**Family-focused vs. Drinker-focused Smartphone Interventions to Reduce Drinking-related Consequences of COVID-19**

**Abstract (max 450 words)**

**Background:**

For adults with Alcohol Use Disorder who have a supportive family partner, an app with features to promote recovery and tools for working together on recovery may reduce risky drinking days and improve relationships. Smart phones have the capacity to provide support and treatment in real time. They can be a successful distraction for triggers, provide a template for working through tough conversations, and be a lifeline to support during a crisis.

With the extreme stress and isolation caused by COVID-19 and COVID-related protocols, healthcare services had to pivot in how they supported their patients. Effective, affordable, accessible interventions are needed to address the serious problems that have persisted.

Unfortunately, in addition to the increase in available, accessible care, COVID and its restrictions also had a detrimental effect on many individuals’ mental health and substance use issues. Restrictions to social events and public spaces, obvious health issues, increases in interpersonal violence, job losses, fear and anxiety surrounding the virus itself, death of loved ones, and the inability to leave one’s home caused a large percentage of the population to turn to alcohol and substance abuse.

**Objective**:

This study will examine the efficacy of our mobile phone app, FAMCHESS-C (PartnerCHESS), and its ability to decrease risking dinking days for an identified patient and increase relationship satisfaction between said identified patient and their concerned significant other as contrasted to dyads who receive the ACHESS-C app without couple behavioral therapy resources, or dyads who only receive a smartphone.

**Methods**:

A total of 396 adults, 198 dyads, will be recruited with one person as the identified patient and the other as a concerned significant other. In the context of this study, the concerned significant other is defined as a spouse, significant other, or family member. Each dyad is then randomized by gender identity and alcohol severity, based on DSM-5 self-report, into one of three study arms: Control – where neither the identified patient nor the concerned significant other receive the app during the study, ACHESS-C – where only the identified patient receives the app, and FAMCHESS-C – where both participants from the dyad receive the app to use together. For eight months, all participants will receive payment towards their smart phone plan or a smart phone with cellular service provided by the center. At baseline, 4 months, 8 months, and 12 months, all participants will complete written surveys comprising validated scales selected for good psychometric properties with similar populations.

**Results**:

Recruitment ran from May 2022 until June 2023. The intervention period will end in January 2024 with follow up surveys completed in June 2024. The findings will be disseminated via peer-reviewed publications.

**Conclusions**:

To our knowledge, this is the first study of its kind to examine support for both identified patients and their concerned significant others in reducing risky drinking days and improving quality of life during and after the COVID-19 pandemic.

**Trial Registration**:

ClinicalTrials.gov NCT05419128; <https://classic.clinicaltrials.gov/ct2/show/NCT05419128>

**International Registered Report Identifier (IRRID):**

**JMIR Res Protoc**   
  
**doi:**

**Keywords**

Mobile phone, smart phone applications, quality of life, alcohol use disorder, alcohol, risky drinking, couple behavioral therapy, COVID-19,

**Introduction**

**Background**

Throughout the COVID-19 pandemic, increased stress and isolation has led to higher use of alcohol and other drugs.1 A RAND national longitudinal study found an overall 14% increase in drinking days from mid-2019 to mid-2020, with a 41% increase in heavy drinking days and 39% increase in drinking consequences for women.2 Additionally, the CDC issued a health advisory warning of a rapid acceleration in drug overdose deaths during the pandemic.3 Research suggests that reasons for these spikes in drug use and overdoses included stresses and loss of structure that stem from fear of disease, isolation, and job/income loss 4–6. In addition, reduced access to treatment—as the pandemic causes clinics to reduce staff/hours and delay treatment initiation—and job loss leading to loss of health insurance also caused a rise in drug use and overdoses. 7,8

Even before the pandemic, alcohol and substance use disorders afflicted over 20 million American adults age 18 and older.9,10 Over 50% of treated users return to substance abuse within a year.11 The cost of providing treatment is high, and even the best evidence-based programs cannot address in real time the cravings, conflicts, and emotional states that often lead to relapse.12 Since the beginning of the pandemic, the need for interventions to address these issues—including for communities that have been underserved and that face the greatest health, financial, and psychological impacts of the pandemic—has only increased.

Pew nationally representative data indicate that in 2021, 85% of US adults owned a smartphone and roughly 15% relied on it as their primary means of accessing the internet.13 This reliance was especially common among African American and Hispanic populations, lower-income respondents, and younger adults.13 As the pandemic shifted many critical services online (e.g. medical and therapeutic treatment, unemployment benefits, housing and food resources), access to smartphones became a fundamental tool for mitigating inequities in access to health information and other resources.14–17

Beyond the basics of smartphone-enabled internet access, a growing research literature indicates that smartphones can play an important role in treatment for Alcohol Use Disorder (AUD) and Substance Use Disorder (SUD),18 providing anytime/anywhere access to effective care, including assertive outreach,19 monitoring,12,20,21 action planning,22 symptom reinterpretation,23,24 peer25,26 and family support,27 prompts,28,29 and professional support.12,30 The use of smartphones to receive help without physically attending recovery meetings and counseling sessions can reduce stigma and increase treatment seeking and retention. Smartphones are portable, and their software can be modified quickly in response to new needs, such as those posed by COVID.

**Need for a Trial**

Understanding more about how partner-based interventions can support individuals struggling with AUD, and which types of these interventions are most beneficial, is vital to improving outcomes for these populations. Additionally, these types of interventions may provide support for individuals who have previously been unable to access it. More information is needed to understand if these types of interventions are easy to use and provide adequate benefits to both the drinker (subsequently referred to as the identified patient or IP) and their partner or family member (hereafter referred to as the concerned significant other or CSO).

Though similar systems have been tested previously and found to provide positive outcomes, we now seek to test whether this improved system (FAM-CHESS-C) will provide the same results as previous systems and whether including other CSOs, rather than only intimate partners, can provide the same results. Understanding which of these systems provides the best type of support for individuals in recovery, along with their CSOs, is crucial to improving these treatments in the long-term.

**Methods**

**Trial Design**

The trial has a randomized controlled design with 3 groups. Participants will be randomized to 8 months in (1) a smartphone control group, (2) an A-CHESS-C group, or (3) a FAM-CHESS-C group. Descriptions of what participants in each group will receive are included below. All participants will be followed for 12 months (8-month active app/phone-use phase plus follow-up 4 months later).

**Sample Size and Study Setting**

A total of 198 dyads consisting of one IP, who drinks at risky levels or has AUD (any severity), and one CSO will be recruited from the community. Dyads will be recruited through television and Craigslist ads running primarily in Wisconsin, Minnesota and Illinois, email blasts to faculty and staff at the University of Wisconsin, and Facebook ads running nationally. In addition, referrals from addiction treatment agencies, hospitals that identify individuals with AUDs, and the wider community would also be accepted.

**Intervention Groups**

**Smartphone Control**

Both the IP and CSO will receive contact information for Alcoholics Anonymous (AA), Narcotics Anonymous (NA), Al-Anon, Adult Children of Alcoholics (ACOA), Smart Recovery and crisis hot lines. For participants who receive a smartphone, these will be pre-programmed onto their device.

**ACHESS-C**

In the ACHESS-C arm, IP will receive the ACHESS-C app, either on their own device or one provided by the center. The CSO will receive contact information for the aforementioned organizations and hotlines. Again, for participants who receive a smartphone, these will be pre-programmed onto their device.

**FAMCHESS-C**

In the FAM-CHESS-C arm, IP and CSO will both receive the FAM-CHESS-C app, either on their own device or one provided by the center, which contains ACHESS-C services plus Alcohol Behavioral Couple Therapy (ABCT)/PartnerCHESS services.

**Eligibility Criteria**

Both the IP and the CSO must be willing to give informed consent, agree to complete interviews at baseline, 4, 8, and 12 months, and not have a mental or physical condition that limits or inhibits smartphone use to participate in the study. The IP must be age 18 or older and meet criteria for risky drinking (for men, >14 standard drinks in a week or >4 in a day; for women, >7 in a week or >3 in a day)52 or meet criteria for AUD (any severity), as defined by the DSM-5, and have had at least 1 drink in the past 3 months.53 CSOs must be a committed romantic partner, spouse, or family member (e.g. sibling, parent, grandparent, adult child age 21 or older).

Individuals will not be eligible to participate if they have current (last 6 months) evidence of untreated serious mental illness (active psychosis, delusions, hallucinations, active manic phase) or if either partner reports serious interpersonal violence, because of potential safety risk owing to access to a partner's smartphone.

**Recruitment**

This will be a nationwide recruitment using platforms such as email marketing, targeted over-the-air advertising delivered through streaming platforms (e.g. Roku, Amazon Fire TV), local broadcast television, Craigslist, Facebook, and an email blast sent to faculty and staff at the University of Wisconsin. We will aim to reach both individuals who are currently receiving treatment for AUD and those who are not, as well as individuals who may not have access to treatment for a variety of reasons, including stigma or cost through our television and Facebook ads.

After we receive initial indication of interest through phone calls or the online Qualtrics survey from our website, a member of the study team will call the dyad to describe the study. CHESS staff will speak with each member of the dyad individually and follow the phone screening script to determine eligibility. If only one member of the dyad is available, we will ask for permission to contact the other person or encourage the interested party to have their partner call us. In addition, we will offer to send their partner a letter or email which contains a description of the study and how to contact CHESS staff.

If both the IP and CSO are eligible and interested, study staff will schedule a time to complete the informed consent with each participant over the phone, acquiring verbal consent because all recruitment will be done remotely. During the informed consent, participants will be told the nature and purpose of the study, the types of data that will be collected from FAM-CHESS-C and A-CHESS-C, the study risks and measures taken to mitigate these, their right to leave the study at any time, the timeline of the study, and the compensation for their participation. Verbal consent will be documented on the recruitment form and in REDCap, and a copy of the IRB-approved consent form will be sent via mail or email to participants for their records. All study data outside of REDCap will be stored in a locked cabinet at the Center for Health Enhancement Systems Studies at the University of Wisconsin–Madison.

Baseline interviews will be conducted with the IP and CSO individually over the phone. All follow-up interviews will be conducted over the phone, through the mail, or through a secure link via Qualtrics. IPs will always complete the timeline follow-back interview over the phone at baseline, 4, 8, and 12 months. If the IP or CSO declines, the dyad will be excluded. We will document reasons for refusals and monitor whether refusal rates differ by sex, race/ethnicity, and age. We will also note race/ethnicity and whether partners are of the opposite or same sex.

**Randomization**

Once informed consent has been received and the baseline survey has been completed, we will use urn randomization54 to stratify on IP’s gender identity, balancing on alcohol use severity (moderate or severe AUD). The University of Wisconsin-Madison team will ship smart phones to participants who need them, and train IPs and CSOs on the appropriate technology. Participants will be blinded to their intervention group as much as possible while staying in line with the guidelines outlined in the informed consent. Because all participants will receive recovery support resources and content, the script to describe the study arms and expectations for participation can be the same for all arms. Research staff were blinded at baseline, before randomization, but as is generally the case with trials of mHealth for SUDs, blinding was not possible once participants received their technology. Data entry will be performed by staff blind to condition. To set up participants on their assigned app (ACHESS-C or FAMCHESS-C), the researcher conducting the training cannot be blinded to the condition after assignment.

Recruitment Flow Chart

**Timeline**

This table shows the timeline by months of the study, with the first month beginning in September 2021 and the 36th month ending in August2024.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Months of Study** | | | | | | | | |
| **Activity** | **1-4** | **5-8** | **9-12** | **13-16** | **17-20** | **21-24** | **25-28** | **29-32** | **33-36** |
| Project setup |  |  |  |  |  |  |  |  |  |
| Refine ACHESS-C and FamCHESS-C interface and training |  |  |  |  |  |  |  |  |  |
| Finalize protocols and data collection plans |  |  |  |  |  |  |  |  |  |
| Train staff |  |  |  |  |  |  |  |  |  |
| Recruit, set up, and train dyads |  |  |  |  |  |  |  |  |  |
| Operate PartnerCHESS & ACHESS |  |  |  |  |  |  |  |  |  |
| Refresh content including COVID |  |  |  |  |  |  |  |  |  |
| Collect RCT data |  |  |  |  |  |  |  |  |  |
| Data cleaning and preparation |  |  |  |  |  |  |  |  |  |
| ACHESS-C and FamCHESS-C use analysis |  |  |  |  |  |  |  |  |  |
| Data analyses |  |  |  |  |  |  |  |  |  |
| Prepare publications |  |  |  |  |  |  |  |  |  |

**Intervention**

**Background**

CHESS (Comprehensive Health Enhancement Support System) is the overarching name for a variety of eHealth systems built to support continuing care for chronic diseases. All CHESS systems are based on principles of Self-Determination Theory (SDT), providing tools to enhance coping competence, intrinsic motivation, and social relatedness.31 Previous randomized clinical trials (RCTs) have found that CHESS significantly improved: 1) asthma control32; 2) quality of life and cost of care in HIV patients33; 3) quality of life and self-efficacy in breast cancer patients compared with control34 and internet35; 4) risky drinking36; and 5) caregiver burden, symptom distress, and median length of survival in lung cancer patients.37 CHESS for lung cancer was aimed at caregivers as well as patients and was our first to integrate features of Cognitive Behavior Therapy (CBT),37 which is also a cornerstone of Alcohol Behavioral Couple Therapy (ABCT), features of which are integrated into this trial.38

**System Overview**

A-CHESS (Addiction–CHESS) is a smartphone app designed to prevent relapse after treatment for AUD/SUD.36 It offers emotional and instrumental support at any time and place. In a previous RCT, A-CHESS, compared with usual care, reduced risky drinking days by 47%, improved abstinence by 23%,36 and significantly increased treatment retention at months 8 (OR=1.96, 95% CI=1.09-3.52) and 12 (OR=2.16, 95% CI=1.13-4.12).39 Further, a large (N=198) field test of A-CHESS in Appalachia found that individuals with A-CHESS averaged more than twice as many treatment service units (780 vs. 343) and remained in treatment more than 50% longer (410 vs. 262 days) versus a non-randomized comparison group.40 An RCT (N=262) in Philadelphia that involved a mainly African American sample of individuals with SUDs found A-CHESS to be superior to a pure control (49% fewer risky drinking days at 4-, 8- and 12-month follow-ups).87 Source?

A-CHESS does not involve partners in use of the app. In 2020, we adapted A-CHESS to incorporate COVID-19 related content, creating A-CHESS-C. This A-CHESS-C app will be the intervention for the IP-focused (A-CHESS-C) study arm for this proposed study.

Our National Institute on Alcohol Abuse and Alcoholism (NIAAA) R34 funded us to combine ACHESS with a digital adaptation of ABCT38 to develop PartnerCHESS. CSO support can help prevent relapse because AUD problems and intimate relationships are reciprocally related. Distress in the relationship, along with CSO attempts to control the IP’s drinking and substance use, may prompt craving and trigger relapse; alcohol and drug use are associated with greater relationship conflict, especially under the constraints of COVID mandates.41 Further, recovery can destabilize relationships, as new patterns of interacting need to be negotiated to support each partner’s needs.42 Yet many CSOs do not know how to support recovery or manage their own responses to the IP’s changed drinking behavior, including symptoms of post-acute withdrawal such as irritability.27 While CSOs can help loved ones stop drinking or using drugs,43–48 trying to do so may increase their own stress.49–51

ABCT has demonstrated positive outcomes for people with AUD.38 Recognizing the reciprocity between intimate relationships and substance abuse problems, ABCT tries to build abstinence support and strengthen the couple relationship. ABCT uses the relationship to reward abstinence and teaches tools for better communication and more positive activities 38. PartnerCHESS includes key aspects of ABCT which the IP and the CSO each receive within the smartphone app. In addition to the regular ACHESS components, PartnerCHESS incorporates ABCT elements to identify and deal with triggers and cravings, increase positive activities together as alternatives to drinking and to reinforce abstinence, teach the CSO how to be more supportive, and help improve communication.

FAM-CHESS-C will expand PartnerCHESS by 1) adding COVID-19 related content, 2) shifting from exclusive focus on intimate partners to include any concerned significant other (CSO), and 3) adding content from A-CHESS to address comorbid use of other drugs that interact with COVID-19 risk and consequences. Like A-CHESS-C, FAM-CHESS-C will be designed to address immediate and longer-term collateral damage of COVID. Unique to FAM-CHESS-C (vs. A-CHESS-C) is that it engages a CSO. CSOs tend to suffer deeply from a loved one’s alcohol and drug use yet are in a powerful position to support recovery.

**Theoretical Foundation**

CHESS systems are consistent with self-determination theory, which asserts that satisfying 3 basic psychological needs contributes to adaptive functioning: competence (feeling effective, not overwhelmed), social relatedness (feeling connected to others, not isolated), and intrinsic motivation (feeling autonomous, not coerced).88

**Interface and Features**

COVID content. COVID-relevant materials are incorporated into multiple services.

Instant library. Frequently asked questions and brief information on addiction and couples-related issues (e.g. taking care of yourself, financial matters, substance abuse, crisis intervention, referral, medications).

Discussion groups.Forums connect IPs with others as well as with a coach to prompt discussion and reflection.

Personal stories*.* Audio/video of patients and family partners talking about experiences dealing with addiction. The audio/video is not of active study participants, but volunteers willing to share their experiences.

Location monitor. Geo-fencing of areas identified by participants as triggers (e.g. a bar that was frequented) prompts a warning and a suggestion to counteract cravings.

Surveys/ecological momentary assessments*.* Questions assess immediate needs and trends over time. CSOs are asked about their own status and their perspectives on the IP’s status. Advice or referrals to other ACHESS-C or FamCHESS-C services arise from responses to questions62

Guided relaxation*.* Audio/video to guide mindfulness, relaxation, games, and other help for cravings.

Healthy activities. Database of ideas (e.g. taking a walk) and recovery-friendly activities.

Time of day monitor. Scheduled high risk times identified by IPs as triggers (e.g. 5:00 pm on a Friday after work) prompts a warning and a suggestion to counteract cravings.

Tips for Tough Times button. Crisis hotlines, relaxation exercises, optional calls to supporters, links to games for distraction, and other resources.

Skills reminders. Tips and reminders of CBT-based skills (e.g. effective communication, refusal skills).

All the above services in A-CHESS-C are also included in FAM-CHESS-C. Additional features included in FAM-CHESS-C that are not available in A-CHESS-C are:

ABCT tutorials. Interactive e-learning modules explaining key ABCT skills, including helping IP with triggers and cravings, supporting change, self-care, partner-assisted relapse prevention, enhancing pleasant activities together, and improving communication.

Trigger identification and removal. FamCHESS-C prompts dyads to identify coming trigger events and reminds them of ways to address each.

Cravings discussion. Ecological momentary assessments track preconditions for relapse, review urge reduction options, and encourage partner discussions on causes and managing urges.

Discussion Groups. A separate discussion group for CSOs to connect with others and a recovery coach.

Optional Video Meetings. Regularly scheduled group meetups for CSOs facilitated by research staff via zoom. Attending video meetings is completely optional for these participants and will be scheduled periodically based on interest.

Relapse plan. Monitoring and reminding of steps that have been planned and constructed together for relapse prevention.

Reminders*.* Reminders to notice something positive in one's partner, of reasons to stay sober, to take meds, etc.

FamCHESS-C will have two complementary versions—one for the IP, one for the CSO—which contain different, role-relevant information for some services. For instance, the Instant Library for the CSO contains partner-related stories and other material on self-care during crisis, while that content does not appear in the IP version. Additionally, some permissions within services differ by role. For example, CSOs can communicate with other CSOs in the discussion group, and IPs with other IPs, but CSOs cannot read IP’s discussion group posts and vice versa. This enables users to engage in a peer network for more candid interactions.

IPs and their CSOs can access FamCHESS-C when and how they wish, but the system will also push notifications to them. Thus FamCHESS-C does not rely on user initiative alone to drive engagement. For example, IPs will receive notifications when it is time to take a survey or when they are near a high-risk location. CSOs will receive notice of a new post in their discussion group and alerts if the IP has completed a learning module or messaged them through the app.

**Outcomes and Variables**

Figure 1 shows the expected study logic that will be used. Further explanation is provided below.

A diagram of a diagram

Description automatically generated

**Primary Outcomes**

Our primary outcomes are differences between study arms (FAM-CHESS-C vs. A-CHESS-C vs. smartphone control) for 1) IP % risky drinking days and 2) dyad psychological distress. We selected these as the primary outcomes because psychological distress captures the physical and socio-emotional impacts of COVID and alcohol and comorbid drug use for IPs and CSOs.

**Secondary Outcomes**

There are several secondary outcomes looking at the differences between our three study arms. We will examine 1) IP abstinence, 2) dyad relationship satisfaction, and 3) dyad abusive behaviors.

**Mediators**

Effects of A-CHESS-C vs. FAM-CHESS-C on improvements in primary outcomes (baseline to 12 months) will be mediated by improvement from baseline to 4 months in (1) CSO: Couple alcohol-related communication, (2) CSO: Peer support, (3) IP: Motivation, and (4) IP: Extent of use of app.

**Moderators**

The effect of study arm on primary outcomes may be moderated by patient and partner’s gender identities, type of relationship, and partner relationship satisfaction.

**Covariates**

We will consider several potential covariates if the groups significantly differ between groups and they significantly predict the outcome. If both conditions are meet, then they will be included in the model if convergence is not an issue. Those covariates include age, education, race/ethnicity, concurrent treatment, COVID acute and residual symptoms, and psychiatric treatment history.

**Measures**

**Overview**

Table 1 lists all planned measures, number of questions, and sources, with references to validation studies where relevant. These measures have good psychometric properties with similar populations. Where possible, we used PhenX and PROMIS measures (e.g. PROMIS 29.2) so that results are comparable to other studies.64

**Table 1: Proposed Measures, Scales, and Sources for Study Outcomes and Other Variables**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Measure*** | *Who* | ***Source*** | ***# Items*** | ***Time*** |
| **PRIMARY** | |  | | |
| % Risky Drinking Days | IP | Timeline Follow-Back |  | all |
| Psychological distress | Dyad | OQ45 | 45 | all |
| **SECONDARY** | | | | |
| Abstinence | IP | Timeline Follow-Back |  | all |
| Abusive behaviors | Dyad | Composite Abuse Scale (Revised) Short Form | 16 | all |
| **MEDIATORS** | | | | |
| Couple alcohol-related communication (coping skills, competence) | CSO | Use of ABCT treatment Skills | 18 | 4,8,12 |
| Peer Support (Relatedness) | CSO | Bonding Scale | 5 | all |
| Motivation | IP | “Taking Steps” sub scale of the SOCRATES Abstinence Goal Survey | 20 | all |
| App Use | IP | Smartphone data |  |  |
| **MODERATORS** | | | | |
| Patient Gender | IP | Demographics | 1 | 0 |
| Partner Gender | CSO | Demographics | 1 | 0 |
| Type of Relationship | Dyad | Demographics | 1 | 0 |
| Relationship satisfaction | CSO | DAS-7 | 8 | 0 |
| **APP USE/SATISFACTION** |  |  |  |  |
| App use | Dyad in PartnerCHESS; IP in ACHESS | Smartphone data |  |  |
| Impact of app on drinking and relationship satisfaction | Dyad in PartnerCHESS; IP in ACHESS | Non validated questionnaire created by Louise | 5 | 12 |
| Satisfaction | Dyad in PartnerCHESS; IP in ACHESS | Qualitative interview | 20 | After study completion |
| **SAMPLE DESCRIPTION** |  |  | | |
| Alcohol-use Disorder Symptom Severity | IP | DSM-5 Checklist | 11 | 0 |
| Gender Identity | Dyad | Demographics | 1 | 0 |
| Age | Dyad | Demographics | 1 | 0 |
| Education | Dyad | Demographics | 1 | 0 |
| Race/ethnicity | Dyad | Demographics | 2 | 0 |
| Household income | Dyad | Demographics | 1 | 0 |
| Living arrangement | Dyad | Demographics | 1 | all |
| Relationship status | Dyad | romantic and family | 2 | all |
| Employment status | Dyad | Demographics | 2 | all |
|  |  |  |  |  |
| Covid vaccination status | Dyad |  | 2 | 0 |
| Covid symptoms | Dyad | Carfi list | 8 | 4,8,12 |

**Data Collection Methods**

**IP Surveys**

The following IP-reported measures will be gathered via participant surveys at baseline, 4, 8, and 12 months: days of risky drinking, quality of life, relationship satisfaction, physical/psychological conflict, COVID vaccination completion, drinking/drug problems, crisis healthcare admits (ER, 30 day readmits), competence, relatedness, motivation, concurrent treatment services, psychiatric treatment history, and COVID acute and residual symptoms. Reduction of % days of alcohol or drug use will only be assessed at 4, 8, and 12 months. At month 12, % days alcohol or drug use will be assessed. Demographic information will only be collected at baseline.

Surveys will be conducted with both members of the dyad in all three study arms every 4 months (baseline, 4, 8, and 12 months). Baseline surveys will be completed over the phone with study staff. Participants will have the option to complete 4, 8, and 12 month surveys over the phone, by completing a paper survey and mailing it back, or completing the survey using a secure University of Wisconsin-Madison Qualtrics online survey. Participants who wish to complete a paper survey and mail it back will be provided with a self-addressed stamped envelope. IPs will also participate in part of the survey over the phone at 4, 8, and 12 months to obtain a timeline follow-back of their alcohol and drug use patterns. Each participant receives $25 per completed survey. Payments will be processed in 2 ways. If the participant prefers to receive their payment in the mail, we will send cash to the participant within 5 business days of their survey being completed. If the participant prefers, we will send them payment through a mobile app (e.g. Venmo or Paypal). All participants will receive $25 after their baseline survey. Participants who have their own device will receive $50/month to go towards their smart phone plan for 8 months. The payment schedule for these participants is as follows: $100 at 2 months, $100 after the completion of their 4-month survey, $100 at 6 months, $100 after the completion of their 8-month survey and $75 after the completion of their 12-month survey. Participants who receive a smartphone will have the phone plan paid for over the first 8 months and will receive $25 after each survey (4, 8, and 12 months).

**PartnerCHESS System Data** Every participant interaction with the app such as page opens or EMA completion rate will be collected throughout the 8-month active phase of the study. This will be used to determine frequency of use and which features were used.

**Qualitative Interviews**

We will collect qualitative data from 20 IPs and 20 CSOs in the RCT on perceptions of difficulties and benefits of ACHESS-C and FamCHESS-C use.

**Retention**

We will promote retention by providing ready access to support for participant’s use of the technologies, reminding participants of when they have a survey to complete, and by actively following up with participants to encourage them to return surveys. If a survey is not returned within 2 weeks, a research team member will call to check that the survey was received and encourage the patient to complete and return it. The date and time of all communication will be recorded in REDCap along with whether the researcher talked to the participant directly or left a message and any information gathered during the phone conversation. If we cannot reach the participant, the researcher will send another copy and also inquire about ways to contact the person through their partner. In our PartnerChess study, for which we have recently completed data collection, survey response rates were .

**Data Management**

To mitigate the risk of breaches of patient confidentiality, all participants are assigned a unique ID number. All contact information and survey data are housed electronically in REDCap. If patients complete paper surveys, survey data are double entered by 2 different individuals to ensure accuracy. Paper-based files are stored in a locked room in locked file cabinets and can be accessed only by authorized personnel. The database administrator provides access to study data at appropriate levels for various members of the research team.

significant contrasts, with differences

**Quantitative Analysis**

*Assumptions and randomization effect:* Participants will be assigned at random, with constraints that study arms will have roughly equal proportions for our stratified variables (e.g., IP’s gender identity and alcohol use severity (moderate or severe AUD)). Variables will be examined using standard summary statistics, visualizations, and tests for normality and homoscedasticity. Data will be transformed as needed.

*Analysis of study arm effects.* Linear mixed models will be used to assess effects of study arm on each of our primary and secondary outcomes over time. There will be fixed effects for study arm, time, and their interaction. When applicable, a fixed effect will be added for the baseline values of the outcome variables. A by-subject random intercept and by-subject random slope for time will be included to accommodate the repeated measures on time. Time will be measured quantitatively (in months) and centered at the end of the intervention period (8 months). Baseline scores on the outcomes will be mean centered.

Study hypotheses will focus on the test of the parameter estimates for the two study arm effects. We will also test the study arm by time interaction to determine if the study arm effect is consistent or varies in magnitude over the intervention period. If significant study arm by time effects are observed, we will test simple effects of study arm at the timepoints (4, 8, and 12 months).

We will consider a number of potential covariates as listed previously. Of this list, those variables that significantly predict our primary outcomes will be included in the final analysis.

*Analysis of mediators.*We will test for mediators of the study arm effects on our primary outcomes (IP % risky drinking days, dyad psychological distress) using the Joint Test of Significance method that has been recommended for its balance with respect to Type 1 and 2 error rates.a,b To establish mediation, this method requires and simultaneously tests that both the effect of study arm on the mediator (α) and the effect of the mediator on the outcome (β) are jointly significant. Separate mediation analyses will be conducted for each combination of mediator and outcome. Measures of the mediators will be obtained at 4 months, and measures of the outcomes will be obtained at 8 months. Both mediator and outcome measures will be adjusted for their respective baseline values when baseline measures are available.

*Analysis of moderators.*Analyses of study arm moderators including patient and partner gender (two variables, each man vs. women), type of relationship at baseline (romantic partner, family, other), partner relationship satisfaction (at baseline) will be conducted in follow-up analyses that add each moderator separately to the linear mixed models described above. Specifically, we will add fixed effects for the moderator and its interactions with study arm contrasts. Study hypotheses about moderation will focus on the test of the parameter estimates for the study arm contrasts by moderator interaction effects.

*Missing data.*In previous RCTs, we completed 85% of interviews through 12 months and limited missing data on core interview items to about 2%; we expect similar rates in this study. In SUD studies, data are not likely to be missing at random (i.e., the probability that data are missing relates to what the data would have been had the data been observed).c We will conduct a sensitivity analysis on missing data, using logistic regression in order to examine whether dropout at follow-up is associated with observed/assigned factors, covariates, or outcomes at baseline. If missing data affects power or is significantly not missing at random, linear mixed models or multiple imputation will be used.

**Qualitative Analysis**

For data sets of patient and physician interviews, a coding scheme of key themes will be constructed based on the research questions of perceived benefits and barriers to use and examination of the data. Each scheme will be pilot-tested, and then 2 trained coders will code an overlapping subsample of 20% of content. Once reliability is established with a minimum Krippendorff α of .80 per category, the coders will work independently to code the rest of the material.

**Ethics Approval**

This study protocol received ethical approval from the University of Wisconsin Health Sciences and Minimal Risk Research Institutional Review Board (reference 2021-0943). All amendments to the protocol have been submitted to the institutional review board and approved. This study complies with the Declaration of Helsinki and its later amendments.

**Results**

Recruitment began in April 2022 and ran through May 2023. The intervention period will end in June 2024. As of July 2023, a total of 400 participants have been recruited. The findings will be disseminated via peer-reviewed publications.

**Discussion**

**Study Overview**

Because of the significant impacts that substance use can have on both individuals and their relationships, incorporating relationship-based supports into treatment shows promise for improving both treatment and relationship outcomes. Understanding what types of content provide the best support, both to IPs and to their CSOs, will allow future relationship-based supports to be more effective and improve outcomes further. To assess this, we will examine group differences in days of alcohol use, dyad quality of life, dyad relationship satisfaction, and dyad psychological and/or physical conflict. These measures will allow us to develop a greater understanding of how these different supports differentially affect IPs and their CSO and their relationships with each other.

**Comparison with prior work**

Our center has extensively studied the use of smartphone-based supports for substance use and has found good evidence that these mobile applications are effective.36,39,40 Additionally, there is previous research showing that relationship-based treatments for substance use can improve outcomes.79 Adding elements from these relationship-based treatments to our center’s previously developed substance use supports will allow development of an understanding of how relationship-based treatments for substance use can be developed and what elements of these treatments are most useful and effective.

**Future directions**

Relationship-based interventions show promise to provide additional support for individuals in recovery from SUDs and give an avenue to support relationship partners as well. Because of the damage that substance use can cause to family and romantic relationships, providing support to both the individuals using substances and those around them may provide a unique way of improving outcomes for these individuals. However, understanding what aspects of these interventions are most helpful is vital to improving outcomes for these populations.

Future research may want to further emphasize the development of communication and behavioral skills as strong relationships can be an important buffer against future substance use and relapse. Additionally, the research team may want to expand this project into other areas of substance use beyond only alcohol use to see whether the same results are found and if the same support can be found for other types of SUDs.

**Conclusions**

Because of the importance of family and other intimate relationships in our lives and well-being, relationship-based interventions are a promising avenue to increase support for both individuals in recovery from substance use disorders and their family members and improve outcomes for these individuals. Our goal is to find the best way to provide innovative types of support to individuals who have been impacted by substance use, either directly or indirectly, and understanding what aspects of these interventions provide the best support and incorporating them into future interventions will allow future interventions to be improved.

**Acknowledgements**

**Conflicts of Interest**

**Multimedia Appendix**

**References**

1. ‘Relapsing Left and Right’: Trying to Overcome Addiction in a Pandemic - The New York Times. Accessed February 17, 2023. <https://www.nytimes.com/2021/01/04/nyregion/addiction-treatment-coronavirus-new-york-new-jersey.html>

2. Pollard MS, Tucker JS, Green HD. Changes in Adult Alcohol Use and Consequences During the COVID-19 Pandemic in the US. *JAMA Netw Open*. 2020;3(9):e2022942. doi:10.1001/jamanetworkopen.2020.22942

3. HAN Archive - 00438 | Health Alert Network (HAN). Published September 21, 2021. Accessed February 17, 2023. <https://emergency.cdc.gov/han/2020/han00438.asp>

4. Yazdi K, Fuchs-Leitner I, Rosenleitner J, Gerstgrasser NW. Impact of the COVID-19 Pandemic on Patients With Alcohol Use Disorder and Associated Risk Factors for Relapse. *Front Psychiatry*. 2020;11:620612. doi:10.3389/fpsyt.2020.620612

5. Ornell F, Moura HF, Scherer JN, Pechansky F, Kessler FHP, von Diemen L. The COVID-19 pandemic and its impact on substance use: Implications for prevention and treatment. *Psychiatry Res*. 2020;289:113096. doi:10.1016/j.psychres.2020.113096

6. DeJong CAJ, DeJong Verhagen JG, Pols R, Verbrugge CAG, Baldacchino A. Psychological Impact of the Acute COVID-19 Period on Patients With Substance Use Disorders: We are all in this Together. *Basic Clin Neurosci*. 2020;11(2):207-216. doi:10.32598/bcn.11.covid19.2543.1

7. Gangopadhyaya A, Garrett AB. Unemployment, Health Insurance, and the COVID-19 Recession. *SSRN Electron J*. Published online 2020. doi:10.2139/ssrn.3568489

8. Gonzalez D, Zuckerman S, Kenney GM, Karpman M. Almost Half of Adults in Families Losing Work during the Pandemic Avoided Health Care Because of Costs or COVID-19 Concerns.

9. Grant BF, Goldstein RB, Saha TD, et al. Epidemiology of DSM-5 Alcohol Use Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry*. 2015;72(8):757-766. doi:10.1001/jamapsychiatry.2015.0584

10. US National Treatment Plan for Substance Use Disorder 2020. Published February 3, 2020. Accessed February 17, 2023. <https://www.issup.net/knowledge-share/publications/2020-02/us-national-treatment-plan-substance-use-disorder-2020>

11. Moos RH, Moos BS. Rates and predictors of relapse after natural and treated remission from alcohol use disorders. *Addict Abingdon Engl*. 2006;101(2):212-222. doi:10.1111/j.1360-0443.2006.01310.x

12. Dennis M, Scott CK, Funk R. An experimental evaluation of recovery management checkups (RMC) for people with chronic substance use disorders. *Eval Program Plann*. 2003;26(3):339-352. doi:10.1016/S0149-7189(03)00037-5

13. Greenwood S. Mobile Technology and Home Broadband 2021. Pew Research Center: Internet, Science & Tech. Published June 3, 2021. Accessed February 17, 2023. <https://www.pewresearch.org/internet/2021/06/03/mobile-technology-and-home-broadband-2021/>

14. NouriSarah, C K, R L, KarlinerLeah. Addressing Equity in Telemedicine for Chronic Disease Management During the Covid-19 Pandemic. *NEJM Catal Innov Care Deliv*. Published online May 4, 2020. Accessed February 17, 2023. <https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0123>

15. Beaunoyer E, Dupéré S, Guitton MJ. COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Comput Hum Behav*. 2020;111:106424. doi:10.1016/j.chb.2020.106424

16. Iyengar K, Upadhyaya GK, Vaishya R, Jain V. COVID-19 and applications of smartphone technology in the current pandemic. *Diabetes Metab Syndr*. 2020;14(5):733-737. doi:10.1016/j.dsx.2020.05.033

17. Banskota S, Healy M, Goldberg EM. 15 Smartphone Apps for Older Adults to Use While in Isolation During the COVID-19 Pandemic. *West J Emerg Med*. 2020;21(3):514-525. doi:10.5811/westjem.2020.4.47372

18. Johnson K, Isham A, Shah DV, Gustafson DH. Potential roles for new communication technologies in treatment of addiction. *Curr Psychiatry Rep*. 2011;13(5):390-397. doi:10.1007/s11920-011-0218-y

19. Godley MD, Godley SH, Dennis ML, Funk R, Passetti LL. Preliminary outcomes from the assertive continuing care experiment for adolescents discharged from residential treatment. *J Subst Abuse Treat*. 2002;23(1):21-32. doi:10.1016/s0740-5472(02)00230-1

20. Helzer JE, Badger GJ, Rose GL, Mongeon JA, Searles JS. Decline in alcohol consumption during two years of daily reporting. *J Stud Alcohol*. 2002;63(5):551-558. doi:10.15288/jsa.2002.63.551

21. Scott CK, Dennis ML, Foss MA. Utilizing Recovery Management Checkups to shorten the cycle of relapse, treatment reentry, and recovery. *Drug Alcohol Depend*. 2005;78(3):325-338. doi:10.1016/j.drugalcdep.2004.12.005

22. Marlatt GA, Witkiewitz K. Relapse Prevention for Alcohol and Drug Problems.

23. Maisto SA, Connors GJ, Zywiak WH. Alcohol treatment, changes in coping skills, self-efficacy, and levels of alcohol use and related problems 1 year following treatment initiation. *Psychol Addict Behav J Soc Psychol Addict Behav*. 2000;14(3):257-266. doi:10.1037//0893-164x.14.3.257

24. Blackburn IM, Moore RG. Controlled acute and follow-up trial of cognitive therapy and pharmacotherapy in out-patients with recurrent depression. *Br J Psychiatry J Ment Sci*. 1997;171:328-334. doi:10.1192/bjp.171.4.328

25. Han JY, Wise M, Kim E, et al. Factors Associated with Use of Interactive Cancer Communication System: An Application of the Comprehensive Model of Information Seeking. *J Comput-Mediat Commun JCMC*. 2010;15(3):367-388. doi:10.1111/j.1083-6101.2010.01508.x

26. Boisvert RA, Martin LM, Grosek M, Clarie AJ. Effectiveness of a peer-support community in addiction recovery: participation as intervention. *Occup Ther Int*. 2008;15(4):205-220. doi:10.1002/oti.257

27. Treating Substance Abuse: Third Edition: Theory and Technique. Guilford Press. Accessed February 17, 2023. <https://www.guilford.com/books/Treating-Substance-Abuse/Walters-Rotgers/9781462513512/contents>

28. Davis JR, Glaros AG. Relapse prevention and smoking cessation. *Addict Behav*. 1986;11(2):105-114. doi:10.1016/0306-4603(86)90034-1

29. Larimer ME, Palmer RS, Marlatt GA. Relapse prevention. An overview of Marlatt’s cognitive-behavioral model. *Alcohol Res Health J Natl Inst Alcohol Abuse Alcohol*. 1999;23(2):151-160.

30. Rapp RC, Siegal HA, Fisher JH. A strengths-based model of case management/advocacy: adapting a mental health model to practice work with persons who have substance abuse problems. *NIDA Res Monogr*. 1992;127:79-91.

31. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol*. 2000;55(1):68-78. doi:10.1037//0003-066x.55.1.68

32. Gustafson D, Wise M, Bhattacharya A, et al. The Effects of Combining Web-Based eHealth With Telephone Nurse Case Management for Pediatric Asthma Control: A Randomized Controlled Trial. *J Med Internet Res*. 2012;14(4):e101. doi:10.2196/jmir.1964

33. Gustafson DH, Hawkins RP, Boberg EW, Bricker E, Pingree S, Chan CL. The use and impact of a computer-based support system for people living with AIDS and HIV infection. *Proc Annu Symp Comput Appl Med Care*. Published online 1994:604-608.

34. Gustafson DH, Hawkins R, Boberg E, et al. Impact of a patient-centered, computer-based health information/support system. *Am J Prev Med*. 1999;16(1):1-9. doi:10.1016/s0749-3797(98)00108-1

35. Gustafson DH, Hawkins R, Pingree S, et al. Effect of computer support on younger women with breast cancer. *J Gen Intern Med*. 2001;16(7):435-445. doi:10.1046/j.1525-1497.2001.016007435.x

36. Gustafson DH, McTavish FM, Chih MY, et al. A smartphone application to support recovery from alcoholism: a randomized clinical trial. *JAMA Psychiatry*. 2014;71(5):566-572. doi:10.1001/jamapsychiatry.2013.4642

37. Gustafson DH, DuBenske LL, Namkoong K, et al. An eHealth system supporting palliative care for patients with non-small cell lung cancer: a randomized trial. *Cancer*. 2013;119(9):1744-1751. doi:10.1002/cncr.27939

38. McCrady BS, Tonigan JS, Ladd BO, et al. Alcohol Behavioral Couple Therapy: In-session behavior, active ingredients and mechanisms of behavior change. *J Subst Abuse Treat*. 2019;99:139-148. doi:10.1016/j.jsat.2019.01.018

39. Glass JE, McKay JR, Gustafson DH, et al. Treatment seeking as a mechanism of change in a randomized controlled trial of a mobile health intervention to support recovery from alcohol use disorders. *J Subst Abuse Treat*. 2017;77:57-66. doi:10.1016/j.jsat.2017.03.011

40. Johnston DC, Mathews WD, Maus A, Gustafson DH. Using Smartphones to Improve Treatment Retention Among Impoverished Substance-Using Appalachian Women: A Naturalistic Study. *Subst Abuse Res Treat*. 2019;13:1178221819861377. doi:10.1177/1178221819861377

41. McCrady BS, Epstein EE. *Overcoming Alcohol Problems: A Couples-Focused Program*. Illustrated edition. Oxford University Press; 2008.

42. McCrady BS. Treating alcohol problems with couple therapy. *J Clin Psychol*. 2012;68(5):514-525. doi:10.1002/jclp.21854

43. Moos RH. Theory-Based Processes that Promote the Remission of Substance Use Disorders. *Clin Psychol Rev*. 2007;27(5):537-551. doi:10.1016/j.cpr.2006.12.006

44. Moos RH, Moos BS. Protective resources and long-term recovery from alcohol use disorders. *Drug Alcohol Depend*. 2007;86(1):46-54. doi:10.1016/j.drugalcdep.2006.04.015

45. Meyers RJ, Miller WR, Hill DE, Tonigan JS. Community reinforcement and family training (CRAFT): engaging unmotivated drug users in treatment. *J Subst Abuse*. 1998;10(3):291-308. doi:10.1016/s0899-3289(99)00003-6

46. Fernandez AC, Begley EA, Marlatt GA. Family and peer interventions for adults: past approaches and future directions.*Psychol Addict Behav J Soc Psychol Addict Behav*. 2006;20(2):207-213. doi:10.1037/0893-164X.20.2.207

47. Bamford Z, Barrowclough C, Booth P. Dissimilar representations of alcohol problems, patient–significant other relationship quality, distress and treatment attendance. *Addict Res Theory*. 2007;15(1):47-62. doi:10.1080/16066350601012665

48. Barrowclough C, Haddock G, Tarrier N, et al. Randomized controlled trial of motivational interviewing, cognitive behavior therapy, and family intervention for patients with comorbid schizophrenia and substance use disorders. *Am J Psychiatry*. 2001;158(10):1706-1713. doi:10.1176/appi.ajp.158.10.1706

49. Ray GT, Mertens JR, Weisner C. Family members of people with alcohol or drug dependence: health problems and medical cost compared to family members of people with diabetes and asthma. *Addict Abingdon Engl*. 2009;104(2):203-214. doi:10.1111/j.1360-0443.2008.02447.x

50. Ray GT, Mertens JR, Weisner C. The excess medical cost and health problems of family members of persons diagnosed with alcohol or drug problems. *Med Care*. 2007;45(2):116-122. doi:10.1097/01.mlr.0000241109.55054.04

51. Orford J, Copello A, Velleman R, Templeton L. Family members affected by a close relative’s addiction: The stress-strain-coping-support model. *Drugs Educ Prev Policy*. 2010;17(sup1):36-43. doi:10.3109/09687637.2010.514801

52. Drinking Patterns and Their Definitions | Alcohol Research: Current Reviews. Accessed February 17, 2023. <https://arcr.niaaa.nih.gov/volume/39/1/drinking-patterns-and-their-definitions>

53. Alcohol Use Disorder: A Comparison Between DSM–IV and DSM–5 | National Institute on Alcohol Abuse and Alcoholism (NIAAA). Accessed February 17, 2023. <https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/alcohol-use-disorder-comparison-between-dsm>

54. Calvert M, Blazeby J, Altman DG, et al. Reporting of patient-reported outcomes in randomized trials: the CONSORT PRO extension. *JAMA*. 2013;309(8):814-822. doi:10.1001/jama.2013.879

55. Martinotti G, Alessi MC, Di Natale C, et al. Psychopathological Burden and Quality of Life in Substance Users During the COVID-19 Lockdown Period in Italy. *Front Psychiatry*. 2020;11. Accessed February 17, 2023. <https://www.frontiersin.org/articles/10.3389/fpsyt.2020.572245>

56. Pieh C, Budimir S, Probst T. Corrigendum to “The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria” [Journal of Psychosomatic Research 136 (2020) 110186]. *J Psychosom Res*. 2020;139:110278. doi:10.1016/j.jpsychores.2020.110278

57. Schmid L, Wörn J, Hank K, Sawatzki B, Walper S. Changes in employment and relationship satisfaction in times of the COVID-19 pandemic: Evidence from the German family Panel. *Eur Soc*. 2021;23(sup1):S743-S758. doi:10.1080/14616696.2020.1836385

58. Panzeri M, Ferrucci R, Cozza A, Fontanesi L. Changes in Sexuality and Quality of Couple Relationship During the COVID-19 Lockdown. *Front Psychol*. 2020;11:565823. doi:10.3389/fpsyg.2020.565823

59. Waddell N, Overall NC, Chang VT, Hammond MD. Gendered division of labor during a nationwide COVID-19 lockdown: Implications for relationship problems and satisfaction. *J Soc Pers Relatsh*. 2021;38(6):1759-1781. doi:10.1177/0265407521996476

60. Langhinrichsen-Rohling J, Schroeder GE, Langhinrichsen-Rohling RA, et al. Couple Conflict and Intimate Partner Violence during the Early Lockdown of the Pandemic: The Good, the Bad, or Is It Just the Same in a North Carolina, Low-Resource Population? *Int J Environ Res Public Health*. 2022;19(5):2608. doi:10.3390/ijerph19052608

61. Lyons M, Brewer G. Experiences of Intimate Partner Violence during Lockdown and the COVID-19 Pandemic. *J Fam Violence*. 2022;37(6):969-977. doi:10.1007/s10896-021-00260-x

62. Chih MY, Patton T, McTavish FM, et al. Predictive Modeling of Addiction Lapses in a Mobile Health Application. *J Subst Abuse Treat*. 2014;46(1):29-35. doi:10.1016/j.jsat.2013.08.004

63. Kahn JH, Tobin RM, Massey AE, Anderson JA. Measuring emotional expression with the Linguistic Inquiry and Word Count. *Am J Psychol*. 2007;120(2):263-286.

64. Hamilton CM, Strader LC, Pratt JG, et al. The PhenX Toolkit: Get the Most From Your Measures. *Am J Epidemiol*. 2011;174(3):253-260. doi:10.1093/aje/kwr193

65. Collins RL, Kashdan TB, Koutsky JR, Morsheimer ET, Vetter CJ. A Self-Administered Timeline Follow-Back to Measure Variations in Underage Drinkers’ Alcohol Intake and Binge Drinking. *Addict Behav*. 2008;33(1):196-200. doi:10.1016/j.addbeh.2007.07.001

66. Johnston KL, Lawrence SM, Dodds NE, Yu L, Daley DC, Pilkonis PA. Evaluating PROMIS® instruments and methods for patient-centered outcomes research: Patient and provider voices in a substance use treatment setting. *Qual Life Res*. 2016;25(3):615-624. doi:10.1007/s11136-015-1131-3

67. Beckstead DJ, Hatch AL, Lambert MJ, Eggett DL, Goates MK, Vermeersch DA. Clinical significance of the Outcome Questionnaire (OQ-45.2). *Behav Anal Today*. 20141222;4(1):86. doi:10.1037/h0100015

68. STRAUS MA, HAMBY SL, BONEY-McCOY S, SUGARMAN DB. The Revised Conflict Tactics Scales (CTS2): Development and Preliminary Psychometric Data. *J Fam Issues*. 1996;17(3):283-316. doi:10.1177/019251396017003001

69. Spitzer RL, Endicott J, Robins E. Research diagnostic criteria: rationale and reliability. *Arch Gen Psychiatry*. 1978;35(6):773-782. doi:10.1001/archpsyc.1978.01770300115013

70. McCollister KE, French MT. The relative contribution of outcome domains in the total economic benefit of addiction interventions: a review of first findings. *Addict Abingdon Engl*. 2003;98(12):1647-1659. doi:10.1111/j.1360-0443.2003.00541.x

71. Venkatesh V, Davis FD. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Manag Sci*. 2000;46(2):186-204.

72. Szajna B. Empirical Evaluation of the Revised Technology Acceptance Model. *Manag Sci*. 1996;42(1):85-92.

73. Schroder KE, E, Ollis CL. The Coping Competence Questionnaire: A measure of resilience to helplessness and depression. *Motiv Emot*. 2013;37(2):286-302. doi:10.1007/s11031-012-9311-8

74. Zywiak WH, Stout RL, Braciszewski JM, Wray TB, Longabaugh R. Test-Retest Reliability and descriptive analyses of the Modified Important People and Activities (MIPA) Interview. *Heroin Addict Relat Clin Probl*. 2016;18(2):41-48.

75. Tangney JP, Baumeister RF, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *J Pers*. 2004;72(2):271-324. doi:10.1111/j.0022-3506.2004.00263.x

76. McLellan AT, Alterman AI, Cacciola J, Metzger D, O’Brien CP. A new measure of substance abuse treatment. Initial studies of the treatment services review. *J Nerv Ment Dis*. 1992;180(2):101-110. doi:10.1097/00005053-199202000-00007

77. Carfì A, Bernabei R, Landi F, Gemelli Against COVID-19 Post-Acute Care Study Group. Persistent Symptoms in Patients After Acute COVID-19. *JAMA*. 2020;324(6):603-605. doi:10.1001/jama.2020.12603

78. McKay JR, Gustafson DH, Ivey M, et al. Effects of automated smartphone mobile recovery support and telephone continuing care in the treatment of alcohol use disorder: study protocol for a randomized controlled trial. *Trials*. 2018;19(1):82. doi:10.1186/s13063-018-2466-1

79. McCrady BS, Epstein EE, Cook S, Jensen N, Hildebrandt T. A Randomized Trial of Individual and Couple Behavioral Alcohol Treatment for Women. *J Consult Clin Psychol*. 2009;77(2):243-256. doi:10.1037/a0014686

80. Diggle P, Kenward MG. Informative Drop-Out in Longitudinal Data Analysis. *J R Stat Soc Ser C Appl Stat*. 1994;43(1):49-93. doi:10.2307/2986113

81. Hedeker D, Gibbons RD. Application of random-effects pattern-mixture models for missing data in longitudinal studies.*Psychol Methods*. 1997;2:64-78. doi:10.1037/1082-989X.2.1.64

82. Longitudinal Data Analysis | Wiley. Wiley.com. Accessed February 17, 2023. <https://www.wiley.com/en-us/Longitudinal+Data+Analysis-p-9780471420279>

83. Enders CK. Missing not at random models for latent growth curve analyses. *Psychol Methods*. 2011;16(1):1-16. doi:10.1037/a0022640

84. White IR, Horton NJ, Carpenter J, Pocock SJ. Strategy for intention to treat analysis in randomised trials with missing outcome data. *BMJ*. 2011;342:d40. doi:10.1136/bmj.d40

85. Hedeker D, Mermelstein RJ, Demirtas H. Analysis of binary outcomes with missing data: missing = smoking, last observation carried forward, and a little multiple imputation. *Addict Abingdon Engl*. 2007;102(10):1564-1573. doi:10.1111/j.1360-0443.2007.01946.x

86. Thabane L, Mbuagbaw L, Zhang S, et al. A tutorial on sensitivity analyses in clinical trials: the what, why, when and how. *BMC Med Res Methodol*. 2013;13:92. doi:10.1186/1471-2288-13-92

87. McKay JR, Gustafson DH, Ivey M, Pe-Romashko K, Curtis B, Thomas T, Oslin DW, Polsky D, Quanbeck A, Lynch KG. Efficacy and comparative effectiveness of telephone and smartphone remote continuing care interventions for alcohol use disorder: a randomized controlled trial. Addiction. 2022 May;117(5):1326-1337. doi: 10.1111/add.15771. Epub 2021 Dec 23. PMID: 34859519.

88. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol 2000 Jan;55(1):68-78.

**Abbreviations**

**AA:** Alcoholics Anonymous

**ABCT**: Alcohol Behavioral Couple Therapy

**ACHESS**: Addiction-Comprehensive Health Enhancement Support system

**ACHESS-C**: Addiction-Comprehensive Health Enhancement Support system – COVID related

**ACOA**: Adult Children of Alcoholics

**AUD**: Alcohol Use Disorder

**CDC:** Centers for Disease Control

**CHESS:** Comprehensive Health Enhancement Support System

**CSO**: Concerned significant other

**DSM-5**: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

**FAMCHESS-C**: Family Comprehensive Health Enhancement Support System – COVID related

**IP**: Identified Patient

**NA**: Narcotics Anonymous

**PROMIS-29**: Patient-Reported Outcomes Measurement Information System–29

**REDCap**: Research Electronic Data Capture

**RCT**: Randomized Controlled Trial

**SDT**: Self-Determination Theory

**SUD**: Substance Use Disorder

**Copyright**