Substance use disorders: Training, implementation, and efficacy of treatment with contingency management

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INTRODUCTION

Contingency management is an effective behavioral treatment approach for patients with substance use disorders (SUDs) across a wide range of substances, including those for which pharmacotherapy is unavailable or only partially effective. Contingency management is typically delivered as an augmentation to psychosocial treatment such as SUD counseling or cognitive-behavioral therapy.

Contingency management uses incentives to encourage treatment attendance and/or abstinence from alcohol/drug use. Contingency management interventions can be customized to some extent to address patient preferences or program needs, such as the resources available for the intervention.

This topic describes the efficacy, implementation, and training for contingency management. The theoretical foundation, indications, assessment, and components of contingency management for SUD are discussed separately. Other SUD treatments, including those for specific substances, are also discussed separately.

- (See "Substance use disorders: Principles, components, and monitoring during treatment with contingency management".)
- (See "Alcohol use disorder: Pharmacologic management".)
- (See "Alcohol use disorder: Psychosocial management".)

- (See "Cannabis use disorder: Clinical features, screening, diagnosis, and treatment".)
- (See "Stimulant use disorder: Psychosocial management".)
- (See "Pharmacotherapy for smoking cessation in adults".)
- (See "Behavioral approaches to smoking cessation".)
- (See "Continuing care for addiction: Components and efficacy".)
- (See "Continuing care for addiction: Implementation".)

EFFICACY

Clinical trials generally support the efficacy of contingency management for enhancing treatment attendance, increasing abstinence outcomes in treatment of substance use disorders (SUDs), and addressing health behaviors in substance users.

Treatment attendance — A review of 16 randomized clinical trials of contingency management targeting attendance concluded that findings were mixed but generally supportive of efficacy [1]. Six of the seven trials in adults treated for substance use had a higher rate of treatment attendance rates in patients assigned to contingency management compared with usual care. As an example, a 2018 study administering contingency management for treatment attendance in weeks 1 to 12 resulted in higher rates of scheduled sessions attended compared with no contingency management (82 versus 68 percent) and was also associated with higher rates of drug abstinence during treatment [2].

Contingency management can be especially useful for improving patient follow-through rates at the start of treatment. As an example, 195 patients with traumatic brain injury completing intake at a case management program for SUD were randomly assigned to either an attention control, a motivational interview, barrier reduction offering financial and logistical help with transportation, or financial incentive for attendance ($20 gift card) [3]. Greater proportions of patients assigned to barrier reduction and financial incentive returned for a second visit to complete an individual treatment plan compared with patients who were assigned to the motivational interview or control groups (74 and 83 versus 45 and 45 percent).

Other trials have shown attendance improvements for:

- SUD treatment in an HIV drop-in center [4]
- Attendance at general psychiatric appointments [5]
- Attendance at PTSD exposure therapy sessions [6]
- Group therapy attendance in methadone maintenance patients [7-9]
- Community psychosocial counseling treatment programs [10-14]

- United States veterans with SUD entering post-residential aftercare groups [15]
- Patient navigator contact in individuals with HIV and SUD [16]
- Treatment attendance in patients with dual psychiatric and SUD diagnoses [17]
- Attendance for methadone dosing appointments [18,19]

Clinical trial findings supportive of contingency management for attendance are particularly important among patients beginning outpatient drug counseling or psychotherapy for SUD, where attendance is a serious clinical problem [1]. Studies have suggested that regular early treatment attendance is associated with better patient engagement and retention [20,21]. Attendance incentives may also have a positive financial impact in programs that receive income based on service delivery.

Drug abstinence — Meta-analyses of clinical trials in patients with varied SUDs have found contingency management to increase rates of drug abstinence during SUD treatment compared with control interventions [22,23]. Interventions using both the voucher reinforcement method (30 trials) [22] and the prize-based reinforcement method (18 trials) [23] were efficacious, with average effect sizes of 0.32 (95% CI 0.26-0.38) [22] and 0.46 (95% CI 0.37-0.54) [23]. Similar effect sizes have been found for contingency management interventions targeting stimulant, opioid, cannabis, alcohol, and tobacco users [22]; however, data suggest that contingency management is less likely to be successful when nonprescribed opioids are the target [24]. (See 'Opioids' below.)

Longer-term studies have generally not found treatment effects of contingency management to be sustained at 6 to 12 or more months after treatment [23,25]. The return to prior symptoms is common for a variety of chronic diseases after treatment ends (eg, hypertension; [26]). Given the current acute care model for addiction treatment, it is advisable to maximize the amount of time that incentives are in place. Additionally, we recommend combining contingency management interventions with other psychosocial interventions that target sustained abstinence following the removal of incentives.

Clinical trial findings for abstinence by type of substance are described below.

Stimulants — Evidence for the efficacy of contingency management is strongest for stimulants among types of substances. Stimulant use disorders were the sole or primary SUDs in the majority of trials included in the two meta-analyses described above [22,23]. A clinical trial of contingency management in a large diverse sample of subjects primarily using stimulants, opiates, alcohol, or cannabis found statistically significant evidence for efficacy only in the stimulant group [27]. Examples of trials of contingency management for stimulant use disorders are as follows:

- **Voucher reinforcement** – The original studies demonstrating efficacy of voucher incentives were conducted in patients with cocaine use disorders treated in a drug-free outpatient setting. Incentives (totaling $1000) were given for cocaine-negative urines over a 12-week period [28,29]. Vouchers consistently increased durations of continuous abstinence during treatment with significantly more voucher than control participants achieving long (at least 10 to 12 weeks) durations of abstinence.

  The same reinforcement program, providing vouchers for cocaine-negative urines, was shown to be effective in patients concurrently maintained on methadone treatment for opioid use disorders [30-32]. (See "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Reinforcement methods'.)

- **Intermittent prize reinforcement** – Intermittent prize reinforcement, using a prize draw or "fishbowl" method, combined with drug counseling, has been shown to be efficacious in comparison with drug counseling without prize reinforcement in patients with stimulant use disorder in drug-free, community-based outpatient settings [33,34] and in patients with stimulant and opioid use disorders in methadone maintenance programs [35,36].

As an example, a multisite, 12-week trial randomly assigned 388 methadone-maintained stimulant users to intermittent prize reinforcement (valued at $400) combined with usual care or usual care alone [36]. Patients in the incentivized group were twice as likely to submit stimulant-negative urine samples compared with usual care participants (odds ratio 1.98; 95% CI 1.42-2.77) and had greater overall cocaine abstinence rates compared with non-incentivized controls of approximately 60 versus 40 percent. (See "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Reinforcement methods'.)

Opioids — Contingency management may be less efficacious when used for nonprescribed opioids. Clinical trial results are mixed for contingency management used to target nonprescribed opioid use in patients enrolled in psychosocial counseling treatment with no pharmacologic support [24,27,37]. One study in patients with a mix of primary drug problems found individuals entering psychosocial counseling treatment with opioid use as their main problem showed no effect of contingency management abstinence incentives [27]. A meta-analysis conducted with 22 studies among 2333 patients receiving methadone or buprenorphine for opioid use disorder in all but one study [24] found no reduction in nonprescribed opioid use during treatment by contingency management compared with control conditions. As an example, a 2013 study was negative for effects of contingency management when added to medication management with or without additional cognitive-

behavioral therapy in 202 patients being treated for opioid use disorder with buprenorphine [38]. The meta-analysis found that polysubstance use and use of a range of nonprescribed drugs other than opioids was significantly improved by contingency management compared with control conditions among opioid users receiving medication-based treatment [24].

Cannabis — Clinical trials have found voucher-based reinforcement led to increased abstinence rates in treatment for cannabis use disorders [39-44]. The long detection duration of cannabinoids after use is a limitation to its use in contingency management as this impedes the ability to provide immediate reinforcement once abstinence has been initiated. The efficacy of contingency management in patients with cannabis use disorder is reviewed separately. (See "Cannabis use disorder: Clinical features, screening, diagnosis, and treatment", section on 'Augmentation with contingency management'.)

Alcohol — Multiple randomized clinical trials have found contingency management to reduce alcohol use in patients with alcohol use disorders or heavy drinking [45-47]. (See "Alcohol use disorder: Psychosocial management", section on 'Contingency management'.)

Contingency management has been most useful in the treatment of patients with alcohol use disorder in settings where frequent breath alcohol levels can be accomplished (eg, intensive outpatient treatment or methadone maintenance programs) and for patients treated for use of other drugs in addition to alcohol, which urine testing can detect [45]. At a minimum, including breath alcohol in the contingency plan can preclude the awarding of reinforcers during acute intoxication. (See "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Alcohol'.)

Novel biomarkers [47] and remote testing methods [46,48,49] hold promise for more widespread application of contingency management for alcohol use disorders. As an example, a 21-day clinical trial was conducted (n = 40) with bronchoalveolar lavage sample collection, verification, and payment all managed remotely. Rate of negative sample submission was 85 percent for those receiving contingent financial versus 38 percent for a noncontingent control group [49].

Tobacco smoking — A systematic review and meta-analysis of 33 clinical trials with over 21,600 participants concluded that contingency management improved rates of smoking cessation at long-term follow-up compared with control conditions, including when follow-up occurs after contingencies have been removed [50]. Trials have used contingency management interventions to enhance cessation among smokers in employment settings [51-53] and remotely using computer monitoring technology [54]. As examples:

- A large study with 2538 employees and their friends [53] examined four variations on incentive schemes and found them all superior to a no incentive control condition at six months (9.4 to 16.0 percent sustained cigarette abstinence versus 6.0 percent). Group-based and individual programs had similar results; conditions that required a financial deposit with return based on smoking cessation were not well accepted.

- A nationwide sample of 94 smokers was enrolled in a randomized trial of an internet-based smoking cessation program in which breath carbon monoxide (CO) readings were monitored remotely via video [54]. Better short-term cessation rates were seen for those who could earn up to $480 over seven weeks for CO readings indicating abstinence compared with those who could earn the same amount just for submitting CO readings (40 versus 13 percent abstinent at four weeks). Group differences were no longer significant at six months (23 versus 13 percent abstinent).

EFFICACY

There are a number of subgroups in which application of contingency management may be particularly beneficial.

Subgroups

Dual diagnosis — Dual diagnosis patients with serious mental illness and substance use disorders (SUDs) constitute a prevalent and costly subgroup. Multiple trials have found reductions in substance use among patients with co-occurring serious mental illness treated with contingency management [17,47,55-57]. As an example, a three-month clinical trial in 176 outpatients with serious mental illness and stimulant use disorders found that contingency management led to improved rates of SUD treatment completion, increased urine tests negative for stimulants, reduced psychiatric symptoms, and reduced days hospitalized compared with treatment as usual [55]. The reduction in hospitalization suggests a potential for cost savings with the use of abstinence incentives in this population. (See "Co-occurring schizophrenia and substance use disorder: Psychosocial interventions".)

HIV-positive — Substance use, including heavy alcohol and intravenous opioid use, is associated with poorer HIV outcomes in people with HIV [58,59], and research has shown that HIV outcomes can be improved for patients with opioid use disorders with the addition of medication-based SUD treatment [59]. Clinical trials have tested the hypothesis that contingency management could improve the efficacy of SUD treatment in HIV-positive individuals with a potential for indirect positive impact on health outcomes. As an example, in a

clinical trial of 170 outpatients with HIV treated at an HIV drop-in center for polysubstance use, the combination of usual care and a contingency management program, which simultaneously targeted drug abstinence and health-related activity goals, resulted in a better profile of viral load outcomes compared with a control group receiving usual care alone during a six-month treatment period [60]. Abstinence-based contingency management has also been shown to reduce injection-related HIV risk behaviors as assessed by the HIV Risk-Taking Behavior Scale [61].

Systematic reviews [62,63] and a meta-analysis [64] support the utility of providing contingency management for HIV-related health behaviors, particularly medication compliance, to reduce viral load. A manual outlining these HIV medication compliance procedures is available to clinicians [65]. (See "Substance use disorder in patients with HIV".)

As an example, a 2017 three-arm clinical trial with 801 patients compared outcomes for patient navigation with and without financial incentives versus usual care. Financial incentives added to a patient navigation intervention increased contact between patients and navigators [16], as well as contact with health care providers [66], and resulted in a higher rate of viral load suppression at a six-month end of intervention assessment compared with that seen in usual care (35 versus 46 percent with suppression); group differences were no longer apparent at 12 months [67].

A 2019 study among 102 persons living with HIV with and without histories of substance use showed a benefit of directly reinforcing viral load reduction. Participants randomized to receive incentives based on providing blood samples with an undetectable viral load provided more virally suppressed samples (72 percent) compared with the rate in a usual care control condition (39 percent) [68]. (See "Substance use disorder in patients with HIV".)

Pregnant smokers — Clinical trials of pregnant smokers have found financial-based contingency management interventions to increase rates of smoking cessation compared with control interventions, with higher quit rates at delivery in contingent incentive groups compared with controls (35 to 40 versus approximately 10 percent) [50,69,70] and higher birth weights in infants of patients treated with contingency management compared with infants of patients in the control group [69]. In a trial of 612 women in Scotland, quit rates at the end of pregnancy were greater with financial incentives (22.5 versus 8.6 percent) [71]. (See "Tobacco and nicotine use in pregnancy: Cessation strategies and treatment options".)

IMPLEMENTATION

Drawing from descriptions of components of contingency management programs (described separately) and the efficacy data described above, we favor the following basic implementation strategies for contingency management.

- We suggest that tangible incentives for **attendance** be offered to all patients starting outpatient alcohol/drug programs for a substance use disorder (SUD), including stimulant, opioid, cannabis, and alcohol use disorders and including treatment with medications such as buprenorphine. These incentives should be started with the very first intake contact and continued during the first 12 weeks of treatment. (See 'Treatment attendance' above and "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Target behaviors'.)

- We suggest that tangible incentives for **abstinence** be offered to patients with an SUD who are actively using any drug (determined by positive drug tests) at the start of outpatient alcohol/drug counseling programs or opioid pharmacotherapy rather than to patients who are in remission. This is a clinically logical strategy, is supported by evidence of differential efficacy with active drug users being the ones with demonstrable benefit from contingency management [33,72], and can result in cost savings [73]. (See 'Drug abstinence' above and "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Target behaviors'.)

Implementation of contingency management requires design choices and customization, described below, which are informed by clinical research and our experience.

Voucher versus intermittent prize reinforcement — The use of a voucher-based point system in which each instance of the target behavior is reinforced versus intermittent prize-based reinforcement can be made on the basis of staff or patient preference and resource availability. Both voucher and intermittent prize reinforcement methods have been shown to be effective when used in SUD treatment [22,23]. Randomized trials comparing voucher reinforcement with intermittent prize reinforcement in patients with SUDs have not found differences in abstinence rates when similar amounts were offered under the two methods [74,75]. (See "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Reinforcement methods'.)

While total value available to be earned has been identified as an important factor impacting outcomes in studies using voucher incentives [22], incentive magnitude beyond a certain minimum may be less important in prize-based programs [76]. As an example, a 2015 trial randomly assigned 240 cocaine-using methadone patients from three community clinics to a standard care condition versus one of three contingency management conditions in which they

could earn $300 in prizes, $900 in prizes, or $900 in vouchers for cocaine-negative urines during the 12-week study [76]. Overall, the three incentive groups submitted 55 to 59 percent cocaine-negative samples compared with 36 percent for the standard care group, but there were no differences across money conditions.

Voucher and prize-based methods differ on some dimensions of implementation ease and acceptability. Compared with the voucher method, the prize-draw method may be:

- More attractive to patients, because they participate in a hands-on procedure that determines the magnitude of the reinforcer on each delivery occasion
- Less attractive to staff because of the work to create and monitor a drawing bowl
- A potentially more cost-effective intervention, being based on intermittent rather than continuous reinforcement schedule [76,77]

Escalating versus fixed schedules — Incentives that escalate in value as target behavior is continued over time are preferred over fixed incentives. Clinical trials have found that escalating and fixed schedules may produce similar overall amounts of abstinence (eg, total number of negative samples submitted), but escalating schedules produce longer durations of sustained abstinence [78,79]. Longer abstinence duration has been clearly associated with the likelihood of better long-term outcomes [80], although that relationship does tend to weaken over time [81]. Nevertheless, consistent and prolonged behavior change may be critical for promoting new habit formation. (See "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Reinforcement methods'.)

Behavioral therapy platform — There is no evidence to support differences in the efficacy of contingency management based on the type of counseling-based therapy it is combined with.

There is a strong conceptual rationale for combining contingency management with cognitive-behavioral therapy (CBT) or other skills-focused behavior therapies, but research on the effectiveness of this approach has yielded mixed results.

The theory behind combining CBT or community reinforcement approach (CRA) with contingency management is that the counseling therapies will teach relapse prevention skills and build positive lifestyle elements that can provide alternative reinforcement and promote better long-term outcomes [82].

Clinical trials to date comparing the combination of contingency management with different types of base treatment have yielded mixed findings [40,83-85]. As an example, a clinical trial comparing voucher-based contingency management delivered alone or with CRA therapy in

patients with stimulant use disorders found positive effects for CRA plus incentives on drug use during treatment compared with the incentives alone condition, but no difference between approaches on post-treatment drug use [85]. CRA did, however, produce better long-term outcomes on some important secondary measures including alcohol use, paid employment, and legal and medical problems.

Delivery via digital therapeutics — Advances in technology have allowed for considerable innovation in the implementation of contingency management for the treatment of substance use disorders. A 2019 meta-analysis including seven studies with 222 patients [86] found that mobile phone delivered contingency management performed better than control conditions in reducing tobacco smoking and alcohol use among adults not in treatment for a substance use disorder.

A program for internet-based delivery of CBT and contingency management was shown to be efficacious in a multisite clinical trial [72]. This evidence-based intervention originally named Therapeutic Education System, was reconfigured for delivery as a smart phone application. Under the name reSET, this is the first digital therapeutic to be acknowledged by US Food and Drug Administration as an efficacious treatment for substance use disorders. Technologies for remote digital monitoring of drug and alcohol use, as well as remote delivery of incentive payments [49], will also likely facilitate future dissemination and adoption of contingency management interventions [87].

Number of target drugs — Clinical trials of contingency management have typically focused on abstinence from a single drug rather than from multiple drugs in polysubstance users. Use of other drugs frequently declines when a primary drug is targeted. As an example, in a clinical trial of patients with cocaine and opioid use, cocaine was targeted as a single drug, but concurrent reduction in nontargeted opiate use was also observed [31].

Clinical efficacy depends on targeting at minimum the primary drug that brought the patient to treatment, particularly if there is evidence of ongoing use of that drug. Targeting a single drug with escalating reinforcement makes the program more manageable and provides patients the opportunity to experience success. Contingency management is also compatible with the usual clinical recommendation of abstinence from all drugs. The use of bonuses to reward abstinence from nontargeted drugs broadens the clinical focus and is a common strategy used in research studies [72].

Treatment duration — Contingency management is typically provided for durations between 8 and 16 weeks. As a general rule, it is advisable for contingency management interventions to be kept in place for as long as feasible.

Studies have found that relapse to substance use is common at the completion of contingency management interventions, even after interventions lasting 52 weeks [32]. Research showing a strong relationship between the duration of abstinence during treatment and longer-term outcomes suggests that outpatient treatment should ideally be kept in place until individuals achieve a specified duration of abstinence (eg, 6 to 12 months) rather than ended at an arbitrary time point, as tends to occur in current models of funding for outpatient treatment in the United States. Epidemiological research suggests that continuous abstinence for at least three years may be necessary before the risk of relapse stabilizes at very low levels [88,89]. Studies of longer-term interventions with adaptive designs that account for individual variability in outcome are needed.

TRAINING

Resources for clinicians seeking training in contingency management include:

- Promoting Awareness of Motivational Incentives (PAMI) – An introductory training that describes principles of contingency management and evidence of clinical effectiveness. Included are background material, research reviews, and some practical implementation resources. Developed by the National Institute on Drug Abuse (NIDA); available without cost at the Clinical Trials Network Dissemination Library website.

- Motivational Incentives: Promoting Recovery Enhanced Substance Treatment Outcomes (MI PRESTO) – A self-guided, interactive online course that provides more detailed information about implementation. Developed by NIDA, MI PRESTO is available without cost at the Clinical Trials Network Dissemination Library website.

- A Community Reinforcement Plus Vouchers Approach: Treating Cocaine Addiction – This manual outlines methods for implementing the original contingency management treatment using voucher-based reinforcement combined with community reinforcement approach psychosocial therapy [90].

- Contingency Management for Substance Abuse Treatment – A manual for implementing contingency management, this publication describes methods and materials developed by experienced clinicians and researchers for training community counselors to deliver abstinence- and attendance-based interventions using the fishbowl method [91].

- Clinical trials have shown that counselors trained in these methods delivered contingency management interventions that improved client outcomes compared with usual care [91-93]. Additional information and resources are available at the UConn website [94].

SOCIETY GUIDELINE LINKS

Links to society and government-sponsored guidelines from selected countries and regions around the world are provided separately. (See "Society guideline links: Opioid use disorder and withdrawal" and "Society guideline links: Benzodiazepine use disorder and withdrawal" and "Society guideline links: Alcohol use disorders and withdrawal" and "Society guideline links: Stimulant use disorder and withdrawal" and "Society guideline links: Cannabis use disorder and withdrawal".)

SUMMARY AND RECOMMENDATIONS

- Contingency management in the treatment of patients with substance use disorders (SUDs) uses incentives to encourage attendance and/or abstinence from alcohol/drug use. Contingency management is typically delivered as an augmentation to other psychosocial and medication-based treatment. (See 'Introduction' above and "Substance use disorders: Principles, components, and monitoring during treatment with contingency management".)

- For patients receiving SUD treatment, clinical trials generally support the efficacy of contingency management using either voucher or intermittent prize reinforcement to promote improved attendance/retention and when used to reinforce abstinence from drugs of abuse. (See 'Efficacy' above.)

- We suggest that tangible incentives for **attendance** be offered to all patients starting outpatient alcohol/drug counseling or psychotherapy programs for an SUD (including stimulant, opioid, cannabis, and alcohol use disorders) (**Grade 2B**). These incentives should be started with the very first intake contact and continued during the first 12 weeks of treatment, with reward parameters (eg, escalating reward values) that encourage frequent, regular attendance. (See 'Treatment attendance' above and "Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Target behaviors'.)

- We suggest that tangible incentives for **abstinence** be offered to patients with an SUD who are actively using (determined by positive drug tests) at the start of outpatient alcohol/drug counseling or treatment programs that incorporate pharmacotherapy rather than to patients who are in remission (**Grade 2B**). Abstinence incentives can then be added to the treatment program of patients who resume some level of use to forestall full relapse and promote resumption of abstinence. (See 'Drug abstinence' above and

"Substance use disorders: Principles, components, and monitoring during treatment with contingency management", section on 'Target behaviors'.)

- Contingency management is at present most useful in the treatment of patients with alcohol use disorder in settings where breath alcohol levels can be measured frequently (eg, intensive outpatient treatment programs) and for patients treated for use of other drugs in addition to alcohol, which urine testing can detect, but new measurement techniques may allow for more widespread utility in future. (See 'Alcohol' above.)

- Longer-term clinical trials of contingency management for SUD have found diminishing effects over time after incentives have ended. Further research is needed on strategies for withdrawing contingency management, the role of relapse prevention skills counseling, and lifestyle change in sustaining long-term benefits [82]. (See 'Drug abstinence' above and 'Behavioral therapy platform' above.)

- Because longer duration of during-treatment abstinence is associated with better long-term outcomes, contingency management should ideally be kept in place until the patient has achieved a prolonged duration of abstinence (eg, 6 to 12 months) rather than stopped after an arbitrary time point. More research is needed to determine the optimal duration of individual treatment. (See 'Treatment duration' above.)

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