Lost in translation? Moving contingency management and cognitive behavioral therapy into clinical practice

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Abstract

In the treatment of addictions, the gap between the availability of evidence-based therapies and their limited implementation in practice has not yet been bridged. Two empirically validated behavioral therapies, contingency management (CM) and cognitive behavioral therapy (CBT), exemplify this challenge. Both have a relatively strong level of empirical support but each has weak and uneven adoption in clinical practice. This review highlights examples of how barriers to their implementation in practice have been addressed systematically, using the Stage Model of Behavioral Therapies Development as an organizing framework. For CM, barriers such as cost and ideology have been addressed through the development of lower-cost and other adaptations to make it more community-friendly. For CBT, barriers such as relative complexity, lack of trained providers and need for supervision have been addressed via conversion to standardized computer-assisted versions that can serve as clinician extenders. Although these and other modifications have rendered both interventions more disseminable, diffusion of innovation remains a complex, often unpredictable process. The existing specialty addiction treatment system may require significant reforms to fully implement CBT and CM, particularly greater focus on definable treatment goals and performance-based outcomes.

Keywords

Contingency management; cognitive behavioral therapy; dissemination; Stage model

Over the past 30 years, enormous resources and scientific effort have been devoted to the development of effective treatments for addiction. This public health problem affects over 25 million Americans and their families with estimated annual costs of more than $180 billion[1] for medical care, lost productivity, and criminal justice system burdens. It is therefore of note that significant developments have been made in the development of effective behavioral and pharmacologic treatments for a range of addictions[2]. Important gains have been made in the pharmacologic treatments of opioid and alcohol dependence. For opioid dependence, methadone maintenance treatment and more recent adoption of buprenorphine and depot formulations of naltrexone, have had significant effects on extending the reach of treatment for heroin and prescription opioid use, significant problems in the US and globally[3, 4]. In the treatment of alcohol use disorders, newer medications such

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as naltrexone and acamprosate have been approved and are becoming more widely available. [5–7] However, for some of the most commonly used abused substances, such as marijuana and cocaine, there are as yet no broadly effective or approved medications.

Important gains have also been made with respect to the development of effective behavioral therapies. Multiple behavioral therapies have been demonstrated to be effective[2, 8] and to improve outcomes when combined with medication.[9] Effective therapies include brief motivational approaches,[10–15] structured family approaches,[16, 17] and two that will be the subject of this review: contingency management and cognitive behavioral therapy.[18]

To date, however, most these evidence-based approaches have not yet become broadly implemented or adopted in clinical practice,[2, 19] for multiple reasons. Of the minority of individuals with drug or alcohol use disorders who receive treatment,[20, 21] only a small proportion receive treatment provided in accordance with practice guidelines and current scientific knowledge.[22, 23] The addiction treatment system operates independently from the general health care system, with the bulk of services delivered by independent practitioners or within specialty addiction treatment settings.[24, 25] This specialty addiction treatment system, primarily supported through public financing (Medicaid, block grants to states) has been underfinanced for decades,[26] leading to a number of systemic problems and limitations:[19] caseloads in community based clinics tend to be high. Waiting lists for residential or intensive programs tend to be long. Few clinics have the resources to address diverse patient needs, notably comorbid psychopathology or medical problems. Clinicians have limited ability to individualize treatments, as most clinical services provided in groups. Many programs lack medical personnel,[27, 28] precluding availability of medications in many settings and perpetuating underutilization of available pharmacotherapies. [6, 23] The non-medical clinical workforce tends to be poorly paid and has high rates of turnover. [29] Training of this non-medical clinical counselor workforce infrequently includes adequate training in evidence-based treatments[30, 31] Attitudes of veteran counselors toward evidence based therapies remain mixed.[32–34] These systemic problems result in an inauspicious environment for the adoption of novel approaches and assumption of their associated costs. Despite these barriers, some empirically validated approaches have had comparative success in penetrating the system in recent years.

Motivational interviewing (MI) [35] has been embraced by the clinical community and adopted[1] fairly widely,[25] at least relative to other approaches. Diffusion of MI from research to clinical settings was guided by Roger's model of diffusion of innovation model, [36] emphasizing factors associated with perceived advantage, compatibility with current practice, simplicity and ease of use, and trial ability; for example, approaches that allow a program to sample of the innovation before deciding to adopt it). MI is now implemented broadly across the US and internationally, fostered by a large network of trainers (Motivational Interviewing Network of Trainers), training resources (books, video examples, adherence measures), international conferences (see motivationalinterviewing.org), and results of research trials that have evaluated methods and

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[1]Adoption as used here is consistent with Rogers definition, "…a decision to make full use of an innovation as the best course of action available" (p. 21).

strategies for training clinicians to learn and use MI effectively in a range of settings (see Refs. 37–41). As interpreted through Roger's S-curve model of the process of adoption of an innovation,[36] MI adoption may be reaching a plateau, slowly leveling out after a steep climb of rapid acceptance by a large number of clinicians and providers after it was initially adopted by early innovators.[42]

In contrast, CM and CBT have made less progress in terms of diffusion to clinical practice. They remain in the early flat section of the S curve, adopted in some settings but unavailable in most. Both appear well-poised for dissemination. CM and CBT both display ample scientific evidence pointing to their efficacy, have been shown to be broadly effective across a range of addictions and related problems, are safe with few or no adverse events traced to their implementation,[43] and are highly compatible with available pharmacotherapies (often demonstrating synergistic effects in combination).[44, 45]

Relative to MI, adoption of CM and CBT in clinical practice in the addictions has progressed more slowly. Each of these approaches appears to require a number of adaptations to fit the existing specialty care and health systems. This review will focus on barriers to dissemination and other factors underlying this comparatively slow progress. I will trace the paths of development of these two interventions from their initial development and validation to current efforts to foster their translation to clinical practice, using the Stage Model of Behavioral Therapies Development[46] as an organizing model. Remaining barriers to broader clinical adoption of CM and CBT will also be described. Health care reforms associated with the Affordable Care Act may provide a window for making these effective approaches more available to those who may benefit from them.

Overview: the Stage Model

The development and dissemination of both CM and CBT was fostered and accelerated by NIDA's Stage Model of Therapy Development (the Stage Model[46]). This model for development of behavioral interventions from basic behavioral research to interventions capable of being delivered in a range of clinical settings was innovative in the arena of behavioral therapies research because it articulated a series of stages that parallel the medications development process for novel pharmacotherapies. The Stage Model was also novel in defining an iterative process for addressing the multiple points where novel interventions were likely to fall off the implementation cliff,[47] including acceptability by clinicians, payors, and patients.

Briefly, Stage I includes initial development and pilot/feasibility testing of new or untested treatments. Stage II consists principally of randomized controlled clinical trials of interventions that have shown promise or efficacy in initial studies. Stage III addresses issues of transportability of treatments whose efficacy has been demonstrated in at least two Stage II trials[48]. Recent refinement of the Stage Model[47] emphasizes that treatment development is not complete until an intervention reaches its highest level of efficacy and is can be implemented for the maximum number of people in the population for which it was developed. Thus, issues such as training of clinicians, provision of ongoing fidelity monitoring with supervision, and adaptation of the intervention to address the realities of

clinical care while retaining its active ingredients figure prominently in the later stages of treatment development. Later stages emphasize maximizing external validity (effectiveness research in Stages III and IV) by testing interventions in community clinics with delivery by community providers. Implementation and dissemination research define the final Stage V.[49]

This model has proven useful as a framework for intervention development because it makes explicit that different research questions are relevant to each stage of a treatment's development. The model then articulates appropriate research paradigms for each level of development. As described in the sections below, the development and dissemination of CM and CBT show how the Stage model can be used to organize programs of research on novel behavioral therapies by moving them from early translational research to broad implementation.

Contingency management

Stage I research in contingency management

Contingency management approaches have strong scientific bases in operant conditioning and in systematic analysis of behavior.[50] These approaches have central tenets: (1) behaviors (including substance use) that are reinforced are likely to be repeated, and (2) drug and alcohol use can be sensitive to environmental consequences.[50] As applied to illicit drug and alcohol use, contingency management approaches arrange systematic application of behavioral consequences in order to change target behaviors.

Contingency management procedures were first implemented in United States addiction treatment in the context of methadone maintenance programs. Two key features of methadone maintenance fostered initial research on the efficacy of contingency management in this setting. First, daily delivery of methadone allowed frequent monitoring of illicit drug use and abstinence via regular urine toxicology screens. Second, the availability of natural rewards in this environment (e.g., take home bottles and other desirable clinic privileges) made it possible to meaningfully reward positive behavior change at relatively low cost. Bigelow, Stitzer, and their colleagues[51, 52] pioneered the evaluation of methadone take-home privileges as a reward for decreased illicit drug use. In a series of well-controlled trials, these researchers demonstrated: (1) the relative benefits of positive (for example, rewarding desired behaviors such as abstinence) compared with negative (for example, punishing undesired behaviors such as continued drug use through discharges or dose reductions) contingencies;[53] (2) the attractiveness of take-home privileges over other incentives available within methadone maintenance clinics;[51] and (3) the relative effectiveness of rewarding drug-free urine specimens compared with other target behaviors.[54]

Another early set of studies evaluated contingency management with focus on enhancing adherence to naltrexone. This was important. Despite the many potential advantages of naltrexone opioid antagonist treatment, including its nonaddicting nature, benign side effect profile in abstinent individuals, low risk of diversion and potential cost savings, naltrexone treatment programs remained comparatively rare and underutilized as compared to

methadone maintenance programs.[55] This was largely due to problems with retention. During the induction phase, about 40% of patients drop out during the first month of treatment and 60% drop out by three months.[56] In the 1970s, preliminary evaluations of behavioral interventions used to address naltrexone's weaknesses, including providing financial incentives for compliance with naltrexone,[57, 58] suggested the promise of these strategies. However, these interventions were not widely adopted. Compliance remained a major problem. Naltrexone treatment and research thus dropped off considerably until the recently, when long acting depot formulations became available.[4]

Stage II

Until the 1980's, contingency management approaches remained largely limited to methadone maintenance and inpatient programs, as natural reinforcers were not as studied in outpatient treatment settings. There has been no effective pharmacotherapy for cocaine use disorder. The need for a potent behavioral approach to address epidemic-level cocaine dependence was addressed by Stephen Higgins and his colleagues at the University of Vermont. Drawing from the Community Reinforcement Approach of Azrin and colleagues,[59] Higgins developed a novel system of behavioral incentives for cocaine abstinence that had four organizing features grounded in principles of behavioral pharmacology: (1) drug use and abstinence must be swiftly and accurately detected, (2) abstinence must be positively reinforced, (3) drug use must result in loss of reinforcement, and (4) emphasis is placed on the development of reinforcers to compete with drug use.[60, 61] In this approach, urine specimens are required three times weekly to systematically detect each episodes of drug use, based on the half-life of readily-detectable cocaine metabolites that are excreted in the urine. Abstinence, verified through drug-free urine screens, is reinforced through a voucher system in which patients receive points redeemable for items consistent with a drug-free lifestyle (e.g., movie tickets, music downloads, small personal items). Third, a key feature of this approach is that number of points earned increases with each consecutive cocaine-free urine specimen submitted, thus encouraging periods of sustained abstinence. Finally, cocaine use results in loss of reinforcement, in that submission of a cocaine-positive specimen, or failure to submit a specimen at the scheduled time, results in loss of reinforcement. When this occurs, earned points are reset to their starting values.[60]

In a series of well-controlled clinical trials, Higgins demonstrated high acceptance, retention, and rates of abstinence for patients receiving this approach, when compared with results of standard counseling oriented toward Twelve Step programs.[61] Moreover, Higgins demonstrated that rates of abstinence do not decline substantially when less-valuable incentives are substituted for the voucher system.[62] The value of the voucher system itself, in producing good outcomes, as opposed to other program elements, was demonstrated by comparing the behavioral system with and without vouchers.[63] Although the strong within-treatment effects of CM decline somewhat after the contingencies are terminated, the voucher system has been shown to have durable effects[64]. Individuals who display longer sustained periods of abstinence within treatment tend to have better long term outcomes after treatment ends.

Following Higgins' initial work, the efficacy of a wide variety of CM procedures was replicated in other settings and samples. Taken together, this body of research highlights the consistency and robustness of the effects of CM. For example, Silverman and colleagues have demonstrated impressive sustained effects of a reinforcement-based therapeutic workplace. Illicit drug users gain entry to paid employment contingent on submission of drug-free urines prior to entering the workplace.[65–67] Milby and colleagues demonstrated efficacy of providing housing for homeless substance users contingent on demonstrating abstinence on submitting drug-free urines.[68–70] Silverman and Higgins demonstrated the efficacy of CM on reducing cocaine dependence within methadone maintenance programs.[71, 72] These approaches have also proven effective in adolescent populations. Krishnan-Sarin and colleagues have demonstrated the efficacy of CM procedures, delivered on-site in high schools, to reduce adolescent smoking.[73, 74] The work by Henggeler and colleagues in implementing CM alone or as a component of Multisystemic Therapy (MST) in state systems supports dramatic improvements in this challenging population.[17, 75–81]

CM procedures have also been demonstrated to address other critical challenges in healthcare, including medication adherence. Even the most potent pharmacotherapy will be ineffective if the patient doesn't take it as prescribed.[82] CM has been shown to enhance compliance with medications for HIV among drug users,[83–85] and to enhance retention and adherence in naltrexone programs.[86–88] The power of CM to enhance compliance is underscored by a recent meta-analysis of 21 studies in which CM had been used to enhance medication adherence in tuberculosis, stroke prevention, schizophrenia, substance use, and HIV treatments. There was a large overall effect (average effect size = 0.77), [89] with larger effects for longer durations of reinforcement, larger incentive magnitude, and more frequent (at least weekly) reinforcement. CM may also be used to address key problems in other areas of medicine. A recent pilot by our group demonstrated that CM could be used to reinforce abstinence from cigarettes in cancer patients waiting for thoracic or throat surgery.[90] Abstinence in this setting is especially desirable as continued cigarette use is a risk factor for postsurgical complication and poor outcomes. Finally, recent work by Higgins further suggests the broader effects of CM interventions.[91, 92] Clinical trials of voucher based CM among pregnant women who smoke produced robust effects of CM on reduction of cigarettes use during and after pregnancy, and on birthweight of the infants.[93, 94]

Stage III and beyond

The studies reviewed above underscore the power of CM interventions in wide range of health behaviors. A growing number of meta-analyses show few other behavioral interventions that have such consistent and robust effects on behavior.[18, 95–97] Thus, the relative scarcity of CM interventions in clinical practice is especially notable. In systematic surveys of clinicians and program directors, the most frequently-cited obstacles to implementing CM in clinical practice include the relatively high cost of the rewards/incentives, ideological issues (e.g., paying drug users to do the right thin), practical considerations that include the limited use of frequent urine screens to verify abstinence by many clinical programs, and limited knowledge of and training in CM.[48, 98–101]

These and related issues characterize much of Stage III research, where investigators attempt to move novel treatments to the clinic and hit the implementation cliff full on. These obstacles typically revolve around issues of generalizability (Will this treatment work with different patients and in different settings?), implementation (What kind of training and what kinds of trainers are necessary for what kinds of clinicians to learn this new technique?), cost (Compared with the costs of implementing the new treatment, what are the savings, particularly in comparison to existing methods?), and acceptability (How acceptable is a new treatment to both clinicians, patients, and payers outside of research settings?). [48, 102]

Nancy Petry's work exemplifies an elegant and systematic approach to addressing these Stage III issues. To address issues of cost, Petry developed a lower-cost variable ratio reward system. She demonstrated that a variable ratio schedule of reinforcement that provides access to large reinforcers (with low probabilities) is effective in retaining patients in treatment and reducing substance use. Rather than earning vouchers, patients earn the chance to draw from a bowl and win prizes of varying magnitudes. The prizes are stored on-site for immediate delivery. Prizes range from small $1 items (bus tokens, McDonald's coupons) to larger $20 prizes (portable radios, watches, and phone cards), to jumbo $100 prizes (for example, small televisions). As in the Higgins system, sustained periods of abstinence are encouraged: the number of chances to draw from the fishbowl increases with each consecutive drug-free urine sample submitted. This prize system is less expensive than the standard voucher system. Only a proportion of behaviors are reinforced with a prize, and the magnitude of most prizes is small. Efficacy of CM has been retained. In a study of 42 alcohol-dependent veterans who were randomly assigned to standard treatment or standard treatment plus CM, 84% of the CM subjects were retained in treatment throughout an eight-week period, compared with 22% of standard treatment subjects. By the end of the treatment period, 69% of those receiving CM had not experienced a relapse to alcohol use, but only 39% of those receiving standard treatment were abstinent.[103] There were similar findings in a subsequent trial with cocaine abusers.[104]

These initial studies were followed by others that systematically addressed key questions regarding breadth, feasibility, and utility of CM procedures when implemented in community treatment programs.[105–107] For example, Petry demonstrated the efficacy of this procedure in reinforcing retention in HIV drop-in centers,[108] in reinforcing alternative goals[109] and in a range of desired outcomes.[110–114] Responding to concerns by community programs that urine specimens are collected much more frequently in CM programs than in standard clinical practice, Petry demonstrated that for patients in outpatient treatment who started treatment while abstinent (e.g., the initial urine submitted was negative for cocaine), reinforcing retention alone is as effective, and less expensive, than reinforcing abstinence.[115, 116] Since most outpatient treatment in the US is delivered in groups, Petry demonstrated that CM could be effectively integrated into group settings.[117, 118] Later studies demonstrated that significant levels of abstinence could be achieved among cocaine using samples with magnitudes of reinforcement as low as $200 per participant,[119] and that lower cost prize based systems were as effective, or more effective, than voucher based reinforcement at comparable reinforce magnitudes.[120, 121] Concerns from providers that drawing prizes from the fishbowl could increase gambling were addressed with evidence that these CM procedures did not increase gambling.[43, 122, 123] In response to concerns that

CM procedures were too complex for delivery by community providers, Petry conducted training studies indicating the efficacy of CM is retained when delivered by community providers. She and others noted that training in CM procedures improves clinicians' attitudes toward CM.[124][80] Henggeler and colleagues have conducted similar work on implementing CM within large state-wide systems for adolescent treatment,, demonstrating that with adequate support by clinical leadership and access to resources, community based clinicians can implement CM.[78, 80]

Issues of acceptability of CM in community settings were addressed in large part by the NIDA Clinical Trials Network (CTN),[125–127] a national research-provider partnership that conducts effectiveness research via testing empirically validated therapies in community based settings. The efficacy of adding CM to standard treatments that targeted stimulant use (cocaine and methamphetamine) was evaluated in two CTN multisite trials conducted in 8 outpatient drug free settings and 6 methadone maintenance settings.[126] Although implemented at a lower magnitude of reward than the studies that established the efficacy of this approach, the addition of CM to standard treatment provided significant benefits in retention and abstinence.[128, 129] This national study provided a platform for a range of programs and clinicians to gain experience with CM procedures. There were high levels of enthusiasm and demonstrable changes in attitudes regarding use and efficacy of CM among providers exposed to this approach.[130] Training materials geared toward facilitating implementation of CM procedures as implemented in the CTN and other in clinical settings are available through a series of blending materials developed in partnership with SAMHSA,[127] and can be downloaded at http://www.bettertxoutcomes.org/bettertxoutcomes/.

CTN studies of CM also provided a platform to address the cost of incentive. In a series of studies on the cost-effectiveness of CM procedures in community programs, CM was associated with increased cost and effectiveness ($148–258 per additional week of abstinence, with lower costs in methadone versus outpatient settings).[131–133] Since the CTN trials, a number of the participating programs have adopted CM procedures using novel strategies to acquire prizes.[134]

Given the severe constraints of funding within the US addiction treatment, the cost of CM procedures, however effective, remains an obstacle to implementation in many settings. These costs are not reimbursed by many state, Medicare, or private insurers, a point to which we will return in the final section of this review. However, as health care reform leads to greater focus on improved quality and cost constraints, health care systems that are responsible for the overall health of their patients have begun adopting CM. CM is now recognized and has been adopted as a standard treatment in the United Kingdom National Health Service through NICE guidelines.[135] The US Veterans Administration recently initiated implementation of CM procedures in 108 VA stations, providing intensive training and direct support for purchase of incentives, urine testing, and other costs of CM.[136] VA clinical staff trained in CM through this initiative has demonstrated high acceptance and readiness to implement CM.[137] Given that the VA is the largest healthcare system in the country, the results of this trial will have important implications for wider adoption of CM in healthcare systems.

Cognitive behavioral interventions

Stage I and II

The challenges of implementing CBT in clinical practice in the addictions differ from those faced by either CM or MI. CBT has had broader acceptability within the addiction field and throughout psychiatry for many years. It is generally held to be among the most effective behavioral approaches for a range of psychiatric disorders. [138] A comprehensive CBT model for the addictions was first developed by Marlatt and colleagues,[139, 140] adapted in part from cognitive behavioral approaches developed for depression and anxiety disorders[141] and based on principles of behavioral pharmacology and learning theory. Following initial validation in alcohol-users,[142] CBT has been shown to be effective across a wide range of substance use disorders, including marijuana, cocaine, and nicotine dependence.[18, 143] CBT is compatible with a number of other treatment approaches, including pharmacotherapy[144, 145] and traditional counseling approaches.[146]

As applied to addictions, two key defining features of CBT are (1) an emphasis on functional analysis of drug use, understanding its antecedents and consequences, and (2) emphasis on skills training. These typically include strategies for: (1) understanding the patterns that maintain drug use and developing strategies for changing these patterns; (2) understanding craving, craving cues, and the development of skills for coping with craving; (3) recognizing and challenging the cognitions that accompany and maintain patterns of substance use; (4) increasing awareness of the consequences of even small decisions (e.g., which route to take home from work), and the identifying seemingly irrelevant decisions which can culminate in high risk situations; (5) development of problem solving skills, and practicing application of those skills to substance-related and more general problems; and (6) developing skills for assertively refusing offers of drugs, as well as reducing exposure to drugs and drug-related cues. These skills are useful in their application to helping patients control and stop substance use. They also provide building blocks for effective behavior in multiple contexts.[147] For example, skills used to cope with craving can easily be applied to other aspects of affect control, the principles used in the sessions on seemingly irrelevant decisions are use can easily be adapted to improve decision making skills, and substance use refusal skills can easily be transferred to more effective and assertive responding in a number of situations.

Although acceptability of CBT is relatively high, multiple lines of evidence suggest that effective implementation of CBT in many substance abuse treatment settings is comparatively rare.[148] CBT interventions are often implemented at much lower levels of fidelity and skill than those seen in efficacy trials. Our program of systematic research on CBT as guided by the Stage model illustrates how treatments can be adapted to better fit clinical practice through an iterative process.[149] Stage 1 work focused on defining and manualizing CBT [150] for drug addiction, leading to its initial validation as treatment for illicit drug use.[151–153] Project MATCH,[154] a large multisite trial of behavioral therapies for alcohol use disorders, set standards for therapist training and implementation in addiction treatment trials that allowed CBT to move rapidly into Stage 2.

Stage 2 efficacy research in CBT for the addictions focused on efficacy research. It chiefly involved comparisons of CBT with other therapies that included supportive counseling, contingency management,[154–157] and pharmacotherapies that included desipramine[156] and disulfiram.[158, 159] An important finding to emerge from this work was the delayed emergence of effects of CBT relative to other therapies (a sleeper effect).[160, 161] Subsequent work emphasized identification of processes and strategies that might underlie the durability that provides one of the most salient aspects of CBT. Learning, practice, mastery and generalization of strategies for fostering cognitive and behavioral control over substance use emerged as prime candidates.[162]

As the efficacy of CBT was established by a number of groups and settings,[163–169] a general observation was that was that the overall level of adherence to CBT, as detected by independent evaluators rating session,[170, 171] was lower than expected. This occurred even when CBT was delivered by carefully trained, closely supervised therapists and despite clear discriminability of CBT and comparison treatments.[171, 172] The correspondence of therapists versus independent rater's assessments of adherence was quite low in multiple studies. Therapists consistently report much higher levels of adherence and integrity than do independent raters of the same sessions.[173, 174175] Several studies evaluating treatment fidelity in the Clinical Trials Network found that clinicians routinely reported that CBT was an key component of the treatment they routinely provided[176] and independent fidelity raters found that, interventions associated with were virtually undetectable.[148, 177] Thus, implementation and fidelity emerge as key issues for dissemination of CBT in clinical practice.

Stage III

Appreciation of the difficulty and cost of delivering reasonably large doses of CBT in clinical practice was further heightened by results of Stage III dissemination/efficacy research. Recognizing that many substance use clinicians in community settings received no formal training or certification in CBT or other empirically validated approaches,[26, 30, 31] we evaluated the efficacy of different training strategies in bringing community based, predominantly masters-level counselors, to levels of fidelity and skill equivalent to those achieved in efficacy trials In this randomized training trial,[178] 78 community-based clinicians were randomized to three training conditions (CBT manual only, interactive website, or 3-day didactic seminar in CBT with supervision via feedback on session tapes). Before training, independent ratings of mock CBT session indicated this low baseline levels of adherence and competence in CBT.[178] Combined didactic training and supervision, the classic clinical trials model provided the only training condition that brought the majority of clinicians to levels of adherence and competence appropriate for a randomized clinical trial. This training procedure was also the most expensive to provide. Similar findings regarding the relative efficacy of intensive didactic training followed by performance monitoring and feedback have been found by others, including Miller's work on training clinicians in motivational interviewing[41] and Rawson's work in CBT counselor training in South Africa.[179]

Regardless of the effectiveness of these and similar methods of training community clinicians to implement CBT and other EBTs,[40, 41, 180–182] high rates of turnover in clinical programs and the lack of available supervision on EBTs in clinical practice[29, 183] suggest these approaches may not be feasible when taken to scale. Thus, many years of work resulted in identification of multiple barriers to implementing CBT in the addiction treatment system with adequate levels of fidelity and standardization. These include very high caseloads and administrative demands on clinical staff, their limited time for focus on individual patients; the tendency for most outpatient care to be delivered in group settings that dilutes the dose of treatments and the relative complexity of CBT relative to supportive approaches.

These issues led to our development of a computer-assisted version of CBT (CBT4CBT[184–186]). In developing a computer-assisted version of CBT that could be used with minimal clinician or staff assistance, it was necessary to clearly specify what the program was intended to convey. We conceived of CBT4CBT as a *cognitive coping skills training machine*. The programming uses multimedia features to demonstrate implementation of targeted coping skills in realistic settings. We emphasize coping skills generalization to address a range of behaviors and problems in addition to addiction. The CBT4CBT program, delivered as an adjunct to treatment as a clinician extender,[184] provides a standardized means in which we can convey specific components of CBT with a high and consistent levels of fidelity. CBT4CBT was designed to be engaging, user-friendly and to require no previous experience with computers or reading skills (any material presented in text was also read aloud). The program collects no PHI. The program is media rich, using games, cartoons and exercises to illustrate points. At its core is a series of videos that, present connected scenes of engaging characters, portrayed by professional actors for each module. The characters first experience a common, difficult situation; then demonstrate use of targeted skills to successfully negotiate the situation without resorting to drug use.

Two randomized trials of CBT4CBT have been completed in community based settings. The first, conducted in an outpatient addiction treatment setting, evaluated outcomes among treatment seeking individuals with a range of substance use problems.[185] We compared outcomes for standard treatment alone (typically group and individual counseling) to those of standard treatment plus CBT4CBT). Participants were predominantly alcohol, cocaine, marijuana, and opioid dependent. Use of multiple substances was reported by most participants (80%). At the end of the 8-week trial, participants assigned to the CBT4CBT condition submitted significantly fewer urine specimens that were positive (34% vs. 53%) for any type of drugs and displayed a trend toward longer continuous periods of abstinence during treatment. A six-month follow-up of 82% of the intention to treat sample indicated significantly better durability of effects of CBT4CBT over standard treatment, for both self-report and urinalysis data.[187] The sleeper effect of clinician-delivered CBT appeared to be with computer delivered therapy. The second randomized trial was conducted with a larger, more homogeneous but challenging population, that is, methadone maintained individuals with cocaine use disorders. As with the first study, acceptance of and satisfaction with the CBT4CBT program by the participants was high. Significantly more individuals maintained at least three weeks of continuous abstinence within treatment. As with the initial trial, the

CBT4CBT program was associated with better outcomes through a 6 month follow-up than standard methadone maintenance treatment.[188]

A major potential advantage of computer delivered therapies is their relatively low cost compared to clinician-delivered therapies. As access to computers and the internet continues to grow, even in rural and remote locations, these therapies become more accessible.[189, 190] Thus, using the same methods to evaluate cost and efficacy as were used in the evaluations of CM as described above, Olmstead reported that, as practiced in the trial, the incremental cost effectiveness ratio (ICER) for producing an additional drug free urine specimen cost $21 for CBT4CBT compared with standard outpatient treatment.[191] This amount compared favorably to ICERs for Petry's CM in methadone programs in the CTN studies ($70), CM in outpatient programs in the CTN ($146, with those costs increases driven by additional urine toxicology screens and administrative costs associated with purchase and management of the prizes), and traditional clinician-delivered CBT ($159) for the same outcome. Furthermore, when taken to scale (a single computer used by many patients), CBT4CBT quickly dominated treatment as usual.[191] Evaluation of CBT4CBT, as well as numerous other computerized therapies for the addictions[192–196] is still in its early stages.[197–201] Nevertheless, this line of research promises to make a form of empirically validated therapy more broadly available to individuals who might benefit from it.

Remaining challenges for dissemination of evidence-based therapies: cost, fidelity, and performance standards

As described in the sections above, systematic research on CM and CBT, guided by the Stage Model, has resulted in development and validation of modified versions of these treatments that are more 'community friendly' than their original versions. Multiple obstacles to their dissemination have been addressed. Both CM and CBT have been modified for more efficient delivery at lower cost, while retaining efficacy in community settings. Both have been shown to be feasible to implement in a variety of specialty addiction treatment settings. Training studies have demonstrated that clinicians can be trained to implement these treatments effectively. Both have been shown to be compatible with effective pharmacotherapies. Both are well accepted by a range of patient samples. While some clinicians may have been wary of both of these approaches early in their development, exposure to these forms of treatment in practice had led to greater acceptability [13677, 78].

Nevertheless, we are cautious about predicting widespread adoption of CM interventions, CBT4CBT and other web-based interventions with the specialty addiction treatment in the near future. Diffusion of intervention is not a rapid process [36, 49], for many reasons. One of the more prominent issues is cost. Most new, empirically validated therapies carry with them increased costs and hence a strategy to pay for those costs. For medications, these costs include the medication itself as well as physician and staff time medical evaluation and ongoing monitoring. Once approved and included on formularies, some of those costs are reimbursed. For behavioral therapies in general, additional costs include those associated with clinician training, supervision, and ongoing fidelity monitoring. In the case of CM, additional costs include those of regular urinalyses, the rewards and prizes themselves, and

administrative time required by staff to acquire, stock and manage the incentive system.[132, 133, 202] For computerized therapies, these include the cost of computers and set-up, staff training, and site licenses.[191] Novel medications, which, once approved, can leverage the large infrastructure of the pharmaceutical industry to support dissemination. By contrast, there is no such dissemination infrastructure for novel effective behavioral therapies and no sustainable means of paying for them. There is as yet no third party reimbursement for covering the cost of CM or CBT4CBT (and other computerized versions of empirically validated therapies). This leaves no viable means for their large-scale adoption, because the potential cost-offsets of providing evidence based treatments are not realized within most specialty treatment settings. In contrast, Screening, Brief Intervention and Referral to Treatment (SBIRT), a key component of which is motivational interviewing[203] has become reimbursable in many states, and thus likely to continue to play key roles in MI's recent growth and broad adoption.

At the same time, integration of MI into clinical practice has also been characterized by variable outcomes in ways that appear linked to high levels of variation in the fidelity and skill with which it is implemented.[42] Indeed, another major barrier to implementation of virtually all empirically validated therapies is the lack of quality-control measures in most mental health and addiction treatment systems. Clinical supervision, based on systematic review of clinicians' implementation of an evidence-based treatment with objective ratings of fidelity and the provision of feedback, is the gold standard in efficacy trials that establish the effectiveness of behavioral trials. Such careful clinical supervision is rarely available in clinical practice[29, 204, 205] and is not reimbursable in most areas. A notable exception is the VA, which has recently begun to provide supervision, monitoring and feedback as a strategy to foster availability of empirically validated therapies.[206] Without supervision or some means for regular review of clinicians' work, it is unlikely that empirically validated therapies will be implemented with adequate fidelity or intensity.

Given the state of the current specialty addiction treatment system, it is unclear that these or other empirically validated therapies can be effectively implemented within it.[1, 26, 207] Issues including quality of the workforce, availability of training and supervision, high levels of staff turnover, emphasis on providing more individuals with access to care without corresponding increases in capacity, disconnection from the broader health care and psychiatric treatment system undermine the quality of care in the current system.[24, 208] Thus, a major issue, not unique to the addiction field,[209] but highly salient for this review, is the lack of emphasis on performance and outcome in the current system. In most settings, the primary reimbursement models (fee for service and fixed budget) lack proper incentives for provision of quality or cost-effective care.[2, 24] Residential and inpatient treatments provide very few incentives for evidence-based treatments within these relatively expensive services. In outpatient settings, providers are reimbursed at the same rate for individual or group counseling, regardless of what actually occurs during counseling sessions.[2] Where there is no accountability or demand to provide quality evidence-based treatment, there is no incentive to do so.

A number of recent initiatives have attempted to address these issues by mandating that providers provide evidence of 'quality indicators' such as shorter wait times to enter

treatment or better retention in episodes of care.[1, 210] However, these indices of process and engagement, do not measure relevant outcomes. While these metrics are relatively easy to quantify concretely, don't necessarily closely relate to meaningful treatment outcomes. For example, in a recent analyses of outcome data from over 400participants in randomized clinical trials of behavioral and pharmacologic treatments for cocaine dependence, retention as measured by days in treatment was not significantly related to cocaine use or general functioning in the next year.[211] Process indicators such as engagement and retention in treatment are meaningful only where treatment is of high quality and when engagement and retention correlate with outcome goals.

A closely related issue is lack of emphasis on clearly defined, clinically meaningful outcomes in addiction treatment. Perhaps the most challenging obstacle to adoption of evidence-based therapies like CM and CBT and even MI in clinical care in the addiction is the striking lack of information on actual patient outcomes in most clinical settings. It is impossible to obtain from the vast majority of clinical programs. Even a rough estimate of the rates of their enrollees who attain meaningful periods of abstinence or maintain good outcomes after they leave treatment is not available from most programs. Even those who report some outcome data usually focus only on the small subset of patients who remain in treatment.[212] It is also worth noting the infrequency with which many clinical programs monitor their patient's primary symptom (recent drug or alcohol use) at each contact, although urine and breath analysis are reasonably inexpensive and a quite reliable means of monitoring symptoms. As noted earlier, one of the more disturbing obstacles to implementing CM in clinical settings is the lack of routine use of urine monitoring in clinical care. A key implication is that we can't begin to improve care until we measure it effectively and report it honestly—integration of this core feature of CM into clinical care might do much to improve the quality of treatment.

While it is difficult to reach consensus on outcome indicators that might be reported across clinics and programs,[213] the lack of clear data on substance abuse treatment settings keeps the field disconnected from, and to some degree, distrusted by, other areas of medicine, which are moving more rapidly to adopt performance-based outcomes and performance standards.[214] While addiction treatment is far from reaching consensus on a single indicator, a reasonable proxy might encompass (1) abstinence (or not using illicit drugs and alcohol at a harmful level), (2) working (or fulfilling school and family responsibilities), and (3) not being involved in illegal activities or the legal system. Adoption of this kind of practical, patient-oriented outcomes reporting would be novel in both the clinical and research arenas in the addictions system. We have recently reported analyses of data from 5 clinical trials of treatment seeking cocaine-dependent individuals, focusing on rates of good outcomes that included abstinence and lack of problems in legal, occupational, and psychiatric functioning in Addiction Severity Index reporting. We sought data from the end of treatment and the end of a one-year follow-up, based on aggregated data from.[215] For the full sample (N = 424), 11% met this criterion at the end of treatment, and 21% did so at the end of the one-year follow-up period. End of treatment rates of success using these criteria were markedly higher for individuals treated with CM, while end of follow-up rates were best for CM and CBT.[215] These rates may serve as potential benchmarks as the field moves toward emphasis on treatment performance and outcome.

Encouraging emphases on practical outcomes like these by itself should spur adoption of evidence based treatments to improve patient outcomes and quality of care. As in the rest of the health care system, providers respond to incentives.[216] While paying-for-performance has potential drawbacks, evidence is emerging that emphasis on outcomes improves care and with it, adoption of evidence based treatments and practices.[217, 218] Major changes will be needed before specialty addiction treatment moves to a system of routinely tracking and reporting patient outcome. This difficult process, likely to encounter enormous resistance, will provide a starting point for realistically evaluating the value of our treatments and the quality of care we provide to our patients. Changes associated with Affordable Care Act and other components of health care reform, including parity of substance use and mental health treatment with other disorders, enhanced access to care as well as better integration of substance use treatment in primary care, are poised to accelerate this process and foster adoption of evidence based care.

Acknowledgments

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