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A Multi-Level Approach to Predicting Community Addiction Treatment Attitudes About Contingency Management

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Abstract

Adoption of contingency management (CM) by the addiction treatment community is limited to date despite much evidence for its efficacy. This study examined systemic and idiographic staff predictors of CM adoption attitudes via archival data collected from treatment organizations affiliated with the National Drug Abuse Treatment Clinical Trials Network. Multilevel modeling analyses evaluated potential predictors from organizational, treatment unit, and workforce surveys. Among these were individual and shared perceptions of staff concerning aspects of their clinic culture and climate. Modeling analyses identified three systemic predictors (clinic provision of opiate agonist services, national accreditation, lesser shared perception of workplace stress) and five idiographic predictors (staff with a graduate degree, longer service tenure, managerial position, e-communication facility, and openness to change in clinical procedures). Findings are discussed as they relate to extant literature on CM attitudes and established implementation science constructs, and their practical implications are discussed.

1. Introduction

Efforts to bridge gaps between addiction treatment research and clinical practices in community settings (IOM, 1998) continue, including community effectiveness trials conducted by the National Drug Abuse Treatment Clinical Trials Network. Among its targeted evidence-based practices (Tai *et al.*, 2010) is contingency management (CM)—an approach reliant on operant conditioning principles that trace back to Skinner's (1938) formulations. Although specific reinforcers and reinforcement schedules may vary, Petry (2000) notes two tenets of all CM applications: 1) objective detection of substance use (via specimen testing), and 2) provision of known reinforcers to the client when abstinence occurs. Impacts of behavioral reinforcement on substance initiation, maintenance, and discontinuance are documented in analog studies (Higgins *et al.*, 2008; Stitzer & Petry, 2006), and reliable therapeutic effects are reported in meta-analyses of CM efficacy trials (Dutra *et al.*, 2008; Griffith *et al.*, 2000; Lussier *et al.*, 2006; Prendergast *et al.*, 2006). Thus,

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listing of multiple CM applications in the National Registry of Evidence-based Programs and Practices (SAMHSA, 2011) is unsurprising.

Despite theoretical and empirical support for CM, treatment community interest lags behind that for other behavior therapies—some of which are less efficacious (Herbeck *et al.*, 2008; McCarty *et al.*, 2007; McGovern *et al.*, 2004; Petry & Simcic, 2002; Willenbring *et al.*, 2004). A recent study of community providers found only 38% believe CM has strong empirical support, and just 27% support its implementation (Benishek *et al.*, 2010). Lack of familiarity with CM and its efficacy constitute only one of several barriers to community adoption. Implementation costs are a prominent concern (Walker *et al.*, 2010), and further economic complications exist for some treatment organizations due to their revenue and reimbursement sources (Ducharme *et al.*, 2007). Lack of administrative support and perceived inadequacy of clinicians' implementation skills are also reported barriers (Campbell *et al.*, 2003; Rawson *et al.*, 2002; Willenbring *et al.*, 2004). And a poignant barrier for some is philosophical objection to behavioral reinforcement as a means to treat substance misuse (Kirby *et al.*, 2006). If CM advocates hope for greater dissemination of their methods, there is need to identify predictors of favorable CM attitudes among community treatment personnel.

Extant literature suggests links between CM attitudes and several systemic variables. For instance, favorable CM attitudes are associated with organizational characteristics like non-profit corporation status and high annual revenues (Ducharme *et al.*, 2007) as well as clinic provision of outpatient services (Bride *et al.*, 2011) or opiate agonist treatment (Ducharme *et al.*, 2010). Client population characteristics, like the proportion that are adolescent or court-referred, are also systemic indices linked to favorable CM attitudes of staff (Bride *et al.*, 2011). Systemic variables linked to negative CM attitudes include clinic accreditation (Ducharme *et al.*, 2007) and provision of detoxification services (Fuller *et al.*, 2007). Extant literature concerning idiographic staff attributes as predictors of CM attitudes is more equivocal. Whereas favorable attitudes toward evidence-based practice are predicted by education level (Haug *et al.*, 2008; McCarty *et al.*, 2007) and job dimensions like holding a managerial position or longer service tenure (McCarty *et al.*, 2007; McGovern *et al.*, 2004), findings to date for such predictors of CM attitudes are mixed (Bride *et al.*, 2011; Ducharme *et al.*, 2010; Ducharme *et al.*, 2007; Herbeck *et al.*, 2008; Kirby *et al.*, 2006; McCarty *et al.*, 2007). Unfortunately, much of the existing research focuses on systemic or idiographic constructs rather than both. Thus, resolution of ambiguities about the relative magnitude (and direction) of specific systemic and idiographic predictors may require aggregate examination and analysis of these constructs via multivariate analytic methods.

Potential predictors of CM attitudes include staff perceptions of clinic culture, as such perceptions—particularly of openness to change—influence attitudes about treatment innovation (Simpson, 2002). Regarding CM, perceived facility with e-communication may predict positive CM attitudes given the potential for such technology to ease monitoring and documentation functions inherent in its implementation (Petry, 2000). Conversely, perceived support of staff autonomy is linked to negative CM attitudes (Fuller *et al.*, 2007), as well as counselor exhaustion and turnover intention (Knudsen *et al.*, 2008). All are markers of organizational stress, which intersects with a range of issues that can influence attitudes about prospective adoption of new practices (Bakker *et al.*, 2001; Halbesleben & Buckley, 2004). James and Jones (1974) distinguish organizational culture (i.e., shared perception a group attaches to their clinic) from psychological culture (i.e., idiographic perceptions subject to psychological idiosyncrasies). As the rate and quality of innovation dissemination is thought to be affected at both of these levels (Florin *et al.*, 1990; Kenny & LaVoie, 1985), it would be prudent to analyze variance in clinic perceptions both as a function of

idiographic differences among staff at a given clinic, and systemic differences between staff groups at their respective clinics.

To comprehensively examine the noted systemic and idiographic constructs as predictors of CM adoption attitudes, a large-scale collection of nested data concerning addiction treatment organizations and the staff they employ is necessary. Such data were collected in a prior NIDA CTN study (CTN 0008, *A Baseline for Investigating Diffusion of Innovation*), which gathered comprehensive information for 100+ CTN-affiliate community treatment organizations (McCarty et al., 2007; McCarty *et al.*, 2008). Surveys were completed by executive directors of treatment organizations, directors of their individual treatment units, and staff working at those treatment units. Original CTN 0008 aims were descriptive, but two prior secondary analysis efforts inform the current endeavor. The first is Fuller and colleagues' (2007) identification of a three-item CM adoption attitude index via factor analyses, which serves as the current dependent variable. The second is Fitzgerald and McCarty's (2007) use of a multi-level modeling approach to examine predictors of addiction medication attitudes, which provides an analytic blueprint for the current analyses. The current study examines systemic and idiographic predictors of CM attitudes, and notably includes the novel aspect of incorporating among potential predictors the variance in staff perceptions of clinic culture within *and* between treatment units.

2. Materials and methods

The current work is a secondary analysis of CTN 0008 data. This was undertaken as a joint effort between investigators and data analysts affiliated with the Pacific Northwest and Western States Nodes of the NIDA CTN. Relevant CTN 0008 procedures and measures are subsequently summarized, but a more complete detailing of the original CTN 0008 trial is available from previously-published reports (McCarty et al., 2007; McCarty et al., 2008). All original trial procedures were approved by the Oregon Health & Science University Institutional Review Board (IRB) as well as by 40 local IRBs for involved treatment organizations.

2.1. Summary of Relevant CTN 0008 Procedures

The original study involved survey-based data collection from CTN-affiliate treatment programs at three levels, with content primarily extracted from published sources (SAMHSA, 2002; Simpson, 2002). An organizational survey was completed by the executive director of each treatment organization, including corporation type and annual revenue. A treatment unit survey was completed by each clinic director, including accreditation status, service offerings (opiate agonist, outpatient, detoxification), and client population characteristics (% court-referred, % adolescent). Workforce surveys were completed by individual staff, including personal demography, professional background (i.e., education, organizational position and tenure), and perception of clinic culture via the Survey of Organizational Functioning [SOF; (Lehman *et al.*, 2002; TCU Institute of Behavioral Research, 2008)]. The SOF includes four staff attribute subscales (i.e., growth, efficacy, influence, and adaptability) and six organizational subscales (i.e., mission, cohesion, autonomy, communication, stress, and openness to change). Two additional SOF subscales (e.g., program needs, e-communication) were also examined, by virtue of prior CTN 0008 analyses suggesting association with CM adoption attitudes (Fuller et al., 2007). Workforce surveys were the source for the current dependent variable, CM adoption attitude. High response rates (>90%) were observed at each level of assessment.

2.2. Measures

All current measures can be categorized as systemic indices at organization- or treatment unit-levels, or idiographic indices at staff-level. Further, measures of perceived clinic culture (as later described) were examined at both systemic (treatment unit) and idiographic (staff) levels.

2.2.1. Organization-Level Indices—Organization-level indices included corporation type and annual revenue as estimated by each organization's executive director. Corporation type was binary (for-profit, non-profit). Annual revenue was free-response estimate.

2.2.2. Treatment Unit-Level Indices—Treatment unit-level indices included accreditation status, specific treatment provisions (opiate agonist, outpatient, detoxification), and client population characteristics (% court-referred, % adolescent). Accreditation status and treatment provision indices were binary (yes, no). Client population characteristics were percentages of the aggregate served clinic population.

2.2.3. Staff-Level Indices—Staff-level indices included clinic position, education, and organizational tenure. Clinic position was a three-level categorical variable distinguishing managerial, clinical, and support positions. Education referred to highest degree obtained, a three-level categorical variable distinguishing staff as having attained a graduate (doctoral, masters) degree, college degree (bachelors, associates), or secondary education (high school diploma, less). Organizational tenure was a free-response item, with response converted to a scale for years.

2.2.4. Perceived Clinic Culture Indices—The CTN 0008 Workforce Surveys also provided 12 SOF subscales, on which all items were rated on a 5-point scale (1=Strongly Disagree, 5=Strongly Agree). These subscales were: 1) program needs (8 items), e-communication (4 items), staff growth (5 items), staff efficacy (5 items), staff influence (6 items), staff adaptability (4 items), organizational mission (5 items), organizational cohesion (6 items), organizational autonomy (5 items), organizational communication (5 items), organizational stress (4 items), and organizational openness to change (5 items). Per SOF scoring instructions, all subscales were computed as a per-item mean and then multiplied by ten (TCU Institute of Behavioral Research, 2008).

Consistent with James and Jones' (1974) conceptualization and recent work by Baer and colleagues (2009), each SOF index was dually-conceptualized as: 1) shared perception of staff for their common treatment unit, and 2) idiographic perception of individual staff that may vary within a given treatment unit. The intent was to capture each level of a given SOF construct in a manner that minimized untargeted measurement variance. Accordingly, shared perceptions were computed as a mean corresponding staff ratings among workforce surveys for a treatment unit, capturing variance between treatment units while controlling for untargeted variance in staff perceptions within treatment units. Idiographic perceptions were computed as Z-scores based on distribution of staff ratings within a treatment unit, capturing variance within treatment units while controlling for untargeted variance in shared perception between treatment units.

2.2.5. CM Adoption Attitude—Workforce surveys contained 17 attitudinal items, each endorsed on a 5-point scale (1=Strongly Disagree, 5=Strongly Agree), tapping opinions about treatment innovations tested in initial CTN trials. Fuller and colleagues' (2007) factor analysis identified a three-item subscale (i.e. *It is okay for patients to have the opportunity to earn prizes worth as much as \$100 for abstinence; It is okay to pay patients for attending treatment; Incentives can have a positive effect on the patient/counselor relationship*)

representing CM adoption attitude. This subscale evidenced the same internal consistency in the current sample (Cronbach alpha = .72) as reported by Fuller and colleagues (2007). Also previously-reported were respective factor loadings of .88, .63, and .49 for the three constituent items. In conceptual terms, this indicates that CM adoption attitude scores are most heavily influenced by ratings for patients earning prizes, followed by those for paying patients to attend treatment, followed by those for positive effects on the therapeutic relationship. To account for the differential factor loading of these items, subscale scores were computed as weighted sums based on these established factor loadings. This weighted sum served as the lone dependent variable in the current report.

2.3. Current Sample

Data collection in the original CTN 0008 trial encompassed 106 treatment organizations, 348 treatment units, and 3698 individual workforce surveys. The current analytic work involved a reduced sample for two reasons. First, the planned multi-level modeling analyses required presence of complete data of interest on corresponding, multi-level surveys, and this was only available 76 treatment organizations, 209 treatment units, and 1906 staff members. The rate of missing data for most indices was low (5% or less), but higher (17%) for report of one client population characteristic (% court-referred). Second, the dually-conceptualized SOF constructs as shared staff perceptions (means among clinic staff) and individual staff perceptions (Z-scores relative to other clinic staff) required presence of a minimum number of completed workforce surveys for inclusion of a given clinic. Consistent with prior CTN 0008 analyses reported by Fuller and colleagues (2007), an inclusion criterion of five or more completed workforce surveys per clinic was applied. This inclusion criterion reduced the current sample to 72 organizations, 169 treatment units, and 1,813 staff members.

2.4. Analytic Approach

Descriptive statistics (mean, SD, n, percent) were calculated for each predictor, as noted in Table 1. Frequency distributions and histograms were examined for continuous variables to assess normality and, where appropriate (i.e., annual revenues), log-transformed to reduce skew. Levels for some categorical variables (i.e., corporation type, staff education, clinic position) were informed by response distributions. To assess sample representativeness, univariate comparisons (Fisher's exact, Mann-Whitney U, chi-square, independent-samples t-test) were conducted on the dependent variable and predictors. Given 36 such comparisons, a significance criterion of $p < .005$ was applied to reduce likelihood of false positive findings in these tests.

Intraclass correlation coefficients (ICCs) were calculated for SOF indices to determine the ratio of variance at treatment unit- and staff-levels. The ICC is a ratio of variance of the observed responses at a given level to the total variance in responses (West *et al.*, 2007). SOF indices with a treatment unit-level ICC > 0.10 were eligible for inclusion in multivariate models as both treatment unit- and staff-level predictors. Those with a treatment unit-level ICC < 0.10 were considered only as staff-level predictors. ICCs for CM adoption attitudes were calculated to determine response variance attributable to organizations, treatment units, and staff. CM adoption attitudes were modeled utilizing three-level hierarchical linear models (Hox, 1995; West *et al.*, 2007) to account for the nested nature of these data.

Univariate analyses examined the association of each predictor and CM adoption attitude. Predictors at $p < 0.25$ were included in multivariate models, built in stages via backward selection as described by Hox (1995). Initially, all staff-level predictors were included, and those with Likelihood Ratio Test $p > .25$ were sequentially removed. This process was repeated to add or remove treatment unit- and organization-level predictors. In the final

multivariate model, only predictors at $p < 0.05$ were retained. Model diagnostics were evaluated to ensure the final model fit the data well. All analyses were conducted using SAS Version 9.22 (SAS Institute, Cary, NC), using PROC MIXED for all multi-level modeling.

3. Results

3.1. Sample Description and Representativeness

The current workforce sample ($n=1813$) ranged from 5–63 staff per treatment unit, and 1–7 treatment units per organization. Mean staff age was 44.21 ($SD = 11.11$), and 65.9% were female. Spanish, Hispanic or Latino ethnicity was reported by 9.0%. Racial distribution was: 71.4% White; 22.8% Black or African American; 0.9% American Indian or Alaska Native; 1.4% Asian; 0.3% Hawaiian or Pacific Islander; and 3.2% Multi-racial.

The current sample was representative of the original CTN 0008 trial on the dependent variable and 32 of 35 included predictors. In the current sample: 1) treatment units were less likely to be nationally accredited, $\chi^2(1) = 10.40$, $p = .001$; 2) lesser proportion of staff held managerial positions, and greater proportion held clinical positions, $\chi^2(2) = 44.78$, $p < .0001$; and 3) lesser proportion of staff had not obtained an associate, bachelor, or graduate degree, $\chi^2(2) = 38.81$, $p < .0001$. With respect to broad generalizability, prior research documents CTN-affiliated treatment organizations as large in terms of staff and patient census (Ducharme & Roman, 2009), likely to be non-profit corporations and accredited (Ducharme et al., 2007), and to have staff favorable attitudes about and exposure to evidence-based practice (Knudsen *et al.*, 2007a).

3.2 CM Adoption Attitudes

The range of weighted CM adoption attitude scores was 2.00–10.02, with a median of 5.38 and mean of 5.50 ($SD=1.85$). Variance in CM adoption attitudes between organizations was 0.30 and variance between treatment units was 0.18, whereas variance among staff within treatment units was 2.89. The percent total variance accounted for, as estimated by ICCs, was 9.0% by organizations, 5.4% by treatment units, and 85.6% by staff.

3.3 Modeling Analyses

In univariate analyses, the lone organizational predictor associated with CM attitudes (using $p < 0.25$ criterion) was annual revenue. Treatment unit predictors were: accreditation status, opiate agonist service provision, outpatient service provision, and % adolescents served, as well as shared perception of e-communication, organizational mission, organizational cohesion, organizational autonomy, and organizational stress (inverse). Staff predictors were: education, clinic position, and tenure, as well as idiographic perception of program needs, e-communication, staff growth, staff influence, organizational mission, organizational cohesion, organizational communication, and organizational openness to change.

After backward selection, no organization-level predictors remained. As Table 2 outlines, the remaining treatment unit-level predictors were accreditation status, opiate agonist service provision, and shared perception of organizational stress. Specifically, CM adoption attitudes were more favorable at treatment units that: 1) were non-accredited than at accredited treatment units ($\beta = -0.381$; $p = 0.0091$); 2) provided opiate agonist services than at those providing only drug-free services ($\beta = 0.363$; $p = 0.0101$); and 3) had lesser shared perception of stress than at those where greater stress was perceived ($\beta = -0.040$; $p = 0.0047$). Retained staff-level predictors were education, clinic position, tenure, perceived e-communication, and perceived openness to change (see Table 2). Favorable CM adoption attitudes were found among staff having: 1) a graduate degree relative to those with a bachelor/associate degree ($\beta = 0.378$; $p < .0001$) or high school diploma/less ($\beta = 0.726$; $p < .$

0001); 2) a management position relative to those in clinical ($\beta=0.316$; $p=0.0218$) and support positions ($\beta=0.260$; $p=0.0891$); 3) greater organizational tenure relative to those with briefer service ($\beta=0.045$; $p<.0001$); 4) perceived greater e-communication facility relative to co-workers ($\beta=0.154$; $p=0.0005$); and 5) perceived greater openness to change in clinical procedures relative to co-workers ($\beta=0.079$; $p=0.0674$). Model diagnostics did not reveal any anomalies, and it was determined that the final model fit the data well.

4. Discussion

Secondary analysis of multi-level survey data from CTN-affiliate treatment organizations specified influences of CM adoption attitudes. Multilevel modeling analyses revealed that, at a systemic level, treatment settings that are non-accredited, offer opiate agonist services, and have lesser shared perception of work-related stress had more favorable staff attitudes about CM. At an idiographic level, analyses revealed those who earned a graduate degree, held a managerial position, and provided longer-tenured service endorsed more favorable CM attitudes. Further, relative to co-workers, staff perceiving greater e-communication facility and openness to change in clinical practices endorsed more favorable CM attitudes. Several studies have evaluated systemic or idiographic predictors of CM attitudes, but the current effort is the first to also include evaluation of within- and between-clinic variance in indices of organizational culture.

Of the three systemic predictors of favorable CM attitudes, clinic provision of opiate agonist services may be least surprising given congruent prior finding by Ducharme and colleagues (2010) in a large national sampling of addiction treatment clinics. Favorable CM attitudes in such settings may result from operant conditioning principles inherent in federal regulations governing take-home medication doses. In this sense, CM already embodies Rogers' (2003) noted attributes of successful innovations—compatibility, relative advantage, trialability, and observability—in these settings. A second systemic predictor, absence of national accreditation, is also consistent with several prior reports (Bride et al., 2011; Ducharme et al., 2007; Fuller et al., 2007) but is nonetheless peculiar. Concurrence of the original CTN 0008 data collection (2002–2004) with accreditation transience for opiate treatment programs following SAMHSA's introduction of new accreditation requirements bears consideration (although our supplemental inclusion of an OAT provision X accreditation status interaction term in the multivariate model showed it was a nonsignificant predictor, $p>.35$).

The most novel finding among systemic indices was the association of shared perception of clinic stress and negative CM adoption attitudes. Organizational stress in addiction treatment may be attributed to numerous sources, but its link to counselor exhaustion is clear (Gallon et al., 2003; McLellan et al., 2003) as are links between counselor exhaustion and diminished health (Melamed et al., 2006) and work performance (Cropanzano et al., 2003; Taris, 2006). Further, counselor exhaustion and the consequent threat of staff turnover augment shared concerns about service quality and a treatment organization's financial viability (Barak et al., 2001; McLellan et al., 2003). Notably, shared perception of clinic stress predicted negative CM attitudes whereas idiographic perceptions did not. This is salient, as many clinics have less effective means for ameliorating shared stressors among staff than for intervening with a particularly-stressed staff member. Reluctance toward CM adoption may be understandable for such clinics given some uncertainty about its costs and sustainability. To the extent that CM adoption parallels the process of formal research trial participation, there is evidence to suggest that the prospective clinic benefits of such adoption be underscored to alleviate likely shared sources of perceived stress among staff (Knudsen et al., 2007b).

Three of the five idiographic predictors of favorable CM attitudes—education, position, and tenure—often co-vary, as managerial positions are held by more educated, long-standing staff at many clinics. Relative to the original CTN 0008 sample, fewer managers and greater overall education were currently present. Even so, staff with this trio of attributes hold broad clinic influence given common managerial responsibilities for clinical supervision, instrumental social support, and distributive and procedural justice among staff (CSAT, 2007; Eisenberger *et al.*, 2002; Knudsen *et al.*, 2008). Accordingly, most are opinion leaders who shape others' attitudes about treatment innovations like CM (Rogers, 2003). System values have strong moderating effects on opinion leaders' support of innovations (Rogers, 2003), so CM advocates may enhance their efforts by identifying a clinic's opinion leaders and its prevailing values.

The remaining predictors, e-communication facility and openness to change, are novel findings as both reflect staff members' perceptions relative to co-workers. E-communication facility, which Fuller *et al.* (2007) linked to positive views of several treatment innovations, may enable particular staff to acquaint themselves with CM precepts and procedures via on-line addiction journals or blending product (NIDA/SAMHSA, 2007). Openness to new clinical methods, also associated with client measures of treatment satisfaction and perceived rapport (Lehman *et al.*, 2002), is similar in concept to adoption readiness—a construct highlighted in most prevailing implementation science models (Damschroder & Hagedorn, 2011; Greenhalgh *et al.*, 2004). Initial openness to learning about CM may spur examination of its advantages over existing practices and its compatibility with clinic needs and values, as well as the complexity, trialability, and observability of specific CM procedures. To the extent that such initial openness leads particular staff to become learned about CM before their co-workers, this attribute may be a helpful way to identify change agents in organizational adoption processes (Rogers, 2003).

Findings should be considered only with recognition of caveats. This secondary analysis is bound by limitations of the original trial noted by McCarty *et al.* (2007, 2008), namely a cross-sectional assessment and nonrandom sampling of treatment organizations. Thus, findings do not account for potential historical changes and may have limited generalizability. Potential for selection bias is amplified by sample reduction wherein included clinics were less likely to be accredited and staff were more likely to hold clinical positions and post-secondary degrees (the sample was representative on the 33 other indices examined). Sample reduction was necessary, given that the analytic approach required presence of complete data and that conceptualization of SOF indices required a minimum number of staff per clinic to establish between- and within-clinic variance. Current sample characteristics should be considered when interpreting findings. Further caveats include reliance on self-report survey methods, use of an attitudinal index rather than a direct measure of CM adoption, and absence of other constructs as potential predictors (e.g., staff exhaustion and turnover). Given the described range of CM adoption barriers, the three-item dependent variable may not encompass all practical and philosophical issues one faces in considering CM adoption. The index was identified via factor analysis, psychometrically sound, and computed as a weighted sum according to established factor loadings of constituent items. Still, its conceptual limitations are acknowledged. A final caveat is the potential impact of multicollinearity, given a number of semantically-related SOF predictors in modeling analyses. Inter-correlations of SOF were moderate (Pearson $r = .40-.69$), and all predictors were initially evaluated via univariate testing with an inclusive selection criterion ($p < .25$). Still, a possibility of unwanted suppressive effects in the modeling analyses remains.

Caveats notwithstanding, the current work furthers understanding of the confluence of systemic and idiographic influences of CM attitudes. Many dissemination challenges are

well-documented (Kirby et al., 2006; Petry & Simcic, 2002); however, to the extent that positive attitudes are a proxy for successful innovation adoption and implementation, these findings offer practical direction for decisions about CM. First, the number and variety of identified predictors suggests tailoring implementation processes to a given clinic and its personnel is more likely to be effective than a one-size-fits-all approach. Clinics may be best served by joining with an experienced consultant for guidance, and published accounts of such collaborative endeavors provide blueprints or precautions (Henggeler *et al.*, 2008; Kellogg *et al.*, 2005; Walker et al., 2010). Also, clinic-level predictors can guide decision-makers. That is, CM should be strongly considered if a clinic offers opiate agonist services—with thought given to amending incentive structures for take-home doses and other clinic privileges to better shape treatment adherence among clients. Conversely, if staff perceptions reflect elevated stress, CM adoption appears contraindicated. For clinics planning to adopt CM, staff-level predictors can guide decisions about whom to designate in implementation roles. Educated, longer-tenured managers are not only likely to support CM adoption, but often are opinion leaders who shape co-worker attitudes and may be groomed as champions. Staff with e-communication savvy are well-suited for roles capitalizing on their technological know-how (i.e., coordinating interface of CM with medical records system). Likewise, staff with particular openness to change may be useful in preliminary data-gathering processes (i.e., local incentive options, cost analyses, procedural planning).

It is hoped that current findings may spur further research into how effectively CM (and other empirically-supported practices) transition from academic innovators to the treatment community. Such research may, for instance, formally evaluate the utility of CM dissemination processes and products, including: 1) promotional efforts intended to raise awareness of its feasibility and efficacy, 2) workshop trainings to develop implementation skills, 3) supervision processes to cull staff competencies for effective, durable implementation, and 4) only recently-available resources and products (i.e., MI:PRESTO) that automate implementation procedures. In addition to examining changes in implementation skills over the noted processes, potential change in intrapersonal staff dimensions (i.e., attitudes, self-efficacy to implement) also merit focus. Further research may also tap CM attitudes among treatment clientele and 3rd-party payers, whose incentive preferences may be informative. Current findings regarding the identified systemic and idiographic predictors, taken together with a healthy respect for their variability between and within clinics, may inform future research in all of these areas. Through systematic evaluation of CM transportability, broader and more successful adoption of this empirically-supported behavior therapy may be achieved.

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Table 1

Organization-, Treatment Unit-, and Staff-Level Sample Characteristics

Sample Characteristic	Type of Variable	%	Mean	SD	Range
Organization-level					
Corporation Type	Categorical				
For profit		6.9	--	--	--
Not for profit		93.1	--	--	--
Annual Revenue	Continuous, \$	--	\$6.8M	\$7.7M	\$0.2M–43.0M
Treatment-Unit-level					
Opiate Agonist Services	Dichotomous (yes)	30.1	--	--	--
Outpatient Services	Dichotomous (yes)	74.6	--	--	--
Detoxification Services	Dichotomous (yes)	40.2	--	--	--
National Accreditation	Dichotomous (yes)	56.2	--	--	--
Court-Referred Clients	Continuous (%)	--	9.9	17.0	0.0–95.0
Adolescent Clients	Continuous, (%)	--	24.3	33.5	0.0–100.0
Program Needs*	Continuous (Scales)	--	31.4	3.5	17.5–40.0
Use of E-Communication*	Continuous (Scales)	--	29.6	5.8	15.0–40.4
Staff Growth*	Continuous (Scales)	--	35.0	3.0	23.7–43.0
Staff Efficacy*	Continuous (Scales)	--	38.9	1.9	33.2–43.3
Staff Influence*	Continuous (Scales)	--	35.4	2.1	28.5–43.3
Staff Adaptability*	Continuous (Scales)	--	38.5	1.8	32.5–42.3
Organizational Mission*	Continuous (Scales)	--	35.2	3.2	28.5–43.3
Staff Cohesion*	Continuous (Scales)	--	34.2	5.2	16.7–44.6
Staff Autonomy*	Continuous (Scales)	--	34.2	3.1	27.0–43.3
Staff Communication*	Continuous (Scales)	--	32.4	3.9	22.7–42.5
Organizational Stress*	Continuous (Scales)	--	32.3	4.6	18.1–45.0
Openness To Change*	Continuous (Scales)	--	33.3	2.8	25.7–40.4
Staff-level					
Position	Categorical (type)	61.3	--	--	--
Clinical					

Sample Characteristic	Type of Variable	Descriptive Statistics			
		%	Mean	SD	Range
Support		27.7	--	--	--
Management		11.0	--	--	--
Organizational Tenure	Continuous (yrs)	--	5.1	5.5	0.0–32.0
Education	Categorical (degree)				
Doctoral or Masters		38.0	--	--	--
Bachelor or Associate		38.9	--	--	--
High School or None		23.2	--	--	--
Program Needs*	Continuous (Scales)	--	31.5	8.2	10.0–50.0
Use of E-Communication*	Continuous (Scales)	--	29.8	10.1	10.0–50.0
Staff Growth*	Continuous (Scales)	--	35.0	6.4	12.5–50.0
Staff Efficacy*	Continuous (Scales)	--	38.9	5.0	20.0–50.0
Staff Influence*	Continuous (Scales)	--	35.3	6.2	10.0–50.0
Staff Adaptability*	Continuous (Scales)	--	38.5	5.0	17.5–50.0
Organizational Mission*	Continuous (Scales)	--	35.0	6.6	10.0–50.0
Staff Cohesion*	Continuous (Scales)	--	33.9	8.5	10.0–50.0
Staff Autonomy*	Continuous (Scales)	--	34.0	5.8	12.5–50.0
Staff Communication*	Continuous (Scales)	--	32.1	7.6	10.0–50.0
Organizational Stress*	Continuous (Scales)	--	32.4	8.4	10.0–50.0
Openness to Change*	Continuous (Scales)	--	33.2	6.3	10.0–50.0

Table Notes. * Survey of Organizational Functioning (SOF) items from the Lehman et al (2002) instrument version were rated on 5-point scale (5 = Strongly Agree, 1 = Strongly Disagree), with the noted indices computed as mean of subscale items multiplied by 10 per more recent SOF scoring instructions (ICU Institute of Behavioral Research, 2008); SOF indices at treatment-unit level reflect distribution of mean scores for treatment-units computed from corresponding completed workforce surveys whereas SOF indices at staff-level reflect distribution of individual scores from the aggregate sample.

Table 2

Organization-, Treatment Unit-, and Staff-Level Predictors of CM Adoption Attitudes

Variable	β	SE	95% CI	p
Intercept	7.225	0.507	6.21 – 8.24	<0.0001
Organization-Level				
None				
Treatment Unit-Level				
Opiate Agonist Services	0.363	0.141	0.09 – 0.64	0.0101
National Accreditation	-0.381	0.146	-0.67 – -0.09	0.0091
Organizational stress	-0.040	0.014	-0.07 – -0.01	0.0047
Staff-Level				
Position				0.0711
Management vs. Clinical	0.316	0.138	0.05 – 0.59	0.0218
Management vs. Support	0.260	0.153	0.04 – 0.56	0.0891
Tenure	0.045	0.008	0.03 – 0.06	<0.0001
Education (degree obtained)				<0.0001
Graduate vs. Bachelor/Associate	0.378	0.095	0.19 – 0.56	<0.0001
Graduate vs. High School/Less	0.726	0.114	0.50 – 0.95	<0.0001
E-communication	0.154	0.044	0.07 – 0.24	0.0005
Openness to Change	0.079	0.043	-0.01 – 0.16	0.0674

Table Notes. All predictors as indicated in Table 1. SE=Standard error; CI=Confidence interval. Retained predictors were associated with CM adoption attitudes in both univariate analyses ($p < .25$) and multivariate modeling analyses ($p < .10$). For staff-level position, the reference group for the indicated analysis was management. For staff-level education, the reference group for the indicated analysis was graduate.