violation. Likewise, treatment program staff were not informed of clients' group status.

The maximum amount that drug court clients could earn in vouchers over the course of the study was determined by their assigned group. The Standard Treatment Group received no vouchers (\$0); the Drug Testing Group could earn up to \$520 (\$20/week for 26 weeks); the Treatment Plan Group could earn up to \$520, and the Combined Group could earn up to \$1,040 (\$40/week for 26 weeks). The vouchers were available to clients only over the 26 calendar weeks of the intervention.

2.4 Measures

The baseline and follow-up assessments included questions on demographic characteristics, physical health, mental health, criminal history, drug use history, and quality of life, in addition to measures of addiction and psychological functioning: the Addiction Severity Index and the Brief Symptom Inventory.

Addiction Severity Index (ASI). The ASI is a structured interview instrument that is widely used for clinical and research purposes to determine problem severity and service needs in seven domains of functioning: alcohol problems, drug problems, employment/education, family/social, legal, medical, and psychological. The index has excellent inter-rater and test-retest reliability as well as discriminant and concurrent validity (McLellan et al., 1992).

Brief Symptom Inventory (BSI). The BSI (Derogatis & Melisaratos, 1983) is a 53-item questionnaire that measures nine psychological symptom dimensions: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. The scores can be combined to form a Global Severity Index. Internal consistency estimates (Cronbach's alpha) are .71 to .85, and test-retest reliability is .68 to .91 across the dimensions.

Drug Testing. Urine tests were conducted twice a week during the 26-week intervention to detect opiates, cocaine, methamphetamine, benzodiazepines, and marijuana. Breathalyzer tests to detect alcohol use were conducted at the same times as the urine tests.

Research data also included results from on-site urinalysis and breathalyzer tests collected at each assessment point, treatment attendance from program records, and arrest data from client self-report.

Subjects were assessed at baseline, 6, and 18 months after study entry. The analyses reported in this paper are based on data collected at baseline and 6 months. In addition, drug testing and voucher data were collected weekly for 26 weeks starting at baseline. Baseline interviews took place at the Matrix treatment program. Follow-up interviews were conducted at the treatment program, in the community, and in local jails and state prisons. Study participants were not reimbursed for the baseline interview. They received \$20 for the 6-month (end of intervention) interview. Participants received an additional \$5 if they voluntarily provided a urine specimen. Interview payments were provided in the form of gift cards redeemable at local merchants. With the exception of five clients noted in Figure 1, attempts were made to contact for follow-up all clients randomized into the study.

2.5 Statistical Analyses

The current analysis includes data from baseline through the 6-month follow up period. To determine the extent to which randomization resulted in equivalence across study groups, we compared the four groups on the following background variables assessed at baseline: age, gender, race/ethnicity, educational level, marital status, employment, living situation, primary drug, first year of illicit drug use, years of primary drug use, drug injection, Brief Symptom Inventory global score, prior arrests, and prior incarceration. A similar analysis compared those who were interviewed at follow-up and those who were not. The analyses follow the intent-to-treat principle. All clients randomized into the study and for whom follow-up data are available, with the exception of those noted in Figure 1, are included in the analyses.

Descriptive information on the voucher intervention includes the average amount of voucher earnings and the frequencies of different types of treatment plan activities across groups.

The independent variable of interest was treatment condition, as defined above. The dependent variables included treatment participation, drug use, ASI, and BSI scores. Specifically, treatment participation was defined by two measures: the percentage of participants who completed the voucher intervention and the average number of weeks spent in treatment (i.e., up to 26 weeks). From drug and alcohol test results, several drug use outcomes measured over the course of treatment were examined: the mean number of negative tests, the mean number

of tests to the first positive test (for clients who were negative at baseline), the mean longest number of consecutive negative tests, the percentage of clients with a negative test (for all drugs), and the percentage of missing tests. During-treatment changes in functioning from baseline to the six-month assessment were determined by subtracting the 6-month ASI composite scores and the BSI Global Severity score from the baseline scores.

Continuous variables were compared using ANOVA; categorical variables were compared using chi-square using SAS version 9.1. For the variables “weeks in program” and “weeks to first drug use,” we performed survival analyses using the Kaplan-Meier method (Kaplan & Meier, 1958). This method does not require a normal distribution (the time to the occurrence of an event is usually not normally distributed), and it allows the inclusion of censored cases (i.e., those clients who did not drop out of the treatment program or who did not use drugs during treatment). The data were censored at 26 weeks. In addition, in order to account for those who tested positive during the first week of the intervention but then became abstinent, the analysis for weeks to first drug use started at the beginning of the second week of the intervention. The Kaplan-Meier method creates a survival curve for each group and tests whether the curves are significantly different from one another using the log-rank statistic. Survival analyses were performed using SPSS, version 13. All comparisons were tested at the $p \leq .05$ level of significance.

For weekly percentage of clients testing negative for drugs/alcohol, Generalized Estimating Equations (GEE) analysis was performed using SAS 9.1 to assess if the percentage of clients testing negative each week differs across the four treatment groups. GEE models are generalized linear models for correlated data, such as repeated observations over time, and can handle categorical or count data.

For drug use outcome measures, missing drug tests (either due to refusal or to a missed session) were coded as positive (the most conservative approach). For the Kaplan-Meier survival analysis, missing tests that were preceded and followed by clean tests were counted as clean. This was done so that one missed test would not result in a subject being dropped prematurely from the analysis. For the GEE (analysis of weekly percentage of clients testing negative for drug/alcohol, weeks with two negative or one negative and one missing test were considered as negative for that week. Similar imputation procedures have been employed in other CM studies (Petty et al. 2005).

3. Results

3.1 Baseline and Follow-up Characteristics

Table 1 shows selected background characteristics of the study participants in each of the four groups. The randomization procedure resulted in similarity in background characteristics across the four study groups, with none of the differences on the selected variables being statistically significant. Participants were in their early thirties and were primarily white and Latino. The percentage of women ranged from 29% to 40% across groups. About half of the participants had never been married. The average client had not completed high school. Few had been working in the past 30 days. Most were living with parents, relatives, or friends. Methamphetamine was the primary drug for the large majority of clients. Illicit drug use typically began about age 12. Recent injection drug use was low, probably because methamphetamine is usually smoked. Clients' mean Brief Symptom Inventory scores are elevated compared to non-patient norms (e.g., Global Severity Index means are approximately double the reported non-patient norms) but are not as high as those of psychiatric outpatients (Derogatis & Spencer, 1982). Most clients had been arrested between 10 and 12 times, and mean months incarcerated ranged between 19 and 29.

For the six-month follow-up assessment, study participants who were interviewed at six months were compared with those who were not interviewed on the characteristics shown in Table 1. None of the differences on these characteristics was significant.

3.2 Voucher Earnings

The Standard Treatment Group, by design, received no vouchers (\$0); the Drug Testing Group earned a mean of \$383 (SD \$162; 71% of total possible earnings); the Treatment Plan Group earned a mean of \$199 (SD \$145; 37% of total possible earnings); and the Combined Group earned a mean of \$572 (SD \$290; 53% of total possible earnings). Clients in the Combined Group earned a higher amount than those the other groups since they could earn vouchers for testing negative or completing treatment plan tasks, or both.

3.3 Treatment Plan Behaviors

As seen in Figure 2, the most common activities that Treatment Plan and Combined Group members undertook were related to employment (e.g., putting together a resume, submitting job applications, getting job-related documentation) and family (e.g., taking children on outings, taking spouse to a sober event, helping elderly or disabled family members).

3.4 Treatment Retention

As seen in Table 2, a high percentage of subjects in each of the four study groups completed the intervention (60%–76%). Subjects in the three voucher groups were more likely to complete treatment than were those in the Standard Treatment Group, although the differences were not statistically different. Retention in the four groups (measured as mean weeks in the intervention) was also high (20–22.5 weeks out of 26), but again differences across the groups were not significant. Figure 3 shows the Kaplan-Meier survival curves for program retention by group, showing high levels of completion overall, but no significant differences between the curves ($N = 157, \chi^2 = 4.95, df = 3, p = 0.18$).

3.5 During-Treatment Changes in Drug Use

Table 3 presents analyses of drug/alcohol tests. In most cases, differences among the study groups were nonsignificant. However, the number of tests to the first positive test (for those negative at baseline) approached significance ($p = .08$), with the Drug Testing Group achieving an average of 20 tests (10 weeks) to their first positive test, in contrast to the Treatment Plan Group that achieved an average of 11 tests (5 ½ weeks) to first positive. Of the three voucher groups, the Treatment Plan Group showed a trend toward poorer performance in maintaining sobriety.

Figure 4 shows the Kaplan-Meier survival curves for time to first use by study groups beginning at week 2 of testing. The survival curves for the study groups were not significantly different ($N = 157, \chi^2 = 3.17, df = 3, p = 0.37$). Figure 5 shows the weekly percentage of clients testing negative for drugs/alcohol. The GEE analysis of clients testing negative each week indicates no difference among the different treatment groups over time ($\chi^2 = 1.44, df = 3, p = 0.70$). However, the percentage of clients testing negative each week changed over time, showing there was a strong time effect ($\chi^2 = 34.43, df = 1, p < .0001$). A separate GEE analysis of negative tests each week for the Standard Treatment Group compared to the three other groups combined did not show an overall effect for vouchers ($\chi^2 = 0.05, df = 1, p = 0.82$).

3.6 During-Treatment Changes in Psychosocial Functioning

Several measures were used to assess change in client functioning from baseline to six months: mean change in the ASI composite scores and mean change in the Global Severity Index of the Brief Symptom Inventory (BSI). On average, clients in all four groups showed

improvements over time on measures of psychosocial functioning. With two exceptions, none of the differences among the study groups on these during-treatment outcomes was significant. The two exceptions were the ASI Legal and the ASI Psychological change scores. In both cases, the Treatment Plan Group performed more poorly than did the other three groups (Table 4).

5. Discussion

Unlike nearly all other studies of CM to treat substance abuse problems (Higgins & Silverman, 1999; Lussier, Heil, Mongeon, Badger, & Higgins, 2006; Prendergast, Podus, Finney, Greenwell, & Roll, 2006), this study with clients in drug court treatment found that voucher reinforcement of negative urines and of treatment plan tasks had no statistically significant effect on during-treatment measures of treatment retention, drug use, or psychosocial functioning relative to the standard drug court treatment protocol. To our knowledge, this is the first study that tested the effectiveness of CM with substance-abuse treatment clients within the context of an adult drug court (for a study of CM within a juvenile drug court, see Henggeler et al., 2006). Observational data and previous research indicate that the judge is a key element in the drug court model and has a strong effect on treatment outcomes (Marlowe, Festinger, & Lee, 2004; National Institute of Justice, 2006; Satel, 1998). Two particularly important elements of the drug court model are the periodic status hearings before the judge that clients must attend and the rewards and sanctions that the judge imposes for positive and negative behaviors. In this study, it may be that the influence of the judge within the courtroom on the attitudes and behavior of drug court clients had a stronger impact on drug use and other outcomes than did the relatively low-value vouchers awarded as part of the treatment protocol used in this study. The possibility that the effects of the drug court model might override the effects of other (usually) effective treatment approaches is suggested by findings from a multi-site outcome study of the Matrix Model for stimulant treatment (which uses a cognitive-behavioral approach) (Rawson, et al. 2004). In the site where the Matrix Model was implemented within a drug court treatment program, unlike in all the other sites, the model did not increase the mean number of methamphetamine-free urine samples over treatment as usual. More to the point, of all eight study sites, the drug court site had the highest mean number of urine negative samples (in both conditions), suggesting that the effect was mainly due to the influence of the judge or to other elements of the drug court model.

While the rewards and sanctions that the judge imposes for successful performance and for non-compliance are specific to each drug court, most descriptions of “model” drug court programs include the use of rewards (or incentives) and sanctions (usually a brief stay in jail) as a means for the drug court judge to motivate participants to continue participating in treatment, comply with program requirements, and remain drug free (Tauber, 1994; Drug Courts Program Office, 1997; Center for Substance Abuse Treatment, 1997; Sherin & Mahoney, 1996). Most drug court programs report that they use a series of “progressive sanctions” that serve as punishment for relapse or non-compliance and that these sanctions communicate to defendants the seriousness with which the court takes their negative behavior. At the same time, drug courts also use various types of rewards to recognize completion of treatment phases or other accomplishments; these usually consist of verbal praise (before other drug court participants), certificates, and other small incentives. A limitation of this study is that data were not collected on drug court sanctions and incentives. While rewards and sanctions are integral to the drug court model, judges do not necessarily use them in accord with recommended guidelines for the use of reinforcers and sanctions (Marlowe & Kirby, 1999; Petry, 2000). It may be that, rather than having research staff award vouchers, as was done in this study, the optimal use of CM procedures for drug court clients would be to involve the judge, with the cooperation of the treatment staff, in directly setting behaviors with clients and awarding vouchers in accord with CM guidelines.

An additional potential reason for the null results obtained in this study may be the schedule and nature of the reinforcements. Lussier et al. (2006) found that studies with delayed reinforcement schedules had a smaller effect size than those with immediate reinforcement. In our study, clients receiving reinforcement for drug testing had to wait for the next session (2–4 days) to receive a voucher, possibly resulting in a reduced effect size. Also, many study participants requested that research staff use their earned vouchers to pay their fees (\$15 per week) directly to the court. This request was no different from that by some clients that the vouchers be used to pay for phone bills or other financial obligations. Although court fees were important to clients and the vouchers did provide them with direct benefit, the fact that clients did not tangibly receive the voucher may have attenuated the reinforcing effect of the vouchers.

Another possible explanation for the lack of treatment effect is the nature of the flat reinforcement schedule. Each negative urine sample and each completed treatment plan activity was reinforced with a voucher worth \$10. This flat reinforcement schedule is relatively weak compared with other types of voucher-based reinforcement therapy. In particular, recent research has shown success with CM using escalating rewards for continuous drug abstinence. Research has demonstrated that schedules that include an escalation in reinforcer magnitude for consecutive instances of abstinence, when combined with a reset contingency for use, promote more in-treatment abstinence (Roll et al., 1996; Roll & Higgins, 2000; Roll & Shoptaw, 2006).

It should also be noted that it was apparently easier for clients in the Drug Testing Group to earn vouchers than those in the Treatment Plan Group, earning 71% as opposed to 37% of total possible earnings. Although it might have been slightly less convenient for clients to engage in and document treatment plan activities, Iguchi (Iguchi et al., 1997) found in his study that the treatment plan condition produced a reduction in illicit drug use that was sustained following discontinuation of the CM procedure. We plan to investigate in future analyses whether the Treatment Plan Group in this study had similar long-term outcomes.

Finally, the lack of a significant effect among the study groups may have resulted from the selection process of the drug court, producing a relatively more homogeneous and higher functioning population than is typically found in CM studies that have shown positive results. This is unlikely, however, given that there were relatively few restrictions for admission to drug court treatment (and therefore to the study) and given that the participants had extensive criminal background (see Table 1), the sample was at least as varied and if anything less functional than samples in other CM studies.

The above discussion offers several possible explanations of why this study did not find a significant effect for the use of a contingency management protocol with clients participating in a drug court treatment program. Findings should also be considered in light of a number of other limitations of the study design and implementation. First, generalizability may be limited by the characteristics of the study population, primarily male white and Latino methamphetamine users.

Reliance on self-report for arrest may result in under-reporting. Previous studies, however, have found that offenders often report more arrests than are recorded in criminal justice files (Lagenbucher & Merrill, 2001). In addition, there is no reason to believe that there was differential under (or over) reporting by subjects across the study groups.

The number of subjects available for analysis in the study (25–33 in each of four groups) is typical for studies of contingency management (Lussier et al., 2006; Prendergast, Podus, Finney, Greenwell, & Roll, 2006). With a larger sample, we might have been able to detect significant differences between groups on at least some of the outcomes variables. But in some

cases (e.g., mean number of weeks in intervention in Table 2, mean number of negative tests in Table 3), the differences, even if statistically significant, may not have clinical significance.

Treatment program staff, although not informed of clients' group status, may have found out for particular clients over the course of the study due to their extensive contact with the clients. It is unclear how this knowledge might have affected their interactions with clients.

In this particular drug court treatment program, the voucher intervention was in effect only during the first six months of a 12-month program so that the timing of voucher delivery would match the more intensive phases of treatment attendance. In addition, the outcomes reported here are those measured during the first six months of treatment. It is possible, though not likely, that the effects of voucher-based reinforcement may not have become evident until later in the course of treatment or even after the end of treatment. Other studies of this contingency management approach indicate that the impact on behavior, particularly abstinence, is readily detected during treatment, while the vouchers are available to clients (Higgins & Silverman, 1999). Lagged effects of CM are seldom, if ever, seen in the CM literature related to substance abuse treatment.

In conclusion, the use of vouchers (using a flat reinforcement schedule) to promote abstinence and prosocial behaviors within a drug court treatment program was not shown to have a statistically significant impact on drug use or psychosocial outcomes, even though this approach has been found to be effective in other treatment settings. It is likely that the influence of the judge and his ability to impose sanctions on negative behavior (mainly short jail stays for positive urines) overwhelmed the effect of positive reinforcement. Further research on the use of CM procedures in drug court settings needs to be conducted, particularly studies in which the judge is directly involved in distributing vouchers or other rewards for treatment compliance and other positive behaviors. As difficult as they may be to plan and execute, more experimental studies on drug court treatment using CM procedures are needed.

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Figure 1.
Flow diagram of study intake and 6-month follow-up process

Figure 2.
Categories of Treatment Plan Activities

Figure 3.
Survival Analysis: Weeks to Treatment Drop Out for Four Treatment Groups

Figure 4.

Survival Analysis: Time to First Drug Use for Four Treatment Groups 1, 2

¹ Time to first use is calculated beginning at week 2 of testing

² Single missing tests that were preceded and followed by clean tests were counted as clean

Figure 5.
Weekly Percentage of Clients Testing Negative over 26 Weeks

Table 1
Background Variables of Drug Court Treatment Clients in Four Study Groups

Variable	Study Group			* p
	Standard n=37	Drug Testing n=43	Treatment Plan n=38	Combined n=40
Gender, % women	36.1	29.3	40.5	30.8
Ethnicity, %				
White	48.7	61.9	52.6	67.5
Hispanic	43.2	28.6	31.6	25.0
African American	5.4	7.1	7.9	5.0
Other	2.7	2.4	7.9	2.5
Marital status, % never married	48.7	52.4	50.0	55.0
Injection of drugs in past 30 days, % Yes	10.5	2.4	2.6	5.0
Living situation, % with parents, relatives, or friends	60.5	78.6	69.2	70.0
Primary drug, % methamphetamine	81.6	66.7	82.1	85.0
Age, mean years (SD)	32.2 (7.4)	31.2 (7.2)	33.5 (7.7)	31.4 (8.2)
Education, mean years (SD)	11.3 (1.5)	11.9 (1.5)	11.9 (1.4)	11.8 (1.4)
Employed, mean days in the past 30 (SD)	3.9 (6.7)	5.0 (8.2)	2.8 (6.5)	6.5 (10.3)
Gender, % women	36.1	29.3	40.5	30.8
BSI Global Score, mean (SD)	0.63 (0.69)	0.91(0.72)	0.60 (0.62)	0.71(0.65)
Prior arrests, mean (SD)	10.2 (9.4)	10.2 (8.2)	12.5 (15.3)	10.1 (7.1)
Prior incarceration, mean months (SD)	28.7 (41.7)	19.4 (23.8)	23.1 (15.3)	20.8 (23.8)

* Based on ANOVA for continuous variables and on chi-square for categorical variables.

Note: SD = Standard Deviation, BSI = Brief Symptom Inventory

Table 2

Retention by Study Group

Variable	Study Group			p-value*
	Standard n=37	Drug Testing n=43	Treatment Plan n=38	Combined n=40
Subjects who completed intervention, %	59.5	76.7	63.2	70.0
Number of weeks in intervention, mean (SD)	20.1 (8.7)	22.5 (7.2)	21.2 (7.9)	21.3 (8.3)

* Based on ANOVA for continuous variables and on chi-square for categorical variables.

Table 3
Urine Test Results over the Six-Month Voucher Intervention by Study Group

Variable	Study Group			* p
	Standard n=37	Drug Testing n=43	Treatment Plan n=38	Combined n=40
Number of negative tests, mean (SD)	34.7 (16.9)	37.9 (15.9)	35.0 (16.2)	37.4 (16.3)
Number of tests to the first positive test (for those negative at baseline), mean (SD)	15.5 (15.2)	20.0 (18.0)	11.2 (14.2)	19.0 (17.3)
Longest number of consecutive negative tests, mean (SD)	22.9 (14.1)	26.7 (15.9)	21.8 (14.6)	25.1 (15.0)
Negative tests (for all drugs), %	66.7	72.5	67.9	71.8
Missing tests, %	30.9	24.6	29.0	25.5

Note: Maximum number of tests is 52.

* Based on ANOVA for continuous variables and on chi-square for categorical variables.

Table 4
During-Treatment Changes from Baseline to 6-Months: Addiction Severity Index, Brief Symptom Inventory, Mean (SD)

Variable	Study Group			* pvalue
	Standard n=24	Drug Testing n=32	Treatment Plan n=33	
Change in ASI composite scores				
Alcohol	0.04 (0.10)	0.03 (0.12)	0.02 (0.08)	0.95
Drug	0.04 (0.08)	0.07 (0.09)	0.07 (0.08)	0.65
Employment	0.18 (0.27)	0.19 (0.36)	0.12 (0.37)	0.84
Family/Social	-0.01 (0.19)	0.05 (0.19)	0.04 (0.23)	0.76
Legal	0.08 (0.15)	0.10 (0.19)	-0.04 (0.20)	0.01
Medical	-0.04 (0.25)	0.01 (0.35)	0.05 (0.32)	0.64
Psychological	0.11 (0.15)	0.04 (0.21)	0.005 (0.17)	0.06
Change in BSI Global Severity Index score	0.33 (0.50)	0.48 (0.80)	0.38 (0.46)	0.82

Note: ASI = Addiction Severity Index; BSI = Brief Symptom Inventory

* Based on ANOVA for continuous variables and on chi-square for categorical variables.