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An economic evaluation of a contingency-management intervention for stimulant use among community mental health patients with serious mental illness

Sean M. Murphy[a,*], Michael G. McDonell[b], Sterling McPherson[a], Debra Srebnik[c], Frank Angelo[b], John M. Roll[a], Richard K. Ries[b]

[a] Program of Excellence in Addictions Research, Washington State University, Spokane, WA 99210, USA
[b] Department of Psychiatry and Behavioral Sciences, University of Washington School of Medicine, Seattle, WA 98195, USA
[c] King County Mental Health, Chemical Abuse and Dependency Services Division, Seattle, WA 98104, USA

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ABSTRACT

Background: This study examines the cost-effectiveness of contingency-management (CM) for stimulant dependence among community mental health patients with serious mental illness (SMI)
Methods: Economic evaluation of a 12-week randomized controlled trial investigating the efficacy of CM added to treatment-as-usual (CM + TAU), relative to TAU without CM, for treating stimulant dependence among patients with a SMI. The trial included 176 participants diagnosed with SMI and stimulant dependency who were receiving community mental health and addiction treatment at one community mental health center in Seattle, Washington. Participants were also assessed during a 12-week follow-up period. Positive and negative syndrome scale (PANSS) scores were used to calculate quality-adjusted life-years (QALYs) for the primary economic outcome. The primary clinical outcome, the stimulant-free year (SFY) is a weighted measure of time free from stimulants. Two perspectives were adopted, those of the provider and the payer.
Results: At 12-weeks neither the provider ($2652, $p = 0.74$) nor the payer ($2611, $p = 0.99$) cost differentials were statistically significant. This was also true for the payer at 24-weeks (−$125, $p = 1.00$). QALYs gained were similar across groups, resulting in small, insignificant differences (0.04, $p = 0.23$ at 12-weeks; 0.01, $p = 0.70$ at 24 weeks). CM + TAU experienced significantly more SFYs, 0.24 ($p < 0.001$) at 12 weeks and 0.20 ($p = 0.002$) at 24 weeks, resulting in at least an 85% chance of being considered cost-effective at a threshold of $200,000/SFY.
Conclusion: Contingency management appears to be a wise investment for both the provider and the payer with regard to the clinical outcome of time free from stimulants.

1. Introduction

Contingency management (CM) is a well-established intervention for drug and alcohol use disorders. CM employs positive reinforcers (e.g., vouchers or prizes) when individuals demonstrate drug or alcohol abstinence. Meta-analyses of CM have found it to be associated with higher rates of treatment retention and abstinence, relative to standard care (Benishek et al., 2014; Dutra et al., 2008; Lussier et al., 2006; Prendergast et al., 2006). CM has demonstrated efficacy as a treatment for stimulants (cocaine, amphetamine, methamphetamine), marijuana, opioids, nicotine, and alcohol use disorders. Importantly, Dutra et al. (2008) compared CM approaches to all other psychosocial treatments and found that they had the highest rates of in-treatment abstinence. However, the relatively high in-treatment abstinence rates of CM are not typically sustained (Dutra et al., 2008; Rawson et al., 2006, 2002).

Emerging literature has demonstrated the effectiveness of CM for individuals with substance use disorders (SUDs) who also suffer from severe mental illnesses (SMI; Bellack et al., 2006; McDonell et al., 2013; Roll et al., 2004). Adults with SMI, such as schizophrenia, bipolar and re-occurring major depressive disorders suffer from high rates of SUDs, with lifetime rates as high as 50% (Regier et al., 1990). Relative to people with only one of these conditions,

* Corresponding author at: Department of Health Policy & Administration, PO Box 1495, Spokane, WA 99210-1495, USA. Tel.: +1 509 358 7949; fax: +1 509 358 7984.
E-mail address: sean.murphy@wsu.edu (S.M. Murphy).

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individuals with co-occurring SMIs and SUDs have more severe substance use and psychiatric symptoms (RachBeisel et al., 1999), poorer treatment adherence (Bennett et al., 2001), increased homelessness (Galanter et al., 1998), and higher rates of smoking (de Leon et al., 2007), HIV infection (RachBeisel et al., 1999), psychiatric hospitalization (Haywood et al., 1995), emergency room use (Bartels et al., 1993) and incarceration (Abram and Teplin, 1991). The high rates of SUDs among individuals with SMI, and the consequences of this comorbidity, directly contribute to the high economic cost of SMI in the U.S., which is estimated to be well over $400 billion (2013 USD) annually (Insel, 2008).

Many people with comorbid SUD and SMI do not receive concurrent treatment for the disorders (Substance Abuse and Mental Health Services Administration, 2002; Watkins et al., 2001a), although integrated treatments have been shown to reduce drug use (Baker et al., 2006; Barrowclough et al., 2010; Bellack et al., 2006; Drake et al., 1998; Epstein et al., 2004; Watkins et al., 2001b; Weiss et al., 2009). While the results pertaining to reductions in psychiatric severity associated with many integrated treatments are mixed (Drake et al., 2008), two randomized, controlled trials (RCTs) have shown that CM alone (McDonell et al., 2013), or as part of a cognitive behavioral treatment (Bellack et al., 2006) can reduce drug and alcohol use, improve psychiatric symptoms, and reduce inpatient hospitalizations in adults who suffer from co-occurring SUDs and SMI. Moreover, a recent Cochrane Collaboration review reported that CM is a promising treatment for SUDs in outpatients with SMI (Hunt et al., 2013).

Despite the apparent promise of CM interventions in treating co-occurring SMI and SUD, perceived cost and an inability to bill for urine tests and tangible reinforcers present a significant barrier to implementation (Kirby et al., 1999; McGovern et al., 2004; Petry and Simcic, 2002; Srebnik et al., 2013). Information regarding the cost-effectiveness of CM is needed to inform policymakers who are increasingly making decisions about the availability of such treatments based on their clinical and cost effectiveness (Petry et al., 2014). Previous cost-effectiveness analyses (CEAs) on CM have been favorable, but have focused on its application to the treatment of specific drugs rather than co-occurring SMI and SUD, and have focused solely on clinical measures for the effectiveness outcome, such as abstinence or treatment completion (Olmstead and Petry, 2009; Olmstead et al., 2007a, 2007b, 2007c; Sindelar et al., 2007a, 2007b). No studies to date have investigated the cost-effectiveness of CM for individuals with comorbid SMI and SUD, a particularly costly population.

Given that substance misuse affects most areas of functioning and SUDs are generally chronic conditions, quality-of-life is increasingly viewed as an important component of long-term recovery (Laudet, 2011); despite that, it is rarely included as an outcome in contingency-management CEAs. A cost-utility analysis (CUA) assesses the relative cost-effectiveness of an intervention; however, the outcome includes a measure of utility (i.e., satisfaction), and is often expressed as quality-adjusted life years (QALYs). QALYs are beneficial as a measure of effectiveness, in that they reflect the combined preference for length and quality of life. The purpose of this study is to conduct an economic evaluation of a CM intervention as an add-on to treatment-as-usual (TAU) for treating stimulant use disorders among 176 outpatients with a SMI.

2. Methods

2.1. CM intervention

McDonell et al. (2013) conducted a 12-week randomized controlled trial of CM with treatment-as-usual (CM + TAU) relative to TAU with non-contingent rewards for 176 individuals with SMI and stimulant dependence who were receiving community mental health and addiction treatment at one community mental health center in Seattle, Washington. Participants were assessed during the intervention as well as during a 12-week follow-up period. Eligibility criteria for the study included using stimulants in the 30 days prior to the study, and meeting Mini International Neuropsychiatric Interview criteria for methamphetamine, amphetamine or cocaine dependence, and criteria for schizophrenia or schizoaffective (39% of participants), bipolar I or II (34% of participants), or recurrent major depressive disorder (27% of participants). The urn randomization procedure was used to balance the groups according to gender, substance use severity, mood versus psychotic disorder, and psychiatric hospitalization in the year prior to the study.

Participants were randomized to either CM + TAU or TAU with noncontingent rewards for participation. The variable magnitude of reinforcement CM procedure was used. To start, participants in the CM group earned 1 draw from a bowl of tokens for each urine sample that was negative for stimulants (i.e., amphetamine, methamphetamine and cocaine). The tokens varied in value, with 50% simply reading "good job", and the remainder being associated with a prize valued anywhere between $1 and $80. Urine samples were collected 3 times per week with reward draws at each session. Each full week of continued stimulant abstinence resulted in an additional opportunity to draw a token, as did testing negative for alcohol, opioids and marijuana. If a participant tested positive for stimulants, or missed their session, they were unable to draw a token on that session, and had their number of draws reset to 1. TAU participants were quasi-yoked to those in the CM + TAU group, such that their number of prize draws was equal to the average number for CM participants in the week prior. The number of prize draws for the first week was determined by reassigning the first 5 TAU participants to CM + TAU and calculating their average number of prize draws. These 5 participants were then excluded from the intention-to-treat sample. Noncontingent participants therefore received the same number of prizes as their CM + TAU counterparts, but received prizes for submitting urine samples, instead of for submitting drug-free urine samples. Services provided as part of TAU included: mental health, chemical dependency, housing, and vocational.

For the 12-week intervention period, CM + TAU was associated with significantly fewer days of stimulant use (0.91 versus 4.67, $p < 0.05$) and alcohol use (1.84 versus 4.32, $p < 0.05$), and a significantly lower rate of injection drug use engagement (37% vs. 66%, $p < 0.05$) compared with TAU. Days-of-stimulant-use was also significantly lower for CM + TAU relative to TAU during the follow-up period (1.83 versus 3.65, $p < 0.05$).

2.2. Cost measures

The resource costing method was used to calculate costs. This method consists of multiplying the number of units of each resource utilized by participants, by the respective unit cost. The cost for each participant is then obtained by summing the relevant costs.

Few resources were required for the intervention itself; these included: a case manager, urine analysis (UA) supplies, and reinforcers. The case manager's time (including the time it took to order and manage prizes) was valued using the median annual salary from the Bureau of Labor Statistics' (BLS) Occupational Outlook Handbook (2014), $28,850, as well as the BLS' estimated benefit rate of 30.2% for the *health care and social assistance* industry group. The case manager's estimated total annual compensation was $41,332 ($19.87 per hour). Case managers spent approximately 15 min with each client per visit, and 5 h per week managing prizes for all clients. The values of the (UA) supplies and reinforcers were obtained from the principal investigator and research coordinator. The average cost of UA supplies and reinforcers was $256. Intervention costs varied by individual, by week, depending on session attendance, the number of draws for prizes, and the value of the prizes received. We did not include the cost of the noncontingent prizes received by the control group, as the prizes were not designed to influence the decision-making process of the control group and would not be used in "real-world" applications of the intervention. Therefore, incorporating the value of the noncontingent prizes would bias the costs in favor of the CM group.

The number of non-study outpatient mental-health and chemical-dependency visits, days of inpatient psychiatric and substance abuse treatment, number of detoxification admissions and the number of emergency department (ED) visits were collected from the Washington State Department of Social and Health Services' (DSHS) databases (McDonell et al., 2013). Mean unit cost estimates from SAMHSA's Alcohol and Drug Services Study (ADSS; Substance Abuse and Mental Health Services Administration, 2003) were used to value outpatient, inpatient and detoxification services. ED visits were valued using mean expenditures for adults aged 18 to 64 years from the Health, United States, 2012 report (National Center for Health Statistics, 2013). All dollar values were converted to 2013 U.S. dollars using the BLS Consumer Price Index for medical care.

2.3. Effectiveness measures

We calculated both a clinical and an economic measure of effectiveness. The clinical outcome, stimulant-free years, is a weighted measure of time free of stimulants. This measure was based on the number of stimulant positive urine samples, measured 3 times a week during the intervention period and monthly during the 12-week follow-up period.

Our primary economic effectiveness measure is the QALY. QALYs are calculated by multiplying the duration of time spent in a given health state by a preference-weighted health-related quality-of-life (HRQoL) score associated with that state. The weights typically range from 0 to 1, with 0 representing death and 1 representing