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Telehealth Treatment for Alcohol Misuse: Reviewing Telehealth Approaches to Increase Engagement and Reduce Risk of Alcohol-Related Hypertension

Dan V. Blalock[1,2,3] · Patrick S. Calhoun[1,2,4,5] · Matthew J. Crowley[1,6] · Eric A. Dedert[1,2,4,5]

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Abstract

Purpose of Review Telehealth interventions for alcohol misuse may be especially impactful in hypertensive populations because of the increased blood pressure associated with alcohol overconsumption. This review examines emerging telehealth interventions for alcohol misuse and categorizes them according to phases of the treatment process.

Recent Findings Evidence for telehealth cognitive behavioral therapy (CBT) is preliminary but suggests it is efficacious and increased access to treatment. Evidence for contingency management (CM) is growing, and mobile adaptation of CM for alcohol misuse suggests it is efficacious in initial abstinence induction. Evidence for mobile health (mHealth) texts and applications is large and variable but generally suggests it is efficacious for reducing alcohol misuse and relapse prevention.

Summary Variability in telehealth interventions for alcohol misuse may hinder conclusion implementation. Matching specific telehealth interventions with phases of alcohol misuse treatment and focusing on high-impact populations (i.e., those with hypertension) may maximize benefits on population health.

Keywords Alcohol misuse · Telehealth CBT · Mobile health · Contingency management · Hypertension · Alcohol treatment

Introduction

Alcohol misuse, defined as a range of hazardous drinking behaviors, is a serious and growing global health issue. Much of the negative health impact of alcohol misuse on a population level can be attributed to its association with increased rates of hypertension and, consequently, cardiovascular disease (CVD). The 2017 American College of Cardiology/American Heart Association Guideline for the prevention and management of hypertension suggests abstinence or moderation of alcohol intake (≤ 1 drink/day for women, ≤ 2 drinks/day for men) [1••]. Unfortunately, the effectiveness of current alcohol misuse treatments is limited by access to treatment and adherence with abstinence induction and relapse prevention. Leveraging recent advances in telehealth for delivery of alcohol misuse treatment may improve the effectiveness of each phase of the intervention process.

This article is part of the Topical Collection on *Telemedicine and Technology*

✉ Dan V. Blalock
daniel.blalock@duke.edu

[1] Center of Innovation to Accelerate Discovery and Practice Transformation (ADAPT), Durham Veterans Affairs Health Care System, Durham, NC, USA

[2] Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Durham, NC, USA

[3] Durham, USA

[4] VA Mid-Atlantic Region Mental Illness Research, Education and Clinical Center, Durham, NC, USA

[5] Durham Veterans Affairs Medical Center, Durham, NC, USA

[6] Division of Endocrinology, Diabetes and Metabolism, Department of Medicine, Duke University School of Medicine, Durham, NC, USA

Alcohol and Hypertension

Alcohol Misuse Epidemiology

Alcohol misuse has increased by at least 14% in all age and race groups since 2000, with African Americans and adults over 65 increasing alcohol misuse by over 60% [2•]. Although the primary cardiovascular effect of alcohol misuse is increased rates of hypertension, the health impact of alcohol

misuse is typically quantified in terms of CVD risk and mortality. Alcohol misuse is associated with 3–5 times higher relative risk for all-cause mortality [3] and two times higher relative risk for CVD-specific mortality [4, 5]. Alcohol misuse is estimated to account for 3.5% of the global disease burden of CVD, which equated to 593,000 deaths in 2016 [6••].

A recent consensus statement across five European countries estimated that if only 25% of patients with uncontrolled hypertension received screening and intervention for alcohol misuse, the rate of uncontrolled hypertension would drop by almost 7% [7]. Thus, patients with uncontrolled hypertension may be a key population to target to maximize the benefits of alcohol misuse intervention.

Causal Pathways Between Alcohol Misuse and Hypertension

Recent evidence suggests increased hypertensive risk may actually begin at lower limits than those represented in most CVD-specific J-curves, with blood pressure reliably increasing in individuals consuming less than 10 drinks a week [8]. This increased hypertensive risk due to alcohol misuse can be attributed to at least two causal pathways.

First, there is a well-established direct biological relationship between acute and sustained alcohol misuse and increased systolic blood pressure. One estimate suggests that each drink per day beyond three increases systolic blood pressure by 10 mmHg [9]. A recent meta-analysis of alcohol reduction interventions demonstrated that alcohol reductions in people who drank more than two drinks a day resulted in blood pressure reductions, with the highest risk drinking group showing reductions of 5.5 mmHg in systolic blood pressure when cutting their drinking by 50% [10]. To provide context for this effect, a meta-analysis of intensive counseling and education trials for multiple risk factors yielded an average decrease of only 2.71 mmHg in systolic blood pressure over 6 months [11].

Second, alcohol misuse is associated with decreased adherence to antihypertensive medications. A study, for example, examining two cohort samples totaling over 100,000 patients with hypertension demonstrated 27% poorer hypertensive refill adherence in patients with alcohol misuse than those without alcohol misuse [12]. Another study examining 20,000 patients found a linear relationship between alcohol consumption screening scores in primary care and antihypertensive refill rates [13]. Finally, a third study found a dose-response relationship whereby alcohol misuse on 1 day was associated with large increases in both same-day and next-day nonadherence to antihypertensive medications [14]. Because medications are the most common and effective treatment for hypertension, any impact on adherence to these medications can minimize their benefits for the prevention and management of hypertension [15].

In sum, alcohol misuse contributes strongly to the prevalence of hypertension; treating alcohol misuse in patients with hypertension offers a targeted route to efficiently decrease the global health burden of alcohol misuse. Several advances in telehealth treatments may help increase both adherence and access to alcohol misuse treatment.

Telehealth Approaches for the Treatment of Alcohol Misuse

The current public health approach to intervening on alcohol misuse involves screening, brief intervention, and/or referral to specialty treatment (SBIRT) [16]. Unfortunately, current evidence suggests this model may be less effective in increasing uptake of alcohol misuse treatment than previously thought [17]. Recent advances in technology make telehealth a promising strategy for increasing the uptake and effectiveness of alcohol misuse interventions on a population level, especially within the context of primary care [18••]. Three particular telehealth interventions for alcohol misuse have shown promise in recent years: telehealth cognitive behavioral therapy (CBT), mobile contingency management, and mobile health (mHealth) messaging via texts and apps.

Telehealth approaches to alcohol misuse treatment can be arranged based on what part of the treatment process they are aimed at benefiting. Moreover, telehealth approaches to alcohol misuse treatment can be arranged based on the degree of integration of a telehealth approach into the intervention design itself. Figure 1 presented in this review organizes the predominant telehealth approaches for alcohol misuse on a continuum of the intervention process and a continuum of integration between telehealth approach and actual intervention. When examined together, the degree of integration between telehealth approach and alcohol misuse intervention provides evidence of the likely phase in the alcohol misuse treatment process being targeted. In short, more telehealth integration appears to be associated with alcohol misuse interventions further along in the treatment process. Table 1 presented below explains how each intervention falls along this continuum.

Telehealth CBT for alcohol misuse represents a minimally integrated telehealth approach. Either telephone or video technology is used to deliver CBT for alcohol misuse as an intervention with previously established efficacy. In this way, telehealth CBT can be seen as a telehealth approach that increases initial access to CBT for alcohol misuse without seeking to alter the intervention. Mobile contingency management for alcohol misuse represents a moderately integrated telehealth approach. Video recordings or directly linked breathalyzer technology is used to measure patients' adherence to alcohol abstinence requirements, often as they participate in some additional alcohol misuse intervention (e.g.,

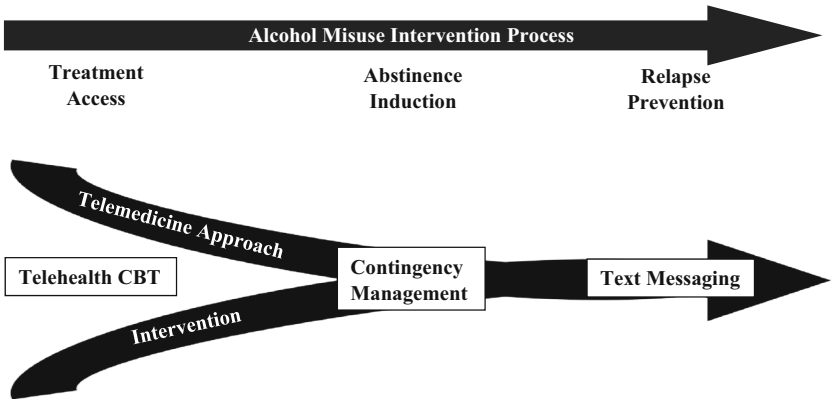

Fig. 1 Integration of telehealth approaches across the alcohol misuse intervention process

CBT). This technological assistance allows contingency management interventions to be applied to the initial abstinence induction phase of alcohol misuse treatment, which requires frequent real-time measurement and feedback for abstinence. Finally, mHealth text and app interventions for alcohol misuse represent a highly integrated telehealth approach. The use of cell phone technology to deliver very frequent, light-touch, real-time intervention to patients is again often paired with additional alcohol misuse intervention (e.g., CBT) and aimed at helping patients adhere to alcohol abstinence or reduction goals over time to prevent relapse.

The three telehealth interventions for alcohol misuse described come with varying degrees of evidence, unique challenges, and emerging new directions. We now review each below.

Telehealth Approach 1: Telehealth CBT

Cognitive behavioral approaches for alcohol misuse are widely acknowledged as evidenced-based interventions due to a large number of well-controlled randomized clinical trials including landmark multisite studies of alcohol treatment including Project MATCH and Project COMBINE [19–21]. Compared with other active treatments, CBT has a statistically significant but small treatment effect ($g = 0.15$) indicating that 58% of patients receiving CBT fare better than those who receive another active treatment [22]. CBT is associated with a large effect when compared with no treatment (random $g = 0.80$).

Table 1 Differing goals of telehealth interventions for alcohol misuse

Telehealth intervention	Degree of telehealth integration	Phase of intervention process	Primary goal
Telehealth CBT	Low	Access	Increase access to efficacious intervention
Mobile contingency management	Medium	Abstinence induction	Increase monitoring and feedback during short-term behavior change
mHealth texts and apps	High	Relapse prevention	Increase support and skill practice to solidify long-term behavior change

While the telephone has been an integral part of managing mental health crises for decades, traditional psychotherapy models have tended to view face-to-face contact between therapist and client as the gold standard. Beginning in the 1990s, however, a growing number of therapists began to routinely provide therapeutic encounters via telephone and challenged assumptions that therapists and clients must be present in the same room [23]. Today, telephone delivered psychotherapy is an increasingly popular mode of delivering care, and there have been numerous trials demonstrating its efficacy across a wide range of behavioral and mental health conditions including alcohol use disorder and other addictions [24•, 25–28].

Alcohol misuse is a promising target for telemedicine use. Currently, only 15–25% of individuals with alcohol misuse seek treatment (according to the National Institute on Alcohol Abuse and Alcoholism). There is a critical need to provide interventions that overcome barriers to treatment. Telephone counseling can increase access to treatment by removing barriers of geography and stigma [29]. Telephone counseling for treatment of persons with alcohol use disorder has demonstrated acceptability, feasibility, and efficacy [27, 30, 31].

Although relatively few studies have directly compared face-to-face CBT for alcohol use disorder to telephone-based therapy, a number of studies have compared face-to-face motivational interviewing or motivational enhancement therapy (MET) for alcohol use disorder to telephone-based approaches [24•]. In a recent systematic review, Jiang and colleagues (2017) reviewed the effectiveness of telephone-based counseling as an alternative to face-to-face interventions for alcohol misuse. Across a total of 11 randomized clinical trials included in the review, all 11 trials supported the efficacy of telephone-based interventions. These results provide support for the premise of telephone-based

counseling as a promising alternative to face-to-face clinic-based counseling for persons with alcohol misuse.

Despite the promising evidence for telehealth delivery of efficacious CBT for alcohol misuse, these methods remain untested in many areas and it is unclear the degree to which adjunctive components of telehealth treatment (such as mobile contingency management and mHealth texts/apps discussed below) may augment telehealth CBT outcomes or provide additional support throughout other stages of the treatment process.

Telehealth Approach 2: Mobile Contingency Management

Contingency management (CM) is a behavioral treatment based on operant conditioning that uses rewards (e.g., money, vouchers redeemable for other rewards, and desired items from a pool of prizes) to reinforce targeted behavior changes. To change substance use behavior, CM treatments provide rewards that are contingent upon demonstrating abstinence from a substance, typically through biochemical verification of abstinence from the substance.

Meta-analyses have found that CM is one of the most efficacious approaches to inducing initial abstinence from a substance, producing moderate-large effect sizes [32] and producing effect sizes beyond that of other behavioral treatments across multiple drugs of abuse [33, 34], including a trial in veterans with alcohol misuse [35]. In addition to the effect of CM on inducing abstinence, the incentives provided by CM have evidence of efficacy for engaging people with substance use disorders in treatment and promoting retention in treatment [34]. CM has demonstrated evidence of efficacy in a range of populations who typically have lower rates of successfully changing substance use behavior, including individuals with low motivation to quit [31, 33] and individuals with comorbid psychiatric disorders [36]. As a result, CM is a promising method being increasingly utilized in special populations that have poorer response to other substance use treatments [33].

The effectiveness of CM for engaging people in treatment might be a particularly good fit for people with alcohol use disorders, a problem for which only an estimated 15% of people ever seek treatment [37]. Unfortunately, the utilization of CM interventions for treatment of alcohol use disorders has been limited by the challenges of bioverifying abstinence from alcohol, which is eliminated from the breath within hours. As a result, detection of alcohol use requires monitoring that detects substance use at least once per day. Nevertheless, there is evidence to support the efficacy of CM approaches for alcohol misuse. Despite suboptimal implementation of CM for alcohol misuse in previous trials (e.g., most trials have not monitored alcohol abstinence during evenings and weekends) [35, 38, 39], trials combining CM with other behavioral treatments at clinic visits occurring two to five times weekly to bioverify alcohol abstinence using a breathalyzer have found that augmenting intensive outpatient substance treatment with behavioral incentives decreased dropout [35, 39], nearly doubled the duration of longest abstinence [38], and increased the odds of alcohol abstinence at the end of treatment [39].

To address the bioverification challenges presented by the quick elimination of alcohol from breath samples, mobile health approaches have assessed alcohol consumption using randomly prompted video recordings of breath alcohol content assessments that are verified by research staff [40] or 3 scheduled assessments using facial recognition software [41]. Two pilot trials of CM that used mobile-monitoring approaches demonstrated 89–96% breath alcohol assessment collection rates [40, 41] and significantly reduced rates of alcohol use, relative to monitoring with reinforcement that is not contingent on alcohol abstinence.

To enable monitoring and bioverification with less frequent assessments, emerging methods of detecting alcohol use over longer time periods are also being utilized in research on CM for alcohol use. Tests of ethyl glucuronide tests are sensitive to detecting small amounts of alcohol consumption that occur in at least the previous 26 h [42]. In one trial using ethyl glucuronide testing, relative to the group without CM, the CM group reported a large reduction in heavy drinking days [43]. However, ethyl glucuronide lab testing is not yet affordable enough for routine monitoring to be scalable, and lab testing would delay feedback to participants, compromising the effectiveness of CM. CM is more effective when feedback and reinforcers occur close to the time of the desired behavior. Transdermal monitors of alcohol use are also in development and could provide continuous assessment [44], though a method of identity verification will be necessary to ensure that the intended patient is the person wearing the monitor. Finally, a metabolite of alcohol called phosphatidylethanol (PEth) is detectable in blood spot testing for 2–3 weeks [45]. PEth tests distinguished between low-risk drinking and hazardous drinking levels and has demonstrated 94% sensitivity and 100% sensitivity for discriminating between alcohol dependence and nonhazardous drinking [46, 47].

Telehealth Approach 3: mHealth Texts and Apps

Numerous interventions exist leveraging telehealth messaging delivered by some electronic means to patients and participants. While some of these interventions include web-based applications or direct telephone communication [48], the current overview is restricted primarily to mHealth interventions—defined as those that can take place in some written form (text or application) on patients' mobile phones.

While these different telehealth messaging delivery methods may have unique benefits or costs, at least one systematic Cochrane review of 57 studies showed no difference in the

effectiveness of initial and sustained alcohol consumption reduction across web-based, telephone, or mHealth text and app modalities [49••]. This review also found an average decrease of 1.5 drinks per week and one binge-drinking episode less per month in patients in mHealth interventions compared with patients in other arms (typically no or minimal intervention). The persistence of these alcohol consumption reductions was variable but generally remained at 6- and 12-month follow-ups. No other alcohol-related outcomes aside from the number of drinks and binge-drinking episodes were consistently affected by mHealth interventions. This review also concluded that mHealth interventions facilitating problem-solving, behavior substitution, and delivering educational information from a credible source were the most likely to produce reductions in alcohol consumption.

Several other recent systematic reviews and meta-analyses with smaller study *N*'s (eight to 19 studies) have yielded similar results suggesting mHealth interventions via texts or apps reduce drinking by 1 to 3.5 binge-drinking days a month [50–53]. However, some meta-analyses reported on a large proportion of studies (up to one-third) that showed no measurable difference [53]. One meta-analysis also demonstrated a clear signal for increased attendance for clinical appointments related to alcohol misuse treatment [52]. A common comment across meta-analyses is the large variability in dosage of messaging (once a week up to six times a day), length of intervention (less than a week to over 6 months), and follow-up period (none up to 1 year). Since the time frames of these meta-analyses, at least two newer mHealth text messaging RCTs have been published and both show reduced alcohol misuse from 1 to 3 months post-treatment follow-up [54, 55]. Taken together, this evidence suggests large variability in the way mHealth interventions for alcohol misuse is conducted. While there appears to be consistent evidence in meaningful sustained reduction of alcohol consumption, a not insignificant proportion of mHealth trials still fail to find this reduction in alcohol consumption.

Aside from the large variability in how mHealth interventions are conducted, a consistent criticism of many mHealth text and app-based interventions in other domains is that many of the informational or reminder-based interventions fail to deliver theory-driven content to patients [56]. Several meta-analyses have begun to attempt to categorize content in terms of behavioral change theory (BCT) components [49••, 53]. One additional promising and simple BCT that is highly amenable to text messaging is implementation intentions. Implementation intentions involve creating if-then statements that pair specific actions (i.e., a replacement behavior for drinking) with environmental cues (i.e., triggers for drinking). Implementation intentions have been shown to be effective across numerous health behaviors [57]. More recently, studies have also shown implementation intentions to be efficacious in reducing drinking by over one drink per week without the assistance of technology [58, 59]. Given the efficacy of text message interventions for alcohol misuse, introducing and reinforcing alcohol misuse implementation intentions via text messaging would seem a natural extension to leverage mHealth technology further with this efficacious BCT.

Conclusions

Research studies on telehealth treatments for alcohol misuse are growing at an exponential rate. Luckily, many of these telehealth methods are evidencing a signal for increasing access to alcohol misuse treatment, increasing abstinence induction, and increasing sustained alcohol misuse reductions. With the large variability in methods for leveraging telehealth and the large variability in phases of the treatment process, it is important to consider what additional parameters can be utilized to ensure this growing body of research is focused enough to demonstrate meaningful impact. The overall disease burden of alcohol misuse in patients with hypertension is high [6••], and evidence supports the effectiveness of telehealth interventions for alcohol misuse in primary care settings [18••]. Thus, focusing some telehealth intervention on patients with alcohol misuse and hypertension may be one way to maximize the impact of these interventions on population health as a whole.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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