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## Technology-Based Interventions for the Treatment & Recovery Management of Substance Use Disorders: A JSAT Special Issue

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The field of substance abuse treatment has made considerable advances in identifying effective interventions. These include a growing group of effective pharmacotherapies, including medications for opioid dependence (e.g., buprenorphine, methadone), nicotine dependence (e.g., nicotine replacement medications; bupropion; varenicline), and alcohol dependence (e.g., naltrexone, acamprosate) (Douaihy et al., 2013). Effective treatments also include the major forms of psychosocial therapies now widely considered to be empirically-supported, including motivational interviewing and motivational enhancement therapy (to help increase individuals' interest and commitment to behavior change), cognitive behavioral therapy (focused on implementation of cognitive and behavioral regulatory skills and strategies), and contingency management (CM) interventions (which provide tangible rewards for demonstrating targeted behaviors such as treatment attendance or providing drug-free urine specimens). The community reinforcement approach to has also received empirical support (and is focused on helping individuals establish and maintain new patterns of behavior that do not involve substance use but which leverage social, recreational, family and vocational reinforcers to help individuals in their recovery from substance use disorders). Evidence-based approaches additionally include models of integrated psychosocial interventions targeting co-occurring substance use and mental health disorders, as well as strategies for reducing HIV risk behavior among persons with problematic substance use. Behavioral therapies for substance use disorders have been shown to have robust effects in their own regard and to enhance outcomes when combined with effective medications (e.g., agonist therapies for opioid dependence). Additionally, some behavioral treatments have greater effects when they are delivered in combination with one another compared to when they are delivered in isolation (Carroll & Onken, 2005; Dutra et al., 2008; Higgins et al., 2003; Marsch & Dallery, 2012).

Unfortunately, despite the strong evidence-base for these treatment advances, these and other empirically validated therapies are infrequently used in community-based practice. They often require extensive clinician training to deliver, along with staffing and financial resources not available to many community-based treatment programs. Moreover, even when clinicians receive appropriate training in these models of care, the interventions are infrequently delivered with fidelity due to issues such as heavy client caseloads and high

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### Disclosure

Dr. Marsch is affiliated with HealthSim, LLC, a small business that developed a web-based psychosocial intervention for substance use disorders. This relationship is extensively managed by Dr. Marsch and her academic institution.

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rates of clinical staff turnover (Carroll & Rounsaville, 2007). Access to treatment is also a major problem, as less than one tenth of individuals who could benefit from addiction treatment actually receive it.

As one strategy designed to overcome these barriers and to promote broader access to evidence-based behavioral treatment, a number of researchers have explored the role that information and communication technologies (e.g., interactive web and mobile-based behavioral intervention tools) may play in the delivery of evidence-based behavioral interventions for substance use disorders (Johnson et al., 2012; Marsch 2012; Moore et al., 2011). This early stage, but growing, line of research has highlighted the promising role that technology may play in improving the effectiveness, cost-effectiveness, and reach of efforts to assess, prevent, treat, and support the recovery management of substance use disorders and other risk behavior. Using technology to deliver evidence-based interventions theoretically allows for these complex activities to be implemented with enhanced fidelity and at lower cost, without increasing demands on time or training needs of health care professionals. Technology-based therapeutic tools may function as important “clinician-extendors” to provide individuals with access to therapeutic support even at times when they are not engaged in clinical interaction with a clinician. Even more broadly, these tools, if demonstrated to be effective, may enable more widespread dissemination of evidence-based care to broader audiences in a wider array of settings and models of care than what is possible with traditional models alone (Carroll & Rounsaville, 2010). Technology may enable entirely new models of care for substance use disorders both within and outside of formal systems of care.

The rapid development of technology-based interventions parallels the rapid increase in access to the Internet and mobile devices. Over 90% of individuals worldwide have access to mobile phone services, totaling about 6 billion mobile phone subscriptions worldwide (ITU, 2012). Importantly, Internet and mobile access is also high and growing among even the most traditionally underserved and vulnerable populations (Gibbons et al., 2001), including among persons with substance use disorders (e.g., McLure et al., 2013).

The rapid growth of this area has yielded a number of intriguing glimpses into the promise of this field: Published research to date has indicated that technology-based interventions targeting substance use are likely to be successful when developed using models that embrace effective informational technologies and engage end users in the development and refinement process, and are grounded in the principles of the traditional evidence-based approaches from which they are adapted.. Technology-based interventions may increase patients’ treatment outcomes when they are delivered as a supplement to substance abuse treatment (e.g., Carroll et al. 2008; Marsch et al. 2011). While still rare in the literature, a few studies suggest that these tools may produce positive outcomes comparable to those observed from treatment provided by highly trained clinicians delivering evidence-based behavioral treatment (Budney et al., 2011; Kay-Lambkin, Baker, Lewin, & Carr, 2009). Some early work suggests they may be effective in a direct to consumer model (Dallery & Raiff, 2012; Hester et al., 2009); Other research points to the potential cost-effectiveness of this approach (Olmstead, Ostrow, & Carroll, 2010).

Nonetheless, the application of technology to the field of substance use is at an early stage, and methodologic quality is still variable, and in many ways similar to the state of behavioral therapies research 20 years ago (Kiluk et al., 2011). Much more rigorous research is still needed to understand how to optimally engage individuals in use of these tools, the types of individuals who do (and do not) benefit from these approaches, how to best integrate these tools into various systems of care, how to promote sustained use of effective

tools in various models and settings of addiction treatment, and the strengths and weaknesses of these approaches.

Manuscripts in this Special Issue of the *Journal of Substance Abuse Treatment* focus on the application of technology to the delivery of interventions for the treatment and recovery management of substance use disorders. These manuscripts are intended to highlight the diversity and current state of the science of empirically-supported innovations in this specific area of intervention delivery.

Although a large number of manuscripts were submitted for publication consideration within this Special Issue, these original research reports were selected because of their greater experimental rigor. The included manuscripts range from experimental evaluations of technology-based interventions highlight a variety of types of interventions (brief interventions, behavior therapy, medication adherence tools, HIV prevention interventions) and technology platforms (mobile, web, videoconferencing, phone-based interactive voice response), for an array of populations (adults, adolescents, criminal justice populations, post-partum women), in a number of different settings (addiction specialty treatment programs, schools, emergency rooms, criminal justice settings). They additionally reflect a variety of experimental research designed, including those focused on the design, development, and clinical evaluation of these technology-based therapeutic tools, as well as research focused on models for their successful implementation and sustained use.

## **Interventions evaluating screening and brief intervention in a range of settings**

### **Clinician versus computerized brief intervention in the ED**

Bonar and colleagues present process and evaluation data from a large trial comparing brief interventions for drug use and HIV risk reduction in the emergency department, comparing feasibility and change in a number of psychological constructs when delivered by clinician versus computer compared with standard care. These findings are of significance as relatively few adequately powered studies have appeared which directly compare clinician-versus technology-delivered versions of the same intervention.

### **Computerized SBIRT in high schools**

The article by Curtis and colleagues highlights the successes and challenges in a real-world implementation of a computerized substance abuse screening, brief intervention and referral to treatment (SBIRT) model implemented with adolescents in a school setting. This implementation research project highlights the importance of engaging multiple stakeholders in order to promote the adoption and implementation of a technology-based system and identifies important factors that impact the sustainability of technology-based interventions.

### **Feedback and skills training for college students**

The manuscript by Weaver and colleagues in this Special Issue reports on an evaluation of various types of brief, web-based interventions for college students, designed to understand the relative and/or combined utility of normative feedback about individuals' substance use and moderation skills training.

## **Technology to support aftercare and long term recovery**

### **Mobile relapse prevention tool**

The manuscript authored by Chih and colleagues describes a statistical model that used input from persons in recovery from alcohol dependence entered into a mobile phone-based

recovery support tool (ACHESS) to predict personalized risk of lapse to alcohol use. The potential utility of this approach in triggering in the moment, mobile-phone delivered interventions to help individuals prevent lapse to substance use, at times when they may be at greatest risk for use, is promising.

### **Counseling by videoconference in opioid agonist treatment**

The article by King and colleagues describes the use of web-based videoconferencing as a platform to provide individual counseling for stable clients receiving opioid agonist treatment. This approach may offer an alternative concept for the provision of web-based services – as a clinic-based privilege that can reduce the considerable time demands of methadone treatment for those that have achieved clinical stability, similar to the use of methadone take-home doses for reinforcing behavior change. Although there are challenges to implementation as described in the article, videoconferencing counseling sessions may be preferable for a subset of clients in later stages of recovery, who may have gained greater work and family responsibilities that might interfere with routine clinic counseling schedules.

### **Models of Deployment and Durability of Effects**

#### **TES web-based behavior therapy without CM**

In terms of web-based interventions that have progressed further through the stage model of behavioral therapy development (Carroll & Onken, 2005), Marsch and colleagues report the effectiveness of the web-based, Therapeutic Education System (TES) behavior therapy intervention at increasing abstinence rates within opioid dependent patients receiving methadone maintenance treatment. TES has established efficacy in previous trials, however this is the first attempt at implementation within a model where it partially substituted for standard counseling. Also, this randomized trial evaluated the effect of TES without the provision of contingency management incentives, thereby increasing the feasibility for resource-constrained community treatment settings. Offering a computerized tool as a central part of service delivery within substance abuse treatment programs could provide many benefits for the clients, clinic staff, and treatment programs, and may become an important treatment delivery model in the new healthcare environment.

#### **eSBI for postpartum women**

Ondersma and colleagues present data on a replication of their original RCT evaluating electronic screening and brief intervention (eSBI) for postpartum drug-using women. This is a significant study not only because it represents one of the few replications in this field to date, but also evaluates the durability of these brief computerized interventions in clinically representative settings. Strategies for enhancing the longer-term efficacy of brief technology-based interventions are one of the most critical and challenging facing this field.

### **Special Populations and New Methodologies**

#### **Web-based tool for criminal justice population**

Walters and colleagues report on their development of a two-session web-based intervention designed to target substance use and HIV testing and care within a criminal justice population. This intervention, which is currently being evaluated in a randomized controlled trial, is an example of “persuasive” technology, utilizing motivational interviewing techniques to encourage behavior change within a population typically resistant to treatment engagement. Such an automated intervention can extend the reach of empirically supported treatments to settings that often present numerous challenges for face-to-face intervention implementation.

### **Text messaging to support HIV medication adherence**

Another intervention in the early stages of efficacy evaluation is described in the article by Ingersoll and colleagues, who developed a two-way text messaging intervention tool for substance users who are non-adherent with HIV medications. Substance users are at particularly high risk for non-adherence to medication regimens, and often experience many other barriers to care, such as fewer financial resources, and co-occurring mental disorders. Mobile phone based interventions could provide a tool for reaching such disenfranchised populations and address behaviors that threaten non-adherence as they occur in real time.

### **Using CM to enhance IVR compliance**

In a novel study evaluating use of ‘traditional’ behavioral therapies to support adherence to technology, Lindsay and colleagues present data drawn from a randomized trial of interventions for cocaine use, where a high level of compliance for collection of outcome data using interactive voice response (IVR) was critical. A variable schedule of reinforcement produced better compliance than did a fixed level of reward; moreover, an unexpected and significant finding was that IVR adherence was associated with better outcomes.

### **Telephone versus web-based delivery of a cannabis intervention**

Identifying how mode of delivery may affect outcomes, as well as sample characteristics, Rooke and colleagues conducted secondary analyses using data from two completed trials among cannabis users: one delivered via phone and the other via web. This study highlights how user preferences may influence engagement with the intervention as well as outcome.

In conclusion, the articles in this Special Issue highlight the broad range of applicability of technology-based interventions at preventing and treating substance use and related problem behaviors. Such interventions offer significant promise for the field moving forward, as successful dissemination of empirically supported therapies may be realized through the use of technological advances. However, despite the excitement regarding the potential of these interventions, much of the work remains in an early stage of development/implementation, and a cautious approach is indicated at this time in order for the benefits to be fully achieved.

There are many design, development, and implementation challenges and questions that need to be sufficiently considered and resolved prior to broad dissemination. Just as a promising pharmacotherapy or behavioral therapy needs to progress through multiple stages of investigation prior to acceptance as a valid, efficacious treatment, so too, should technology-based interventions be subject to the same process of rigorous evaluation and refinement. The studies in this report highlight many of the methodological and practical challenges facing us, but also underline the potential for technology based interventions to not only enhance the reach of our interventions, but also to better understand how effective interventions achieve their effects, and under what circumstances.

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