Internet-Delivered Treatment for Substance Abuse: A Multisite Randomized Controlled Trial

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Objective: Computer-delivered interventions have the potential to improve access to quality addiction treatment care. The objective of this study was to evaluate the effectiveness of the Therapeutic Education System (TES), an Internet-delivered behavioral intervention that includes motivational incentives, as a clinician-extender in the treatment of substance use disorders.

Method: Adult men and women (N=507) entering 10 outpatient addiction treatment programs were randomly assigned to receive 12 weeks of either treatment as usual (N=252) or treatment as usual plus TES, with the intervention substituting for about 2 hours of standard care per week (N=255). TES consists of 62 computerized interactive modules covering skills for achieving and maintaining abstinence, plus prize-based motivational incentives contingent on abstinence and treatment adherence. Treatment as usual consisted of individual and group counseling at the participating programs. The primary outcome measures were abstinence from drugs and heavy drinking (measured by twice-weekly urine drug screens and self-report) and time to dropout from treatment.

Results: Compared with patients in the treatment-as-usual group, those in the TES group had a lower dropout rate (hazard ratio=0.72, 95% CI=0.57, 0.92) and a greater abstinence rate (odds ratio=1.62, 95% CI=1.12, 2.35). This effect was more pronounced among patients who had a positive urine drug or breath alcohol screen at study entry (N=228) (odds ratio=2.18, 95% CI=1.30, 3.68).

Conclusions: Internet-delivered interventions such as TES have the potential to expand access and improve addiction treatment outcomes. Additional research is needed to assess effectiveness in nonspecialty clinical settings and to differentiate the effects of the community reinforcement approach and contingency management components of TES.

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Drug and alcohol abuse is one of the costliest public health problems in the United States, with illicit drug use accounting for an estimated cost to the economy of $193 billion in 2007 (1) and excessive alcohol consumption exceeding $223 billion in 2006 (2). Effective treatments for substance use disorders exist, but major barriers to their use include lack of access to specialty care (3) and avoidance of treatment due to stigma. Individuals with substance use disorders often present to primary care, but primary care providers face many competing demands for services. Furthermore, evidence-based behavioral treatments require that the clinicians delivering them receive adequate training and ongoing supervision, without which treatments may be implemented incorrectly or not at all (4–6).

Internet-delivered behavioral interventions have the potential to surmount these barriers by delivering treatment of high and consistent quality at low cost, and with a limited burden on clinical staff (7, 8). Patients can interact with web-based interventions outside of traditional clinical settings, which can address the problems of access and stigma. The past decade has seen the emergence of a number of technology-based interventions for substance abuse, primarily for alcohol, most of which have not been adequately tested for effectiveness (9–11). Several computer-delivered cognitive-behavioral and contingency management interventions for substance use disorders have shown efficacy in single-site clinical trials (12–14).

Here we present results of one of the first large multisite effectiveness trials of a computer-delivered intervention for substance abuse, implemented across a diverse sample of community-based addiction treatment programs. The Therapeutic Education System (TES) (12) is a web-based version of the community reinforcement approach plus contingency management, a packaged approach with substantial demonstrated efficacy (15, 16). Effective treatments, particularly behavioral interventions, often consist of combinations of active ingredients likely to produce the largest effect and thus the most benefit to treatment programs. Our hypothesis was

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that TES, when substituted for some of the usual clinician-delivered treatment, would both improve substance use outcomes and reduce dropout compared with treatment as usual.

Method

Recruitment Sites

Patients seeking treatment for drug or alcohol problems at 10 community-based outpatient treatment programs nationwide (affiliated with the National Drug Abuse Clinical Trials Network) were enrolled between June 2010 and August 2011. Details of program selection and characteristics have been reported elsewhere (4). Outpatient addiction treatment programs were selected for geographic and patient diversity, and they varied in programming, consistent with the goals of an effectiveness trial to promote external validity. Programs had to offer at least two face-to-face therapeutic group or individual sessions per week, lasting at least 2 hours, with most offering two to six sessions per week. Each program was asked to enroll approximately 50 patients (range=38–60).

Study Design

After completing a 2–3 hour baseline assessment, patients were randomly assigned, in a 1:1 ratio, to receive 12 weeks of either treatment as usual or treatment as usual plus TES, with the intervention substituting for approximately 2 hours of clinician time (the equivalent of two Internet-delivered modules, twice a week; i.e., four modules per week, or 48 modules over 12 weeks). All participants were asked to provide urine drug and breath alcohol screens twice a week. Randomization was conducted by an independent statistician at a centralized data center in randomly permuted blocks, stratified by treatment site, patient's primary substance of abuse (dichotomized as stimulant versus nonstimulant, since contingency management has been tested most for cocaine dependence [17, 18]), and whether or not the patient was abstinent at the baseline assessment and study entry based on urine drug and breath alcohol tests. Abstinence at study entry is a strong predictor of outcome (19) and thus is arguably an important covariate in primary outcome analyses (20). Patients and staff were not blind to treatment arm. Additional details of the study design and rationale have been reported elsewhere (4).

Participants

Patients were eligible if they were age 18 or older; indicated by self-report that they had used illicit substances in the 30 days before study entry, or 60 days for those exiting a controlled environment (alcohol could be the primary problem, but patients had to have used at least one illicit drug as well); had entered the treatment episode within the past 30 days (randomization occurred on average 9.5 days [SD=7.4] after treatment entry); were planning to remain in the area and in the treatment program for at least 3 months; and were proficient in English. Patients were excluded if they were being treated with opioid replacement therapy (e.g., buprenorphine, methadone) or were unable to provide informed consent. The study was approved by the institutional review boards of the New York State Psychiatric Institute and all participating clinical sites. Patients provided written informed consent after receiving a complete description of the study.

Internet-Delivered Intervention

TES (12) includes contingency management and 62 interactive multimedia modules, based on the community reinforcement approach, requiring approximately 20–30 minutes each to complete. The community reinforcement approach is grounded in the premise that drugs compete with more delayed prosocial reinforcers; hence, the treatment promotes skills training to teach, encourage, and increase satisfaction with drug-free sources of reinforcement (21). An initial training module that teaches patients how to use the program is followed by modules on basic cognitive-behavioral relapse prevention skills (e.g., drug refusal, managing thoughts about using, conducting functional analyses). Subsequent modules teach skills aimed at improving psychosocial functioning (e.g., communication, mood management, family/social relations, time management), as well as prevention of HIV, hepatitis, and sexually transmitted infections. Video clips show actors modeling the skills being taught. Short quizzes assess the patient's grasp of material; the pace and level of repetition of material is adjusted accordingly to maximize individual mastery of the skills and information being taught.

Each clinic received computers for on-site delivery of the intervention; patients could also access the intervention outside the clinic via the Internet. Treatment program clinicians, who had patients in the Internet-based condition, were asked to incorporate brief discussion of module completion into individual counseling sessions. An electronic reporting system allowed clinicians to view summaries of their patients' computer activity. According to clinicians' documentation, most individual treatment-as-usual sessions (85.3%) included discussion of the patient's participation in the computer intervention.

TES includes a flexible system for delivering contingency management according to the prize-based incentive system developed by Petry and colleagues for delivering low-cost contingency management in community-based treatment settings (17, 18). Incentives take the form of opportunities to draw vouchers from a virtual "fishbowl." Some vouchers provide congratulatory messages (e.g., "Good job"), while others are exchangeable for prizes of mostly modest value (usually around $1, occasionally around $20, rarely $80–$100). In the present study, draws were awarded for abstinence (based on negative urine or breath alcohol screens) and for completion of modules (up to the recommended four per week, although there was no cap on the number of modules that could be completed). Research staff entered target behaviors into the computer and oversaw prize distribution.

Assessments

Twice a week during the 12-week treatment phase (i.e., 24 half weeks), and again at 3- and 6-month follow-up visits, urine was collected and screened for 10 drugs with standard lateral flow chromatographic immunoassays (QuickTox dip card) and temperature and adulterant test strips, and self-report drug and alcohol use data were collected using the timeline follow-back calendar method (22). Each half week of treatment was categorized as abstinent if the urine screen was negative and the self-report indicated no drug use or heavy drinking days (according to the National Institute on Alcohol Abuse and Alcoholism guidelines: >4 drinks a day for men and >3 drinks a day for women), and not abstinent otherwise. If self-report was missing but the urine screen was positive, the half week was scored as not abstinent. Abstinence during a given half week was considered missing if 1) self-report indicated no use but the urine screen was missing, 2) the urine screen was negative but self-report was missing, or 3) both urine and self-report were missing. Abstinence at the 3- and 6-month follow-up visits was scored similarly based on the urine screen and the last 4 days of self-report data.

Research staff tracked each patient's participation in the community-based treatment program. If a patient dropped out of treatment, the event was scored as the last week that a patient attended a face-to-face group or individual therapy session at the treatment program (range=0–11 weeks). Patients who attended treatment in week 12 were considered censored at that point.

Sample Size, Power, and Statistical Analysis

Means and standard deviations or frequencies and percentages were calculated for baseline characteristics of the randomized

sample. Two primary outcome measures—abstinence from drug or heavy alcohol use in the last 4 weeks of treatment and retention in treatment (time to dropout)—were prespecified in the study protocol, along with their respective data analysis plans (4). Sample size computations were based on a Bonferroni adjustment approach (i.e., each hypothesis test has a significance level of 0.025) with 80% power to detect an odds ratio of 1.5 for the abstinence outcome (12) and 90% power to detect 50% versus 35% (Internet-based intervention versus treatment as usual) retention (17) with 500 participants. The dichotomous abstinence scores for each of the 24 half weeks in the 12-week treatment phase were analyzed using a repeated-measures piecewise logistic model, where a linear time-by-treatment interaction was allowed during the first 16 half weeks (8 weeks) but a constant study intervention effect was assumed during the last 8 half weeks (4 weeks). Generalized estimating equations (23) were utilized to adjust for the correlation of half weeks within patients. Missing half week data were excluded; the median number of missing half weeks during the last 8 weeks was 1 (interquartile range=4) for both treatment arms. The stratification factors (treatment site, primary substance [stimulant versus nonstimulant], and abstinence at baseline/study entry) were included in the model as main effects. During subsequent model building, the interaction of each covariate with treatment was tested and considered significant if the p value was <0.100.

The primary retention outcome (time to dropout) was analyzed with survival methods stratified by site, using a log-rank test and a proportional hazards model to consider effects of the stratification factors as covariates (24). Schoenfeld residuals were used to test the assumptions of proportional hazards (25).

Two summary outcome measures typically reported in other clinical trials—the total number of abstinent half weeks and the greatest number of consecutive abstinent half weeks—were prespecified as secondary outcome measures and were analyzed using a Wilcoxon rank-sum test. Missing half weeks were imputed as not abstinent. At the 3- and 6-month follow-up points, the log-odds of abstinence was modeled as a function of visit, treatment assignment, and stratification factors, using generalized estimating equations to adjust for the correlation within patients. Missing half week data were excluded. All analyses used the intent-to-treat sample and were conducted using SAS, version 9.2 (SAS Institute, Cary, N.C.).

Results

A total of 1,781 patients entering outpatient addiction treatment were screened (see the flow diagram in Figure S1 in the data supplement that accompanies the online edition of this article). Of these, 850 were not eligible, primarily because of no reported recent drug use. Of those who were eligible, 408 did not complete the baseline assessment, and 507 were ultimately randomized. Of note, of the 130 who were eligible but not interested, only 7.7% indicated that their lack of interest was due to the computer delivery of the intervention. The randomized sample (see Table 1) was diverse (37.9% female, 44% ethnic/racial minorities [including 3% of patients who identify as both white and Hispanic/Latino]) and presented for a range of typical substance use problems; 33.7% (N=171) were primary stimulant users (cocaine or other stimulants), and 54.2% (N=275) had negative urine drug and breath alcohol screens at baseline/study entry. Patients with negative screens at baseline/study entry had fewer days of substance use in the previous 30 days (mean=5.3, SD=6.7) compared with those with positive screens (mean=15.2, SD=9.2).

Treatment Adherence

Patients in the TES group completed a mean of 36.6 computer-delivered modules (SD=18.1) out of a recommended 48 (range=0–72); 22% of Internet sessions were completed off-site. TES patients earned a mean of 118 (SD=90) voucher draws (out of a possible 252 draws) contingent on abstinence or module completion, resulting in a mean of $277 (SD=226) worth of prizes over 12 weeks.

Patients in the treatment-as-usual and TES groups attended similar numbers of treatment-as-usual therapy sessions at their treatment programs (TES group: mean=21.2, SD=17.5; treatment-as-usual group: mean=20.4, SD=17.5) and similar numbers of sessions per week in the weeks prior to dropout (TES group: mean=1.4, SD=0.9; treatment-as-usual group: mean=1.3, SD=0.9). Notably, these average numbers of sessions attended are lower than the two to six sessions per week typically recommended across the participating treatment programs.

Effect of Treatment on Abstinence

Results of the logistic regression modeling abstinence are summarized in Table 2. Model 1 includes the main effects of treatment and stratification factors. Compared with patients in the treatment-as-usual group, those receiving TES had greater odds of abstinence at the end of treatment, by a factor of 1.62 (p=0.010). Main effects of abstinence at baseline/study entry and treatment site were also significant. Abstinence at baseline/study entry strongly predicted abstinence at the end of treatment. Sites varied in the overall rates of abstinence their patients achieved. There was no significant main effect of primary stimulant use. Interactions of primary stimulant use by treatment and site by treatment were not significant. The interaction of abstinence at baseline/study entry by treatment (p=0.068) was included in model 2, in which the effects of each treatment condition were estimated separately in the abstinent and nonabstinent strata. Among patients who were not abstinent at baseline/study entry, those in the TES group had more than twice the odds of abstinence compared with those receiving treatment as usual, whereas among those who were abstinent, there was no significant difference between conditions. Figure 1 presents the observed rates of abstinence by half week across the 12-week trial, along with rates at the 3- and 6-month follow-ups, stratified by abstinence at baseline/study entry.

Compared with patients receiving treatment as usual, those receiving TES achieved significantly more total half weeks of abstinence during the 12-week trial (mean=11.1 [SD=9.0] compared with mean=8.8 [SD=8.2]; p=0.008) and more consecutive abstinent half weeks (mean=8.0 [SD=8.1] compared with mean=5.1 [SD=6.1]; p=0.001).

TABLE 1. Baseline Demographic and Clinical Characteristics of Participants in Outpatient Addiction Treatment Programs Receiving Treatment as Usual or Treatment as Usual Plus TES, an Internet-Delivered Behavioral Intervention for Substance Abuse[a]

Variable	Overall Sample (N=507)		Treatment as Usual Plus TES (N=255)		Treatment as Usual (N=252)	
	Mean	SD	Mean	SD	Mean	SD
Age (years)	34.9	10.9	35.6	10.7	34.2	11.1
Days of alcohol or drug use in past 30 days	9.8	9.4	10.2	8.9	9.4	9.8
	N	%	N	%	N	%
Female[b]	192	37.9	91	35.7	101	40.1
Race[c]						
White	284	56.0	136	53.3	148	58.7
Black or African American	116	22.9	69	27.1	47	18.7
American Indian or Alaska Native	3	0.6	2	0.8	1	0.4
Asian	13	2.6	6	2.4	7	2.8
Native Hawaiian or Pacific Islander	12	2.4	7	2.7	5	2.0
Multiracial	54	10.7	23	9.0	31	12.3
Other	23	4.5	10	3.9	13	5.2
Hispanic or Latino[d]	55	10.8	26	10.2	29	11.5
Education						
<High school diploma	118	23.3	60	23.5	58	23.0
High school diploma or GED	310	61.1	161	63.1	149	59.1
>High school diploma	79	15.6	34	13.3	45	17.9
Marital status						
Never married	308	60.7	148	58.0	160	63.5
Married or remarried	72	14.2	36	14.1	36	14.3
Separated, divorced, or widowed	127	25.0	71	27.8	56	22.2
Underemployed (unemployed/irregular part-time)	190	37.5	106	41.6	84	33.3
Primary substance						
Alcohol	104	20.5	58	22.7	46	18.3
Cocaine	102	20.1	53	20.8	49	19.4
Stimulants	69	13.6	33	12.9	36	14.3
Marijuana	114	22.5	54	21.2	60	23.8
Opiates	108	21.3	49	19.2	59	23.4
Other	10	2.0	8	3.1	2	0.8
Substance dependence[e]						
Alcohol	224	44.2	119	46.7	105	41.7
Cocaine	177	34.9	90	35.3	87	34.5
Stimulants	100	19.7	47	18.4	53	21.0
Marijuana	146	28.8	68	26.7	78	31.0
Opiates	158	31.2	78	30.6	80	31.7
Other	41	8.1	21	8.2	20	7.9
Abstinent at baseline and study entry	275	54.2	136	53.3	139	55.2

[a] There were no significant differences between groups on any variable.
[b] Gender was not reported by one participant.
[c] Race was not reported by two participants.
[d] Ethnicity was not reported by four participants.
[e] Dependence was assessed using the DSM-IV Checklist, a semistructured interviewer-administered measure that provides a current (past-year) substance use dependence diagnosis based on DSM-IV-TR criteria (modified from reference 26).

At the 3- and 6-month follow-ups, abstinence at baseline/study entry continued to significantly predict abstinence (odds ratio=2.39, 95% CI=1.67, 3.42, $p<0.001$). The effect of TES compared with treatment as usual was no longer significant.

Retention in Treatment

There was less dropout from treatment among patients in the TES group than in the treatment-as-usual group (log-rank p=0.017) (Figure 2). The proportional hazards model yielded a main effect of treatment (hazard ratio=0.72, 95% CI=0.57, 0.92, p=0.010) similar to, and an effect of abstinence at baseline/study entry analogous to, the primary abstinence outcome: patients who were abstinent were less likely to drop out (hazard ratio=0.66, 95% CI= 0.51, 0.86, p=0.002). There was no main effect of the stratum of primary stimulant use, nor were there significant stratum-by-treatment interactions.

Discussion

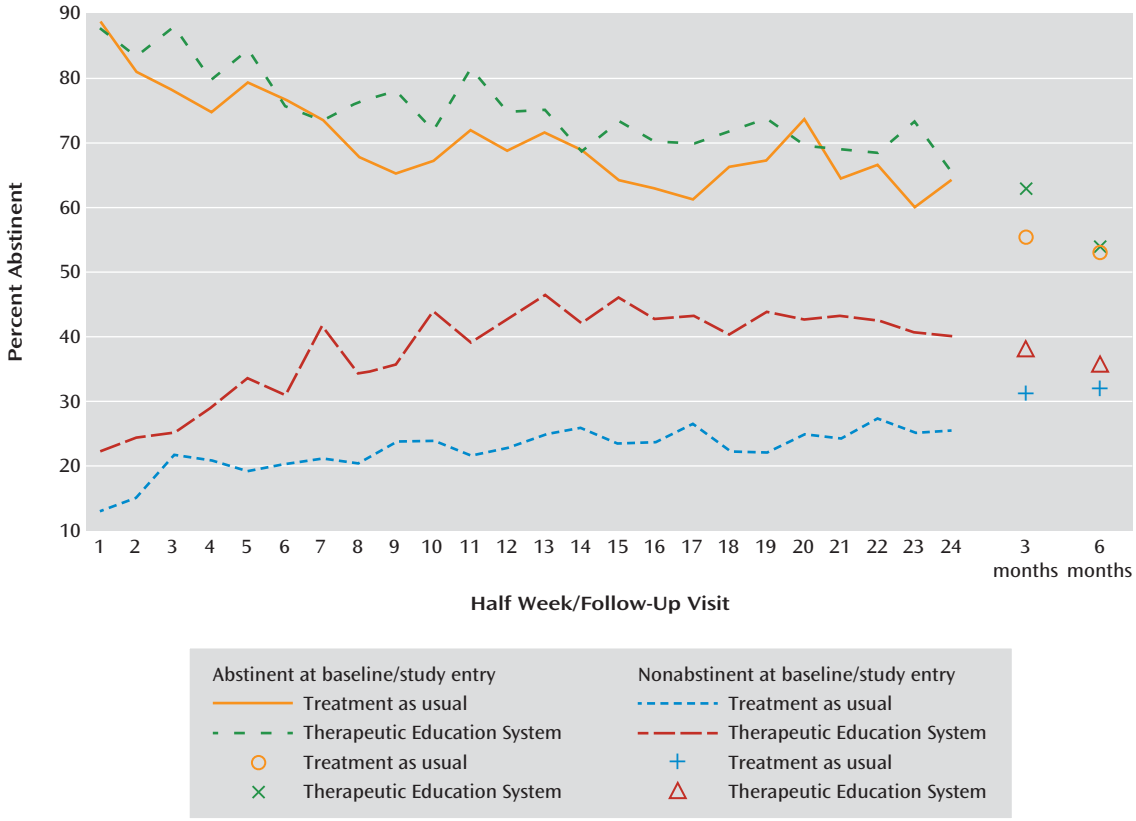
TES, an Internet-delivered behavioral intervention consisting of a combination of skills-oriented counseling

TABLE 2. Logistic Regression Model of Abstinence From Drug Use or Heavy Drinking Among Participants in Outpatient Addiction Treatment Programs Receiving Treatment as Usual or Treatment as Usual Plus TES, an Internet-Delivered Behavioral Intervention for Substance Abuse (N=507)

Model and Variable	Odds Ratio[a]	95% CI	p
Model 1: Main effects			
Abstinent at baseline/study entry	5.73	4.20, 7.80	<0.001
Stimulant as primary substance	1.23	0.90, 1.68	0.193
Clinical site[b]			0.003
Treatment (TES versus treatment as usual)	1.62	1.12, 2.35	0.010
Model 2[c]: Treatment assignment by abstinence at baseline/study entry interaction			
TES versus treatment as usual, nonabstinent at baseline/study entry (N=228)	2.18	1.30, 3.68	0.003
TES versus treatment as usual, abstinent at baseline/study entry (N=268)	1.17	0.76, 1.80	0.489

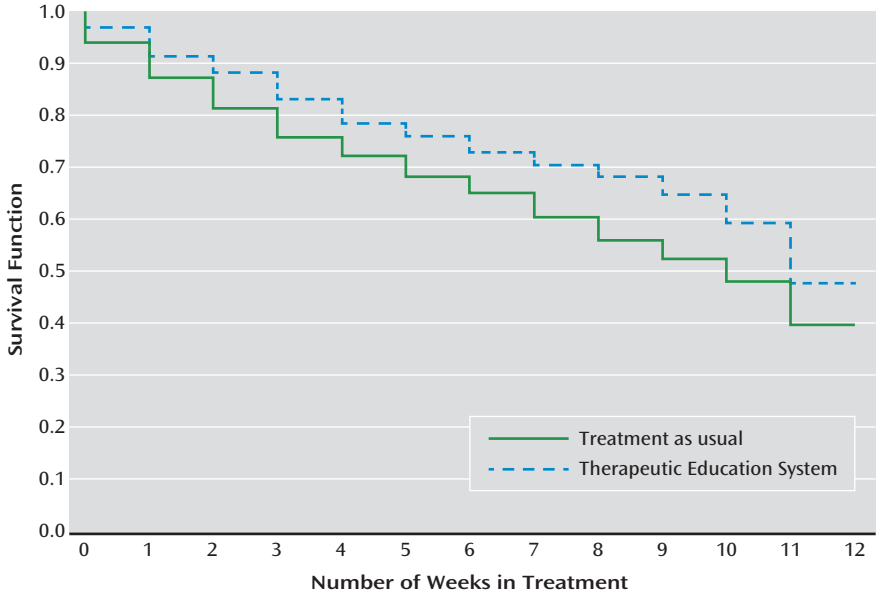
[a] Odds ratios reflect the last 4 weeks (weeks 9–12) of the treatment phase.
[b] Odds ratios for each site compared with the referent site ranged from 1.02 (95% CI=0.55, 1.90) to 0.31 (95% CI=0.17, 0.58), indicating that the odds of abstinence varied across sites.
[c] After fitting model 1, including the main effects of treatment and stratification factors, each of the stratum-by-treatment interactions was tested using a significance threshold of 0.10. Only the abstinence at baseline/study entry by treatment interaction (p=0.068) met the threshold, and the effects of treatment (TES versus treatment as usual) are therefore shown separately in the nonabstinent and abstinent strata.

FIGURE 1. Abstinence by Treatment Half Week and at Follow-Ups Among Participants in Outpatient Addiction Treatment Programs Receiving Treatment as Usual or Treatment as Usual Plus TES, an Internet-Delivered Behavioral Intervention for Substance Abuse, by Abstinence at Baseline/Study Entry



derived from the community reinforcement approach and contingency management, was effective at improving treatment outcomes in a large, diverse sample of patients seeking care across 10 community-based addiction treatment programs around the country. Compared with the control condition, in which patients received standard care, the Internet-delivered intervention improved retention in treatment, produced equivalent high rates of abstinence among patients with a good prognosis (i.e., those who were abstinent at baseline/study entry), and most importantly, doubled the odds of abstinence among patients with an otherwise poor prognosis (i.e., those who were not abstinent

FIGURE 2. Kaplan-Meier Plot of Time to Treatment Program Dropout Among Participants in Outpatient Addiction Treatment Programs Receiving Treatment as Usual or Treatment as Usual Plus TES, an Internet-Delivered Behavioral Intervention for Substance Abuse



at baseline/study entry). Community-based effectiveness trials represent an important step in the translational spectrum (27). Consistent with the emphasis of an effectiveness trial on external validity, the computerized intervention was integrated within community-based treatment programs with typical treatment-seeking patients. The results support the promise of the intervention for dissemination and adoption into the addiction treatment system.

Increasing recognition of the public health impact of addiction, as well as Affordable Care Act legislation, calls for the expansion of services for patients with addictions (28, 29). However, both the specialty addiction and primary care systems face shortages of provider time as well as of expertise in delivery of evidence-based interventions (30). TES is a computerized version of two of the most effective and best-replicated treatments for substance dependence. Computerized versions of other effective treatments for substance abuse, such as cognitive-behavioral therapy for relapse prevention (CBT) (13, 14), have also shown promise in single-site randomized trials. Treatments such as the community reinforcement approach or CBT require substantial time and specialty training for clinicians to deliver them. In contrast, computer-assisted treatments can be prescribed by a clinician without specific intervention training, or even by a clinician with little training or experience in any form of addiction treatment, in less time than if a clinician were to directly deliver the treatments (12). The present study took place in community-based addiction specialty care settings. Future studies should test TES and similar interventions in non-addiction treatment settings and as part of screening, brief intervention, and referral to treatment models.

The trial was designed so that patients in the TES condition were assigned to attend fewer standard care sessions at their treatment programs, according to a clinician-extender model. However, the number of standard care counseling sessions those patients ended up attending was similar to that of the control patients. Consistent with the finding of improved retention in treatment, this suggests that TES improved engagement in standard outpatient treatment. It also means that patients in the intervention condition experienced a higher overall dose of therapy. The relatively low overall attendance at treatment-as-usual sessions may reflect the difficulty engaging patients in addiction treatment and highlights the importance of efforts to improve engagement.

Strengths and Limitations

Strengths of this effectiveness study include the randomized controlled design, the prespecification of primary outcome measures and analyses, the high follow-up rates, and the relatively low rates of missing outcome data. The outcome measures chosen are germane, as abstinence is the primary goal of treatment and dropout from treatment is a substantial problem that limits the effectiveness of outpatient addiction treatment (31). As befits an effectiveness trial, the study was conducted with a large, demographically and geographically diverse sample, and eligibility criteria were kept broad. These features suggest that the sample is likely to be representative of patients seeking community-based treatment for substance abuse problems across the United States, with findings reflective of how the intervention performs when integrated into real-world treatment settings.

A main limitation is that the study tested TES as a package, compared with treatment as usual, in a two-arm design. Thus, it is not possible to disentangle the unique

effects of the computerized community reinforcement approach and of contingency management. The two-arm design has the advantage of simplicity, which is a consideration in community-based effectiveness trials. Furthermore, previous research with clinician- and computer-delivered community reinforcement approach and contingency management techniques have suggested that both contribute to beneficial treatment effects (15, 32–35). However, future research should attempt to disentangle the effects of the two components in both community-based addiction settings and non-specialty settings.

The superiority of TES over treatment as usual was not sustained at longer-term follow-up. The effects of contingency management interventions may diminish once the contingencies end (18). In contrast, some (36), although not all (37), studies of CBT for addictions have observed that the benefits of the intervention actually increased after treatment, suggesting, as one would hope, that the patients learned skills that they continue to practice and benefit from over time. It may be that the beneficial effect of TES observed during the active treatment phase was mainly attributable to the contingency management component of the intervention, although this was not tested in the present study. A diminishing intervention effect over time is consistent with the chronic, relapsing nature of addiction (38) and the need for ongoing monitoring and treatment. In the present study, TES was available to patients only during the 12-week trial, but since it is Internet accessible, it could be made available to patients indefinitely, an option that should be studied.

Finally, a number of patients were eligible for the study but did not enroll. This raises the generalizability question of whether the unenrolled patients might have responded differently to the intervention. A previous analysis of the screening data (39) showed that the unenrolled patients reported more drug use compared with their enrolled counterparts. The greater relative benefit of TES among patients who were not abstinent at baseline/study entry (associated with more drug use) suggests that those not enrolled might have benefited. Engaging patients at the outset of an episode of outpatient treatment remains a challenge that needs to be addressed.

Conclusions

The study findings suggest that Internet-based TES, as well as other efficacious computer-assisted interventions now emerging (13, 14), have the potential to help bridge the gap between the enormous need for high-quality evidence-based treatment for addiction and the capacity of the treatment system to deliver. Barriers to implementation of such interventions need to be addressed, including training clinicians to effectively prescribe and monitor computer-delivered interventions and developing reimbursement systems to fund them. Effective computer-delivered interventions for addictions should be studied in a broader array of clinical settings, including primary care.

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