Title
Interventions to Reduce Drug Use Among Methamphetamine Users at Risk for HIV

Journal
Current HIV/AIDS Reports, 16(1)

ISSN
1548-3568

Authors
Corsi, Karen F
Shoptaw, Steve
Alishahi, Musheng
et al.

Publication Date
2019-02-01

DOI
10.1007/s11904-019-00423-y

Peer reviewed

HHS Public Access

Author manuscript

Curr HIV/AIDS Rep. Author manuscript; available in PMC 2020 February 01.

Published in final edited form as:

Curr HIV/AIDS Rep. 2019 February ; 16(1): 29–36. doi:10.1007/s11904-019-00423-y.

Interventions to reduce drug use among methamphetamine users at risk for HIV.

Karen F Corsi, ScD, MPH[1], **Steve Shoptaw, PhD**[2], **Musheng Alishahi, MA**[1], and **Robert E. Booth, PhD**[1]

[1]University of Colorado School of Medicine, Department of Psychiatry

[2]University of California Los Angeles, Departments of Family Medicine and Psychiatry

Abstract

Purpose of review.—This paper reports on the results of a study comparing two behavioral treatments for methamphetamine users. The outcomes was the effectiveness of the interventions in reducing meth use. The interventions were Contingency Management (CM) and Contingency Management plus Strengths-Based Case Management (CM/SBCM).

Recent findings.—CM/SBCM was found to be associated with attending more sessions for people who reported being in a couple. Also, participants who earned more money in the first part of the study were more likely to have more clean urinalysis in the second part of the study. Latent class analysis identified a class of participants who were in a couple, without sexual abuse history and less meth use at baseline. This class tended to have more clean urinalysis in the CM/SBCM intervention.

Summary.—These results indicate that incentive-based interventions with case management may be useful for helping meth users reduce their drug use.

Keywords

Methamphetamine; behavioral interventions; contingency management

Introduction

Methamphetamine (“meth”) use continues to be a serious problem nationwide, as evidenced by recent figures from the National Survey on Drug Use and Health (NSDUH) indicating that over 650,000 people over age 12 reported current methamphetamine use in 2016 [1]. The 2012 NSDUH survey indicated that over 12 million people had tried methamphetamine in their lifetime, with 1.2 million people reporting using meth in the year leading up to the survey [2]. Much of that use is concentrated in the Western states, including Colorado [3].

Corresponding author: Karen F. Corsi, ScD, MPH, 1557 Ogden St., Denver, CO 80218, Ph. 720.942.1804, Fax. 303.316.7697, Karen.corsi@ucdenver.edu.

Conflict of Interest

All authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent

This research is in compliance with the Declaration of Helsinki and all research procedures were approved by the Colorado Multiple Institutional Review Board (COMIRB).

Colorado's meth problem may be related to rural areas where meth is prevalent, as well as a thriving tourist industry and state capital located in the central part of the state where two Interstate highways intersect. According to law enforcement officials, the majority of Colorado meth comes from Mexico and increasingly Asia and Canada [4]. Local law enforcement crackdowns on clandestine laboratories and chemical controls through restrictions on purchasing meth ingredients have decreased domestic production dramatically [4, 5].

Research has shown that meth use is associated with a heightened sex drive and appetite, leading to HIV sex risk behaviors [6, 7, 8, 9, 10, 11]. Indeed, studies have linked HIV incidence to increased meth use in some men who have sex with men (MSM) populations [12, 13, 14]. While much research has focused on high risk sex behaviors among MSM [15, 16, 17, 18, 19], there are studies showing that heterosexual meth users, and women in particular, also experience a heightened sex drive and thus increased sex while on meth [7, 20, 21, 22, 23]. Women who inject meth report not only high risk sexual activity, but also injection risk behaviors such as sharing needles [7]. Additionally, research has shown that heterosexual meth users engage in more sex-related risk than other drug users [24, 25, 26], including decreased condom use during vaginal and anal sex, exchanging sex for drugs or money, and sex with an IDU [27]. Others have found that female meth injectors in San Francisco engaged in more sex-related risk than opiate injectors, including increased unprotected anal sex, sex with more than 5 partners, and commercial sex work [28]. The Centers for Diseases Control (CDC) has called for further research to examine differences among heterosexual meth-users [9].

Treatment programs that have been found to be successful for meth users include contingency management (CM) [29], cognitive behavioral therapy (CBT) and the Matrix Model [16, 30, 31]. CM for treatment-seeking MSM who use meth is effective in reducing drug use and HIV risk behaviors [16, 32] and among heterosexual meth users [33, 34]. There has been less research on CM conducted with street-recruited, heterosexual meth users and there is some evidence that CM efficacy is lost when used in non-treatment-seeking MSM followed in sexually transmitted infection clinics [35]. Research examining meth treatment indicates that individuals with co-occurring mental illness, who are homeless and who have other drug use problems need greater effort to achieve success in treatment [36]. Strengths-based case management (SBCM), as proposed here, may be an ideal intervention for meth users in that many areas of the individual's life are addressed to further help him/her be successful in treatment

Contingency management (CM).

Contingency management is based on Skinner's principles of operant conditioning in behavioral psychology, dating back to the 1930s [37]. The basis of this model is that behavior is learned and reinforced by environmental contingencies that reward or punish. As such, human behavior may be predictable in the presence of such contingencies or rewards [38]. CM procedures have been used for many years as a means by which to reduce substance use and other drug-use behaviors, including attendance in treatment and adherence to treatment [39, 40, 41, 42, 43, 44, 45, 46]. These procedures have been used with cocaine

users to elicit improved abstinence outcomes [47, 48, 49], as well as with alcohol users [44]. In voucher-based CM programs, drug users who submit urine samples that are negative for specified drugs are reinforced with vouchers. Based on operant conditioning [37], CM rewards those who comply with the targeted behavior and does not reward when compliance is not achieved. Theoretically, escalating reinforcements that reward behaviors necessary to produce consecutive drug-free urine samples successfully compete with the rewarding effects of illicit drugs, thereby producing sustained drug-free lifestyle behaviors [50]. Urine monitoring involves frequent testing, usually three times a week, often with rewards increasing in value when consecutive drug-free urines are produced. For example, in a study by Shoptaw and colleagues, participants were initially provided vouchers for meth-free urines worth $2.50 [16]. Vouchers increased in value with consecutive negative results and every third negative sample resulted in a $10 bonus voucher. Findings showed that, compared to cognitive behavioral therapy (CBT), conditions containing CM resulted in better outcomes at the conclusion of the intervention period, including retention, length of consecutive negative urine samples and reduced anal intercourse. Other research has shown that CM is an efficacious treatment for meth use [51].

CM has become widely accepted as an evidence-based component of treatment for meth use [16, 34, 52, 53, 54], and results of studies have shown that CM may increase the likelihood of providing meth-free urines in treatment [52]. A metaanalysis that examined four treatment studies and a lab study suggested that CM is an effective and appropriate intervention for meth use disorders [29]. Additionally, CM may produce long-term reductions in meth use and sex risk behaviors among MSM who use meth [16, 55, 56, 57]. Others have found CM to be effective as well, both in methadone maintenance clinics [58, 59] and in drug-free modalities [47, 60]. Additionally, abstinence achieved through CM procedures can lead to improved quality of life [61]. CM has been shown to be effective in a homeless population with co-occurring substance use disorders [62], which is similar to the street-recruited population of this proposal.

Strengths-based case management (SBCM).

Case management has a long history in the United States [63]. It has received attention as an intervention strategy with drug users [64, 65, 66, 67]. Studies of PWID who were either seeking or in treatment found that case management was associated with reduced time to admission [64, 68], increased retention [69], less relapse [67], and improved family and social relationships [70]. Case management has also been found to result in much higher rates of treatment entry than other interventions as well as improved linkage to substance abuse treatment [71]. For example, Bokos and colleagues reported that 90% of case managed participants entered treatment, compared to just 35% for controls [68]. Similarly, Mejta and colleagues found that 98% in case management entered treatment, compared to 57% of controls, and that they remained in treatment nearly twice as long [64]. The use of case management for HIV prevention stems from the premise that an individual’s ability to effectively respond to the threat of HIV is compromised when other problems are perceived as having greater immediacy and salience than AIDS [72, 73, 74]. Case management is an intervention that may help clients identify and access needed resources in order to function independently [75] and thus focus on health concerns. Clients who are helped in obtaining

resources may be more likely to stay involved in drug treatment, regardless of their acceptance of a substance abuse problem or motivation for treatment. Our interest in testing this approach with meth users not in treatment stems from the observation that this population has multiple chronic needs that impact motivation to reduce HIV risk and drug use. Strengths-based case management (SBCM) is a specific type of case management that is based on the following principles: 1) clients are most successful when they identify and use their strengths, abilities, and assets; 2) goal-setting is guided by the clients' perceptions of their own needs; 3) the client-case manager relationship is promoted as essential; 4) a creative approach to the use of the community will lead to the discovery of needed resources; and 5) case management is conducted in the community [75]. It differs from more traditional case management models that emphasize resource brokerage and client advocacy in its recognition that only the individual can change his/her behavior. SBCM has been used with individuals who have a variety of health issues, including mental illness [76]. In one study, SBCM was effectively used to link newly HIV diagnosed persons to medical care [77]. Other recent research has shown SBCM to be effective in linking drug users to substance abuse treatment [71].

No recent research has examined the use of these interventions to reduce methamphetamine use. Because these have been found to be useful in other drug-using populations as well as in pilot work by the authors [79], then it is relevant to test this in a larger, randomized trial as is presented here.

Methods.

This study used a randomized controlled trial design to compare the effectiveness of two interventions in reducing meth use and HIV risk behaviors among street-recruited, out-of-treatment, heterosexual meth users in Denver, Colorado. A total of 253 participants were recruited through street and community outreach in Denver. To be eligible for the study, participants had to be 18 years of age or older and competent (not too intoxicated or mentally disabled) to give informed consent at the time of the interview. Additional eligibility criteria included: 1) meth use (verified through urine drug screening and a self-report of meth use of at least 4 times per month for the last 3 months as assessed by the Timeline Follow-Back interview; [78]); 2) self-reported sex with someone of the opposite sex in last 30 days; 3) ability to provide a reliable address and phone number for contact; 4) not in drug treatment in the past 30 days; 5) willingness to be tested for HIV at baseline and follow-up; 6) not transient and no known reason (e.g. pending incarceration) why he/she would not be available for follow-up interviews; and, 7) not currently mandated by the criminal justice system to receive treatment (based on self-report). Meth use for the purposes of eligibility was defined as: having used meth in any form (snorting, smoking, injecting and/or booty bumping) at least 4 times per month in the three months prior to the interview. Participants could have been using other drugs in conjunction with meth during that time, but they had to report meth as their drug of choice during the initial eligibility screening. Current meth use was determined by a positive urine for methamphetamine at the time of the screening.

Intervention arms.—After completing the baseline interview and random assignment to a study arm, all clients received an HIV testing and counseling session that included a pre-test session, a rapid HIV test, and a post-test counseling session with HIV results. Next, clients were assigned to a case manager if they were in the CM/SBCM arm. If the client was assigned to CM, he/she was referred to the outreach worker for orientation to the CM protocol. Those assigned to CM received 16 weeks of contingency management only. Those assigned to the CM/SBCM received both 16 weeks of contingency management as well as simultaneous strengths-based case management.

Contingency Management.—The CM model was a modification of work done by Shoptaw and colleagues for the MSM population in Los Angeles [16]. The protocol involved the provision of vouchers of escalating value for successive meth-free urine samples with reset. The reset happened when a urine as not clean, then the running tally would reset to the lowest amount. The voucher system provided vouchers for meth-free urines, not cash, which could be redeemed at any time for goods and services such as candy, gum, toiletries, athletic equipment or gear, school or office supplies, baby clothes, or other pro-social items purchased at a local Target store. All CM or CM/SBCM participants were eligible to participate in the CM intervention which consisted of 51 visits 3 times per week over 17 weeks. Participants were asked to come to the study site three times a week to leave a urine sample; at the time of the visit, there was minimal contact with project staff. In other words, participants in the CM arm simply came to the study site, provided their urine, received the result, were offered a voucher if their urine was free of meth, and given brief positive verbal feedback. Other drug use was not tested and most participants were recruited as primarily meth users (i.e. meth was defined as their drug of choice), so they were not penalized for other drug use.

Phase I: Weeks 1–4: The first four weeks of the CM protocol included decreasing incentives contingent on providing any urine sample at all (positive or negative for meth). In addition, there was an increasing bonus for meth-free urine samples. This provided a time period for stabilization and engagement, as well as getting the client accustomed to the study procedures.

Phase II: Weeks 5–17: In weeks 5–17, the incentive was contingent solely on a meth-free urine sample. The client's starting incentive amount was based on the level he/she achieved for meth-free samples during the first four weeks. If the client did not provide any meth-free urine samples in the first four weeks then the incentive amount started at $2.50 and increased by $1.25 for each subsequent meth-free UA to a maximum of $10. Participants could also earn an additional bonus of $10 for every third consecutive meth-free urine sample. There was a reset procedure in place that allowed participants to return to their place in the escalating contingency schedule after producing three consecutive meth-free urine drug screens. In addition, each client was allowed 2 excused absences in weeks 5–17. An absence was considered excused if the client called beforehand to notify the outreach worker. In the case of an excused absence, the client did not receive a reward for that day but the voucher value was not reset. Positive urine drug screens were handled in a non-judgmental manner, with the outreach worker encouraging the client to continue pursuing

the goal of abstinence. The maximum amount a client could earn by providing all meth-free urine samples was the equivalent of $685.75 in vouchers.

Contingency management plus strengths-based case management (CM/SBCM).—Participants assigned to CM/SBCM simultaneously received CM as described in the preceding section and SBCM as described below for 17 weeks. SBCM, like other case management strategies, included five processes: 1) Assessment - identifying client strengths and needs; 2) Planning - prioritizing goals and objectives and developing a specific plan to achieve them; 3) Linking - identifying, referring and facilitating intakes at appropriate agencies; 4) Monitoring - assessing client progress and satisfaction; and 5) Advocacy - working on the individual's behalf to achieve goals and objectives. It differed, however, from other case management approaches in its emphasis on strengths and the client's self-determination regarding goals and priorities. SBCM included at least 3 and up to an unlimited amount of sessions during the 17-week intervention period, depending on the needs of the client.

Analyses.

We used longitudinal negative binomial regression to examine the effect of the interventions on attending UA sessions and clean urinalysis (UA) for meth using SAS version 9.4 (2008) The count data was right tailed and the dispersion suggested that negative binomial modeling would be more appropriate than Poisson regression. We explored baseline predictor variables, including age, gender, race/ethnicity, relationship status, meth use in the last 30 days, marijuana use in the last 30 days, and a lifetime history of sexual or physical abuse (Table 1). A mixed selection strategy was used to select a parsimonious model that included covariates with a p-value of <0.05, or suggestive interactions with $p < 0.07$. We tested interaction terms based on relationship status and intervention. Models stratified by relationship status are presented. UA session attendance was broken down into two time periods: session A (first 4 weeks) and session B (weeks 5–17). Complex higher order interactions between covariates were explored and shown to be significant for predicting clean UAs. Latent class analysis was performed on baseline data to examine how the classes behaved differently. General estimating equations were used to evaluate changes in HIV risk behaviors between treatment groups. HIV risk behaviors were assessed in three categories defined by no condom use for vaginal or anal sex, sex for money or drugs, and use of dirty needles in the 30 days prior to interview. However, there were not significant effects of CM/SBCM and CM on HIV risk behavior during the study period.

Results.

A summary of baseline characteristics is shown in Table 1.

Demographics.—The mean age of the study population was 38 years (SD=9.6) and the majority were female (53%). Most individuals identified as White non-Hispanic (61.7%) while 22.9% identified as Hispanic. Notably, 67.1% reported experiencing physical abuse during their lifetime, while 47% reported experiencing sexual abuse in their lifetime. At baseline, individuals used meth on average 17.1 days (SD=12) in the last 30 days but slightly lower marijuana use, 12.2 days (SD=12.7). Approximately 60% of participants considered

themselves single or not in a relationship. There were no significant differences between intervention groups with respect to these baseline characteristics.

Effect of interventions on UA visits.—CM/SBCM was significantly associated with attending at least one UA session (p-value = 0.0139). Of the 253 study participants, 172 individuals attended a minimum of one session, while 110 attended three, and 68 attended more than five UA sessions. A significant interaction was observed between CM/SBCM and relationship status in those who attended at least one and at least three sessions, but not for attendance to at least five sessions. The stratified results of the association between CM/SBCM and number of UA sessions attended are shown in Table 2. CM/SBCM was not significantly associated with attending UA sessions in participants who identified as single, however, for individuals in a relationship and randomized to CM/SBCM, they were 2.7 times more likely to attend at least one UA session than partnered individuals in the control group (95% CI 1.2, 6.0, p-value=0.0014).

Session A compared to Session B.—Attendance at session A (within the first 4 weeks) at least once was not associated with attending sessions past week 4 (session B), however, money earned in session A was related to attendance in session B (p-value < 0.0001). Concordantly, participants who earned more money in session A were more likely to have more clean UAs in Session B (p-value < 0.0001).

Clean Urinalysis for Methamphetamine.—Methamphetamine use in the last 30 days was predictive of clean UAs within the study population (p-value <0.0001). Individuals who used less meth in the past 30 days were more likely to have a higher number of clean UAs during the intervention. Additionally, there were complex interactions between the intervention, relationship status, and history of sexual abuse in the model. Latent class analysis suggests there were two distinct groups in relation to predicting cleaning UAs, as shown in Table 3.

Latent class analysis.—A significant interaction between intervention and latent class (p-value 0.009) led to stratification by class. As per Table 3, participants who fell into Class 2 were more likely to be in a couple (that is, to report having a regular sex partner), have no history of sexual abuse, and fewer baseline days of meth use. Within that class, participants tended to be older, have less lifetime depression, physical abuse, recent anxiety, and fewer days of alcohol and marijuana use in the last 30 days at baseline. Among individuals in Class 2, there was a significant association between CM/SBCM and number of clean UAs. Study participants in Class 2 randomized to CM/SBCM had 9.2 times the number of clean UAs than individuals in the CM only group, after controlling for marijuana use in the last 30 days. Furthermore, the number of sessions attended mediated the effect of the intervention on the number of clean UAs among participants in Class 2 as compared to those in Class 1.

Conclusions and Future Directions.

Contingency management and other incentive-based programs can be useful for reducing meth use among users. This is important in that meth use can have important health consequences for users, including risk for HIV and other diseases [12]. While the literature

has reported previous research successfully using incentives for stimulant-using populations [16, 33], there is less research focusing on out-of-treatment heterosexual populations such as this one and adding an additional component to the intervention. This study indicates that the addition of strengths-based case management with the incentives-based contingency management can be useful for meth users in reducing their drug use, as was also found in pilot work by this research team [79]. Meth users are at risk for HIV because meth can make a person feel hypersexual and lead to increased frequency of encounters which may not be protected [7, 24, 27]. Also, meth users may inject meth which puts them at risk for HIV through needle sharing [7]. There are myriad other health problems that meth users encounter through days of bingeing on meth including decreased personal hygiene, dental neglect and tooth loss, undernourishment, itchy skin and sores as well as other, more serious cardiac and respiratory issues [9].

Meth users who report being in a couple may have some additional support that assists them in attend more sessions when they are also offered the additional resources of case management. In terms of predicting who will have more clean UAs (which is a marker of reduced drug use), there were several relevant factors. First, there is without question a monetary incentive that is powerful and works to modify behavior. That is, participants who began earning more money in the form of vouchers in the first part of the study were more likely to attend more sessions and also have clean UAs in the second part of the study. This indicates that the voucher system can be a powerful motivator. Another predictor of clean UAs was found in a class of participants who shared the characteristics of being in a coupled relationship, not having a history of sexual abuse and reporting less meth use at baseline. Participants in this class were older, reported less mental health and other substance use problems and, when randomized to the CM/SBCM intervention, reported more clean UAs than those in the other class. This indicates that the additional support provided by case management may be particularly useful for people who already have some support and have less comorbid conditions in their lives. Future studies could target people who do not have these characteristics in order to identify what inventions could beuseful.

Acknowledgements

The authors gratefully acknowledge the funding from the National Institute on Drug Abuse (DA026741), the staff at Project Safe and the study participants, without whom this research would not have been possible.

References

1. Substance Abuse and mental health Service Administration (SAMHSA). Results from the 2016 National Survey on Drug Use and Health: National findings. Rockville, MD: Office of Applied Studies, 2017 (HHS Publication No. SMA 17–5044, NSDUH Series H-52).
2. National Institute on Drug Abuse (NIDA). Research Report Series: Methamphetamine. National Institutes of Health, 9 2013.
3. National Institute on Drug Abuse (NIDA). Epidemiologic trends in drug abuse: proceedings of the Community Epidemiologic Work Group, Highlights and Executive Summary. Bethesda, Maryland: U.S. Department of Health and Human Services: National Institutes of Health: Division of Epidemiology, Services, and Prevention Research, 2014.
4. U.S. Drug Enforcement Administration (DEA). National drug threat assessment 2008: methamphetamine. U.S. Drug Enforcement Administration, 2008.

5. Hoxworth T Patterns and trends in drug abuse in Denver and Colorado: January-December 2005. Community Epidemiology Work Group (CEWG), 2006.
6. Lorvick J, Bourgois P, Wenger LD, Arreola SG, Lutnick A, Wechsberg WM, & Kral AH (2012). Sexual pleasure and sexual risk among women who use methamphetamine: a mixed methods study. The International Journal on Drug Policy, 23(5), 385–392. doi:10.1016/j.drugpo.2012.07.005. [PubMed: 22954501]
7. Cheng WS, Garfein RS, Semple SJ, Strathdee SA, Zians JK, & Patterson TL (2010a). Binge use and sex and drug use behaviors among HIV(−), heterosexual methamphetamine users in San Diego. Substance Use & Misuse, 45(1–2), 116–133. doi:10.3109/10826080902869620 [PubMed: 20025442]
8. Kral AH, Lorvick J, Martinez A, Lewis MA, Orr WA, Anderson R, Bluthenthal RN (2011). HIV prevalence and risk among heterosexual methamphetamine injectors in California. Substance Use & Misuse, 46(9), 1081–1089. doi:10.3109/10826084.2011.557136. [PubMed: 21391786]
9. Mansergh G, Purcell DW, Stall R et al. CDC consultation on methamphetamine use and sexual risk behavior for HIV/STD infection: summary and suggestions. Public Health Reports 2006; 121:127–32. [PubMed: 16528944]
10. Krawczyk CS, Molitor F, Ruiz J et al. Methamphetamine use and HIV risk behaviors among heterosexual men - Preliminary results from five Northern California counties, December 2001-November 2003. Morbitity and Mortality Weekly Report 2006; 55(10):273–7.
11. Centers for Disease Control and Prevention (2006). Methamphetamine use and HIV risk behaviors among heterosexual men--preliminary results from five northern California counties, December 2001-November 2003. MMWR Morb Mortal Wkly Rep, 55(10), 273–277. [PubMed: 16543881]
12. Koblin BA, Husnik MJ, Colfax G, Huang Y, Madison M, Mayer K, Barresi PJ, Coates TJ, Chesney MA, Buchbinder S (2006). Risk factors for HIV infection among men who have sex with men. AIDS, 20, 731–739. [PubMed: 16514304]
13. Ostrow DG, Plankey MW, Cox C, Li X, Shoptaw S, Jacobson LP, Stall RC (2009). Specific sex drug combinations contribute to the majority of recent HIV seroconversions among MSM in the MACS. Journal of Acquired Immune Deficiency Syndrome, 51(3), 349–355.
14. Plankey MW, Ostrow DG, Stall R, Cox C, Li X, Peck JA, Jacobson LP (2007). The relationship between methamphetamine and popper use and risk of HIV seroconversion in the multicenter AIDS cohort study. Journal of Acquired Immune Deficiency Syndrome, 45(1), 85–92.
15. Shoptaw S, Reback CJ, Freese TE. Patient characteristics, HIV serostatus, and risk behaviors among gay and bisexual males seeking treatment for methamphetamine abuse and dependence in Los Angeles. Journal of Addictive Diseases 2002; 21(1):91–105. [PubMed: 11831503]
16. Shoptaw S, Reback CJ, Peck JA et al. Behavioral treatment approaches for methamphetamine dependence and HIV-related sexual risk behaviors among urban gay and bisexual men. Drug and Alcohol Dependence 2005; 78(2):125–34. [PubMed: 15845315]
17. Colfax G, Coates TJ, Husnik MJ et al. Longitudinal patterns of methamphetamine, popper (amyl nitrite), and cocaine use and high-risk sexual behavior among a cohort of San Francisco men who have sex with men. Journal of Urban Health 2005; 82(1):I62–I70. [PubMed: 15738319]
18. Reback CJ. HIV risk behaviors of gay and bisexual male methamphetamine users contacted through street outreach. Journal of Drug Issues 1999; 29:155–66.
19. Dew BJ, Elifson KW, Sterk CE. Differences in HIV sexual risk behaviors between heterosexual and non-heterosexual male users of methamphetamine. Journal of Drug Issues 2007; 37:281–98.
20. Baskin-Sommers A, Sommers I. The co-occurrence of substance use and high-risk behaviors. Journal of Adolescent Health 2006a; 38:609–11. [PubMed: 16635777]
21. Lorvick J, Martinez A, Gee L, Kral AH. Sexual and injection risk among women who inject methamphetamine in San Francisco. Journal of Urban Health 2006; 83(3):497–505. [PubMed: 16739050]
22. Zule WA, Costenbader EC, Meyer WJ, Wechsberg WM. Methamphetamine use and risky sexual behaviors during heterosexual encounters. Sexually Transmitted Diseases 2007; 34(9):689–94. [PubMed: 17471112]
23. Semple SJ, Patterson TL, Grant I. Female methamphetamine users: social characteristics and sexual risk behavior. Women & Health 2004a; 40(3):35–50.

24. Farabee D, Prendergast M, Cartier MA. Methamphetamine use and HIV risk among substance-abusing offenders in California. Journal of Psychoactive Drugs 2002; 34(3):295–300. [PubMed: 12422940]
25. Wohl AR, et al. (2002). "HIV risk behaviors among African American men in Los Angeles County who self-identify as heterosexual." Journal of Acquired Immune Deficiency Syndromes 31: 354–360. [PubMed: 12439213]
26. Gibson DR, Leamon MH, Flynn N. Epidemiology and public health consequences of methamphetamine use in California's Central Valley. Journal of Psychoactive Drugs. 2002; 34(3): 313–9. [PubMed: 12422943]
27. Molitor F, Truax SR, Ruiz JD, Sun RK. Association of methamphetamine use during sex with risky sexual behaviors and HIV infection among non-injection drug users. Western Journal of Medicine 1998; 168(2):93–7. [PubMed: 9499742]
28. Lorvick J, Martinez A, Wenger L, Gee L, Kral A. Methamphetamine use among female injectors in San Francisco. Presented at the First National Conference on Methamphetamine, HIV and Hepatitis, Salt Lake City, UT 2005.
29. Roll JM. Contingency management: an evidence-based component of methamphetamine use disorder treatments. Addiction 2007; 102(Suppl. 1):114–20.
30. Winslow BT, Voorhees KI, Pehl KA. Methamphetamine abuse. American Family Physician 2007; 76(8):1167–74.
31. California Department of Alcohol and Drug Programs, University of California LAISAP. Methamphetamine treatment: a practitioner's reference 2007. Sacramento, CA: California Department of Alcohol and Drug Programs, 2007.
32. Reback CJ, Larkins S, Shoptaw S. Changes in the meaning of sexual risk behaviors among gay and bisexual male methamphetamine abusers before and after drug treatment. AIDS and Behavior 2004; 8(1):87–98. [PubMed: 15146136]
33. Roll JM, Chudzynski J, Cameron JM, Howell DN, McPherson S (2013). Duration effects in contingency management treatment of methamphetamine disorders. Addictive Behaviors, 38(9), 2445–2462. [PubMed: 23688907]
34. Shoptaw S, Klausner JD, Reback CJ et al. A public health response to the methamphetamine epidemic: the implementation of contingency management to treat methamphetamine dependence. BMC Public Health 2006; 6:214–8. [PubMed: 16919170]
35. Menza TW, Jameson DR, Hughes JP, Colfax GN, Shoptaw S, Golden MR (2010). Contingency management to reduce methamphetamine use and sexual risk among men who have sex with men: a randomized controlled trial. BMC Public Health, 10, 774. [PubMed: 21172026]
36. Brecht M-L, Greenwell L, Anglin MD. Methamphetamine treatment: trends and predictors of retention and completion in a large state treatment system (1992–2002). Journal of Substance Abuse Treatment 2005; 29(295–306).
37. Skinner BF. The behavior of organisms: an experimental analysis. Englewood Cliffs, NJ : Prentice-Hall, 1938.
38. Bigelow GE, Silverman K. Theoretical and empirical foundations of contingency management treatments for drug abuse In: Higgins S, Silverman K. Motivating Behavior Change Among Illicit-Drug Abusers: Research on Contingency Management Interventions. Washington, D.C.: American Psychological Association, 1999: 15–31.
39. Stitzer ML, Vandrey R. Contingency management: utility in the treatment of drug abuse disorders. Clinical Pharmacology and Therapeutics 2008; 83(4):644–7. [PubMed: 18305456]
40. Stitzer M Contingency management and the addictions. Addiction 2006; 101(11):1536–67. [PubMed: 17034430]
41. Stitzer M, Petry N. Contingency management for the treatment of substance abuse. Annual Review of Clinical Psychology 2006; 2:411–34.
42. Carroll KM, Onken LS. Behavioral therapies for drug abuse. American Journal of Psychiatry 2005; 162:1452–60. [PubMed: 16055766]
43. Higgins ST, Heil SH, Lussier JP. Clinical implications of reinforcement as a determinant of substance use disorders. Annual Review of Psychology 2004; 55:431–61.

44. Higgins ST, Petry NM. Contingency management. Incentives for sobriety. Alcohol Research and Health 1999; 23:122–7. [PubMed: 10890806]
45. Lussier JP, Heil SH, Mongeon JA, Badger GJ, Higgins ST. A meta-analysis of voucher-based reinforcement therapy for substance use disorders. Addiction 2006; 101(2):192–203. [PubMed: 16445548]
46. Prendergast M, Podus D, Finney J, Greenwell L, Roll J. Contingency management for treatment of substance use: a meta-analysis. Addiction 2006; 101:1546–60. [PubMed: 17034434]
47. Higgins ST, Budney AJ, Bickel WK, Hughes JR, Foerg F, Badger G. Achieving cocaine abstinence with a behavioral approach. American Journal of Psychiatry. 1993; 150:763–9. [PubMed: 8480823]
48. Higgins ST, Wong CJ, Badger GJ, Ogden DE, Dantona RL. Contingent reinforcement increases cocaine abstinence during outpatient treatment and 1 year of follow-up. Journal of Consulting and Clinical Psychology 2000; 68(1):64–72. [PubMed: 10710841]
49. Stitzer ML, Walsh SL. Psychostimulant abuse: the case for combined behavioral and pharmacological treatments. Pharmacology, Biochemistry and Behavior 1997; 57(3):457–70.
50. Petry NM. Contingency management in addiction treatment. Psychiatric Times 2002; 19(2).
51. Rawson RA, McCann MJ, Flammino F et al. A comparison of contingency management and cognitive-behavioral approaches for stimulant-dependent individuals. Addiction 2006; 101:267–74. [PubMed: 16445555]
52. Roll JM, Shoptaw S. Contingency management: schedule effects. Psychiatry Research 2006; 144:91–3. [PubMed: 16905197]
53. Higgins ST. Extending contingency management to the treatment of methamphetamine use disorders. American Journal of Psychiatry 2006; 163(11):1870–2. [PubMed: 17074933]
54. Petry NM, Peirce JM, Stitzer ML et al. Effect of prize-based incentives on outcomes in stimulant abusers in outpatient psychosocial treatment programs: a national drug abuse treatment clinical trials network study. Archives of General Psychiatry 2005; 62:1148–56. [PubMed: 16203960]
55. Shoptaw S, Reback CJ. Methamphetamine use and infections disease-related behaviors in men who have sex with men: implications for interventions. Addiction 2007; 102(Suppl. 1):130–5. [PubMed: 17493062]
56. Menza TW, Colfax G, Shoptaw S et al. Interest in a methamphetamine intervention among men who have sex with men. Sexually Transmitted Diseases. 2007; 34(4):209–14. [PubMed: 16906123]
57. Rawson RA, Marinelli-Casey P, Anglin MD et al. A multi-site comparison of psychosocial approaches for the treatment of methamphetamine dependence. Addiction 2004; 99:708–17. [PubMed: 15139869]
58. Silverman K, Higgins S, Brooner R et al. Sustained cocaine abstinence in methadone maintenance patients through voucher-based reinforcement therapy. Archives of General Psychiatry. 1996; 53:409–15. [PubMed: 8624184]
59. Stitzer ML, Iguchi MY, Felch LJ. Contingent take-home incentive: effects on drug use of methadone maintenance patients. Journal of Consulting and Clinical Psychology 1992; 60:927–34. [PubMed: 1460154]
60. Baker A, Lee NK. A review of psychosocial interventions for amphetamine use. Drug and Alcohol Review 2003; 22:323–35. [PubMed: 15385227]
61. Petry NM, Alessi SM, Hanson T. Contingency management improves abstinence and quality of life in cocaine abusers. Journal of Consulting and Clinical Psychology 2007; 75(2):307–15. [PubMed: 17469888]
62. Tracy K, Babuscio T, Nich C, Kiluk B, Carroll KM, Petry NM, Rounsaville, BJ. Contingency management to reduce substance use in individuals who are homeless with co-occuring psychiatric disorders. The American Journal of Drug and Alcohol Abuse 2007; 33:253–8. [PubMed: 17497548]
63. Weil M, Karls JM. Historical origins and recent developments Weil M, Karls JM, eds. Case Management in Human Service Practice. San Francisco: Jossey-Bass, Inc., 1989: 1–28.

64. Mejta CL, Bokos PJ, Mickenberg J, Maslar ME, Senay E. Improving substance abuse treatment access and retention using a case management approach. Journal of Drug Issues 1997; 27(2):329–40.

65. Siegal HA, Rapp RC, Kelliher CW, Fisher JH, Wagner JH, Cole PA. The strengths perspective of case management: a promising inpatient substance abuse treatment enhancement. Journal of Psychoactive Drugs 1995; 27(1):67–72. [PubMed: 7602442]

66. Hasson AL, Grella CE, Rawson R, Anglin MD. Case management within a methadone maintenance program: a research demonstration project for HIV risk reduction. Journal of Case Management 1994; 3:167–73. [PubMed: 7735089]

67. Shwartz M, Baker G, Mulvey KP, Plough A. Improving public policy funded substance abuse treatment: the value of case management. American Journal of Public Health 1997; 87(10):1659–64. [PubMed: 9357349]

68. Bokos P, Mejta C, Mickenberg J, Monks R. Case management: an alternative approach to working with intravenous drug users Asher RS, ed. Progress and Issues in Case Management. Rockville, MD: National Institute on Drug Abuse Monograph Series, 1992: 92–111.

69. Siegal HA, Rapp RC, Li L, Saha P, Kirk KD. The role of case management in retaining clients in substance abuse treatment: an exploratory analysis. Journal of Drug Issues 1997; 27:821–31.

70. Siegal HA, Fisher JH, Rapp RC et al. Enhancing substance abuse treatment with case management: its impact on employment. Journal of Substance Abuse Treatment 1996; 13:93–8. [PubMed: 8880666]

71. Rapp RC, Otto AL, Lane DT, Redko C, McGatha C, Carlson RG. Improving linkage with substance abuse treatment using brief case management and motivational interviewing. Drug and Alcohol Dependence 2008; 94:172–82. [PubMed: 18242883]

72. Falck R, Carlson RG, Price SK, Turner JA. Case management to enhance HIV risk reduction among users of injection drugs and crack cocaine. Journal of Case Management 1994; 3:162–7. [PubMed: 7735088]

73. Mizuno Y, Purcell T, Borkowski K, Knight K. The life priorities of HIV-seropositive injection drug users: findings from a community-based sample. AIDS and Behavior 2003; 7:395–403. [PubMed: 14707536]

74. Carlson RG, Siegal HA. The crack life: an ethnographic overview of crack use and sexual behaviors among African Americans in a Midwest metropolitan city. Journal of Psychoactive Drugs 1991; 23:11–20. [PubMed: 1941363]

75. Rapp RC, Siegal HA, Fisher JH. A strengths-based model of case management/advocacy: adapting a mental health model to practice work with persons who have substance abuse problems. NIDA Research Monograph 1992; 127:79–91. [PubMed: 1436007]

76. Rapp RC, Chamberlain R. Case management services for the chronically mentally ill. Social Work 1985; 30:417–22. [PubMed: 10273981]

77. Gardner LI, Metsch LR, Anderson-Mahoney P et al. Efficacy of a brief case management intervention to link recently diagnosed HIV-infected persons to care. AIDS 2005; 19(4):423–31. [PubMed: 15750396]

78. Sobell LC, Sobell MB. Timeline FollowBack user's guide: A calendar method for assessing alcohol and drug use. Toronto: Addiction Research Foundation; 1996.

79. Corsi KF, Booth RE. HIV sex risk behaviors among heterosexual methamphetamine users. Current Drug Abuse Reviews, 2008: 1:292–296. [PubMed: 19630727]

Table 1.

Baseline characteristics

Baseline Characteristic	Total Study Population (n=253)	Contingency Management (n=129)	Contingency Management and SBCM (n=124)
Age (mean ± age)	38.0 ±9.6	37.3 ± 10.1	38.8 ±9.0
Gender (n, %) **Male** **Female**	119 (47) 134 (53)	64 (49.6) 65 (50.4)	55 (44.4) 69 (55.6)
Race/Ethnicity (n, %) **White non-Hispanic** **Black** **Native American** **Hispanic** **Other**	156 (61.7) 11 (4.4) 8 (3.2) 58 (22.9) 20 (7.9)	77 (56.7) 7 (5.4) 2 (1.6) 31 (24.0) 12 (9.3)	79 (63.7) 4 (3.2) 6 (4.8) 27 (21.7) 8 (6.5)
History of sex abuse in lifetime (n, %) **Yes**	117 (47.0)	60 (47.6)	57 (46.3)
History of physical abuse in lifetime (n, %) **Yes**	169 (67.1)	89 (69.5)	80 (64.5)
Meth use in last 30 days (mean ± SD)	17.1 ±12.0	17.6 ± 12.1	16.6 ± 12.0
Marijuana use in last 30 days (mean ± SD)	12.2 ± 12.7	13.0 ±13.3	11.3 ± 12.0
Relationship Status (n, %) **Single** **Partnered**	151 (61.6) 94 (38.4)	73 (58.4) 52 (41.6)	78 (65.0) 42 (35.0)

Table 2.

Association between intervention and number of UA sessions attended.

	Partnered			Single		
Model	**Odds Ratio**	**95% CI**	**p-value**	**Odds ratio**	**95% CI**	**p-value**
1A *	2.7	1.2, 6.0	0.0014	1.3	0.62, 2.6	0.5362
3A **	3.4	1.4, 8.8	0.0095	1.2	0.61, 2.4	0.5927

* Model 1A, adjusted for meth use in 30 days, gender, age, marijuana use in last 30 days and history of sexual abuse with outcome of attending at least one UA session.

** Model 3A, adjusted for meth use in 30 days, gender, age, marijuana use in last 30 days and history of sexual abuse with outcome of attending at least three UA sessions.

Table 3.

Latent class characteristics for clean UA association.

Characteristic	Class 1 (N=201)	Class2 (N=40)	p-value
Single	130 (65.0%)	18 (45%)	**0.02**
History of sexual abuse	113 (56.2%)	0 (0)	---
Baseline days of last 30 day meth use	24.2	10.2	**<0.001**
Age	38.0	40.7	0.216
Depression in lifetime	149 (73.6%)	16 (40.0%)	**<0.001**
Physical abuse	148 (73.6%)	18 (45.0%)	**<0.001**
Anxiety in last 30 days	103 (51.5%)	14 (35.0%)	0.060
Days of last thirty alcohol	8.1	5.3	0.180
Days of last thirty marijuana	12.7	8.1	**0.032**