

A Promising Debut for Computerized Therapies

New psychotherapies for many psychiatric illnesses, including substance abuse, are being developed in academic research centers. These new therapies show significant effects in their initial trials, where the structured therapy protocols can be carefully monitored for fidelity. However, their dissemination into real-world practice is compounded by inevitable but unspecified and largely uncontrollable therapist deviations from what worked in research settings. This fact is not a criticism of therapist intentions or values but recognition of humankind's limitations. The labor-intensive nature of psychotherapies, reflected in their cost, also limits their application. A prime example of the difficulties of applying new therapies is substance abuse, where patients are stigmatized, their care is underfunded, the staff is often underpaid and hence undertrained, and the clinical course is complicated by frequent relapse.

Against this difficult background, researchers at Yale report a paradigm-shifting approach that closes the gap to cost-effective real-world delivery of an effective cognitive-behavioral therapy (CBT) program for substance dependence (1). Cleverly called computer-based training for cognitive-behavioral therapy (CBT4CBT), this information age web-based program penetrates previously impenetrable barriers to care delivery. Well-matched patients in a randomized, controlled trial assigned to CBT4CBT compared to those receiving only treatment as usual had half as many positive urine specimens (2.2 versus 4.3; $F=6.18$, $p=0.02$; effect size $d=0.59$) and longer urine-confirmed abstinence (22 versus 17 days, which while not statistically significantly longer demonstrated a moderate effect size [$d=0.45$]).

Was there magic in the program that produced these results? No...and yes! Program content closely followed a manual on CBT published by the National Institute on Drug Abuse (2) available to anyone and employed in previous research studies (3–5). All would acknowledge the theoretical value of the program's content: "understanding and changing patterns of substance use, coping with craving, refusing offers of drugs and alcohol, problem-solving skills, identifying and changing thoughts about drugs and alcohol, and improving decision-making skills." Developing content is a crucial first step, but providing it in real clinical settings often proves far more challenging. How do we train enough therapists to provide a standardized program proven in research settings? Will therapists sustain enough of the therapy protocol to maintain therapy benefits? How can we provide this specialized care in the midst of so many other tasks requiring staff attention? How can we afford it? The magic in CBT4CBT was its conversion to computer delivery, making it available anytime and anywhere there is access to the Internet.

How representative of the real world were the setting and patients in the study? Seventy-seven percent were unemployed, 37% were on probation or parole, 27% sought treatment under duress from the criminal justice system, and three were arrested after random assignment but before participation in any treatment. Cocaine was the main drug problem for 59%, alcohol for 18%, opioids for 16%, and marijuana for 7%, whereas 80% used more than one drug.

All patients were offered weekly individual and group sessions of general drug counseling (treatment as usual). Patients provided twice-weekly urine specimens to separate clinical evaluators. CBT4CBT patients used a computer in a small private clinic room

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with initial assistance if needed. Six modules were offered with a mean of 4.3 sessions completed, lasting an average of 38 minutes per session. Homework was assigned with each module, and CBT4CBT patients completed an average of 2.9 homework assignments. A 17-item evaluation yielded a mean score of 4.3 with 1 meaning low and 5 meaning high satisfaction. For the treatment-as-usual only group, severity (baseline drug use frequency and years of use) was the strongest (and inverse) predictor of treatment outcome, whereas the best predictor for the CBT4CBT group was treatment involvement (number of days in the program and the number of individual and group sessions attended and homework completed). While requiring replication to confirm efficacy and generalizability, CBT4CBT offers promise of better substance abuse/dependence outcomes at low cost.

Where do programs such as CBT4CBT fit into the larger scheme of health care? The ideal treatment might be 3 hours with Osler and 3 with Freud. Reality provides many patients with only 15 minutes, Andy Warhol's measure of fame, with their doctor. Using proven computer therapy programs to guide patients in parts of treatment that patients have to master themselves anyway seems to make sense. Perfectly standardized, even when providing personalized guidance, these programs ensure that patients receive at least what the programs provide, uncompromised by variable clinician availability, skill, or time pressures. Programs like CBT4CBT cost much less to develop than a new medication. Once developed, they can be delivered at a fraction of the cost of human-based therapy.

Computer therapy programs are always available and provide perfect execution of computer code modeling evidence-based clinical decision making that individualizes each patient's path through the program. Programs proceed at the patient's pace and permit patient selection of topics and topic repetition where appropriate. Computer therapy systems can assess progress with standard measures and present results to patients and clinicians as well as using these data to determine next program steps. Computer therapies are more easily studied than therapies provided by humans because they can reach large study populations and because program elements can be manipulated systematically. Identified weaknesses can be modified, refined, and retested. In the end, it is easier to program and reprogram computer therapy systems than to train and retrain clinicians. Consistent delivery is ensured in contrast to the wide variability inherent in therapies delivered by humans. Computer therapies offer the prospect of improvement over time, incorporating new concepts as they are proven and eliminating disproven elements, ensuring patients equal access to evidence-based medicine at a cost that decreases as technology performance increases according to Moore's law.

What do these programs not do? As with any treatment, they do not work for every patient. For 14% of the U.S. population who are "below basic health literacy," programs requiring reading are usually inaccessible (6). For them, interactive voice response, which uses the telephone as the computer terminal, permits patients to hear a recorded voice instead of reading text and then respond orally or by pressing number keys on the telephone. Although modeled on best practices and often developed by highly skilled therapists, computer therapies may fall short of the very best therapists, particularly on those therapists' best days. But as program limitations are identified, they can be corrected and quality improvements implemented and ensured in subsequent use.

What's ahead? When Warner Slack's LINC computer with 1K of memory performed the first direct patient-computer interview in the 1960s, he recognized that the method might be therapeutic (7). In the 1990s, Paulette Selmi (8) showed a minicomputer could deliver effective CBT for depression in a randomized, controlled trial. CBT4CBT continues that line of successful research on the Internet. Computer therapies will, with high and standardized quality, provide low-cost, widespread evidence-based care that complements and supplements what clinicians do, extending clinicians' reach as a part of stepped care. Clinicians can then focus on aspects of practice that they do better than

computer programs, including care of patients who haven't done well with computer-guided therapy. A recent review identified "97 computer-aided psychotherapy systems from nine countries reported in 175 studies, of which 103 were randomized, controlled trials" (9).

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Dr. Greist has proprietary or intellectual property interest in several computer therapies, none of which is described in this editorial. He is a co-author of a program (reference 8) that has never been brought to market, nor is there any plan to do so. Dr. Freedman has reviewed this editorial and found no evidence of influence from these relationships.