



STUDY PROTOCOL PAPER FOR THE

Multi-Site Feasibility Evaluation of Mobile & Technology-Assisted Aftercare Services for Crisis Stabilization Units

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FLORIDA STATE UNIVERSITY | JULY 2021



**Study Protocol Paper for the
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Abstract

Introduction: Crisis Stabilization Units (CSUs) offer short-term stabilization services to persons experiencing a mental health or substance use related crisis. Individuals can be admitted to CSUs through law enforcement decision and referral, however, little is known about this process. Additionally, once admitted, a significant challenge for CSUs is retaining individuals in treatment after their initial stabilization. In response, this study examines the feasibility and acceptability of a mobile and technology-assisted aftercare intervention to retain individuals in community-based systems of care who were specifically brought to a CSU by law enforcement.

Methods: Qualitative interviews with law enforcement and CSU-affiliated mental health staff ($n=80$) explore CSU program design and implementation using a randomized controlled pilot trial (RCT) with a six-month follow-up with individuals brought to CSU by law enforcement ($n=24$). Participants are randomly assigned to either the mobile and technology-assisted aftercare intervention or standard aftercare services. Participants randomized into the mobile and technology-assisted aftercare group receive up to six months of intervention services along with access to behavioral health mobile applications 24 hours a day.

Discussion: This research provides an understanding of outcome trends for those who go through standard CSU services compared to those who receive mobile and technology assisted aftercare services. The study offers insight into the decision process for law enforcement about choosing to use CSUs as an alternative to jail and opportunities to inform that process. The current study is designed to inform a larger RCT efficacy trial of CSUs.

Keywords: mental health disorder, crisis stabilization, law enforcement, substance use disorders, randomized, feasibility and acceptability

Abbreviations: CSU, crisis stabilization unit; CSS, community support specialist; LEO, law enforcement officer; CHW, community health worker; RCT, randomized controlled trial.

Introduction

The use of Crisis Stabilization Units (CSUs) as an alternative to jail for individuals experiencing a mental health or substance use disorder crisis is a relatively new approach [1]. CSUs provide short-term, intensive residential support, education, and treatment to manage symptoms of mental health and substance use disorders, otherwise known as behavioral health disorders. The goal of the CSU is to quickly stabilize the individual – often within 72 hours – and refer them to community-based systems of care after discharge.

To date, the majority of research has examined the use of CSUs as an alternative to psychiatric hospitalization. Less is known about the use of CSUs as an alternative to jail [2,3,4]. Understanding CSUs as an alternative to jail is important and differs from using CSUs as an alternative to psychiatric hospitalization. There is a disproportionate representation of individuals with behavioral health disorders in jails attributed to a lack of viable community-based treatment alternatives for people in crisis [5,6,7,8]. When compared to members of the general public, rates of substance use disorders are approximately nine times higher, and rates of mental health disorders are three to six times higher among incarcerated populations [9]. Incarcerating individuals experiencing behavioral health crises exacerbates symptoms and jails are not designed to connect people to treatment in the community; after release, these same individuals are therefore likely to continue to have untreated symptoms and repeat contacts with law enforcement officers (LEOs).

To the best of our knowledge no feasibility studies have been conducted on CSUs as an alternative to jail and empirical evidence is limited related to CSUs in general [3,10,11]. This study aims to fill this gap in knowledge. This study examines the feasibility and acceptability of a mobile and technology-assisted aftercare intervention to retain individuals in community-based systems of care after being diverted from jail and brought to a CSU by LEOs. Qualitative interviews with law enforcement and CSU-affiliated mental health staff (n=80) explore CSU program design and implementation using a randomized controlled pilot trial (RCT) with a six-month follow-up for individuals brought to CSUs by LEOs (n=24).

Participants are recruited from three distinct counties representing an urban, suburban/urban adjacent, and rural jurisdiction. Participants are randomized into either the mobile and technology-assisted aftercare intervention or standard services. Participants in the aftercare group receive up to six months of intervention services along with access to behavioral health mobile applications 24 hours a day. Feasibility and acceptability is assessed through qualitative interviews with CSU stakeholders, and analysis of participant recruitment, retention, and completed intervention sessions. Additionally, psychological, behavioral, and social outcome trends in participants are monitored.

This study seeks to understand how CSUs may operate as alternatives to jail for LEOs, and how aftercare innovations may improve CSU patient outcomes. To do this, this study will examine critical elements of CSUs, assess the feasibility of adding a mobile and technology-assisted aftercare program, assess comparison conditions that do not result in CSU admission, and develop a protocol for a multi-site RCT.

2. Material and Methods

This study leverages research-practitioner partnerships to answer critical implementation and feasibility questions about Crisis Stabilization Units (CSU). The study is guided by three aims.

Aim 1: Identify key elements and implementation factors for CSU dissemination and adoption.

Aim 2: Develop an implementation guide and pilot test a CSU intervention with mobile and technology-assisted aftercare.

Aim 3: Design a multisite RCT study protocol. The potential study will be designed to compare the relative impact of CSUs with mobile and technology assisted aftercare to CSUs without mobile and technology-assisted aftercare on the following short and long-term outcomes.

2.1. Aim 1 Study Design

Aim 1: Identify key elements and implementation factors for CSU dissemination and adoption.

Study aim 1 uses a cross sectional, qualitative study design conducted with CSU stakeholders (n=80) investigating the feasibility and acceptability factors that may influence CSU dissemination and adoption. Study participants include behavioral health professionals and law enforcement officers. Qualitative interviews and focus groups are collected at one time with law enforcement study participants. Qualitative interviews are collected two times with behavioral health professional study participants that implement aspects of the CSU described in study Aim 2 below. Research questions driving this study aim include: what are the barriers and facilitators to CSUs with mobile and technology-assisted aftercare?; and how does the CSU program design perform in operation? Results from this study aim inform the development and implementation of the pilot intervention described in Aim 2.

2.1.1. Sample

Purposive sampling is used to recruit a specific sample of the intended population. Purposive sampling allows us to strategically identify and include law enforcement and mental health professionals who have experience with CSUs. The number of participants interviewed is determined based on the relative size of each behavioral health and law enforcement agency. The total number of behavioral health agencies represented is two. The number of law enforcement agencies represented is six.

2.1.2. Recruitment

Stakeholders from behavioral health agencies are recruited by establishing relationships with directors and supervisors of each agency and having them connect us to relevant department heads. Prospective sites are met with and the research design, aims, and goals are discussed and reviewed. Then, a memorandum of agreement is signed to establish the researcher-practitioner collaboration. Recruitment dates are coordinated over email and phone with department heads. During recruitment dates we travel to the agency and interview all available staff after reviewing confidentiality protections and a consent letter. Law enforcement stakeholders are recruited by following the same site establishment methods as completed with the behavioral health stakeholders.

2.1.3. Measures

The qualitative interviews were developed by the research team with the goal of exploring processes, barriers, and influences of CSU admission and implementation processes. The interviews follow a semi-structured interview guide. A list of the questions asked of law enforcement and mental health stakeholders can be found in Table 1.

Semi-structured interview guide for CSU Stakeholders	
Law Enforcement	Behavioral Health
<ol style="list-style-type: none"> 1. What are you expected to do you get a call to a scene with an individual in a mental health crisis? What are some possible outcomes to that call? 2. Please tell me about your experience with crisis stabilization units. 3. What does a referral to a CSU look like? <ol style="list-style-type: none"> a. Walk me through that process starting with your interaction with the individual. 4. What are some things you consider before deciding to refer an individual to a CSU? <ol style="list-style-type: none"> a. What are some reasons you would not refer an individual to a CSU? 5. How did you learn about CSUs? <ol style="list-style-type: none"> a. Were you told about who is eligible for these programs at that time? 6. What could cause an individual to be denied services from a CSU? <ol style="list-style-type: none"> a. What happens after they are denied? 7. How often is your agency responding to mental health or substance use related calls? 8. How would you describe the relationship between your department and the CSUs? 9. What would improve CSUs? 10. How does the utilization of CSUs impact the community? 11. How do CSUs impact public safety? 12. What conditions, if any, influence mental and substance related calls in your area? 	<ol style="list-style-type: none"> 1. What does the process of crisis stabilization look like? <ol style="list-style-type: none"> a. What does the process look like once an officer brings someone in for a referral? 2. Who is eligible for services? <ol style="list-style-type: none"> a. How do you identify those individuals? b. How effective is the program at reaching qualifying individuals? c. What are some barriers to services? 3. What is the typical capacity of the CSU? <ol style="list-style-type: none"> a. how long do clients typically stay? 4. What types of services are provided at the CSU? 5. What type of community resources are used at the agency? 6. How does the community perceive the program? 7. What does success look like for the agency? <ol style="list-style-type: none"> a. How do you measure that? 8. What would change about the program? 9. How does the CSU discharge process look? 10. What are some, if any, of the characteristics observed in persons brought to the CSU? 11. Could a mobile aftercare program address any barriers to CSU success, if so, how would it help? 12. Does your agency have the means to deploy a mobile after-care program to persons upon discharge from a CSU? 13. What, if any, mobile applications do your staff members recommend to clients with mental health and substance use related disorders? 14. How likely is your agency to incorporate mental and behavioral health mobile applications into the treatment plans with clients? What would this look like for your agency?

Table 1: Qualitative Questions for CSU Stakeholders

2.1.4. Data collection

Research team members collect qualitative data by completing in person qualitative interviews or focus groups with study participants. Whether a participant receives a qualitative interview or a focus group interview is determined by the individual's preference and availability. These interviews are audio recorded, transcribed, de-identified, and the audio is deleted upon completion.

2.1.5. Analysis strategy

Data from Aim 1 will assist us in the development and implementation of our pilot intervention in collaboration with our community partner. Qualitative data is analyzed using descriptive statistics and qualitative content analytic approach. Consistent with Morgan's [12] recommendations for qualitative content analyses and Hsieh and Shannon's [13] directed qualitative content analytic approach, standard definitions of the concepts of interest are developed based on existing literature on feasibility and acceptability. We start with *a priori* themes created from theory and research of feasibility and acceptability prior to beginning the analysis. As the analysis proceeds, additional codes may develop resulting in a revision to the initial coding scheme [13].

To ensure the study's findings are credible, we are engaging in several standard methods for establishing rigorous and trustworthy results. First, we are maintaining an audit trail to document our decision-making process [14]. Additionally, we are using multiple coders. An initial assessment of intercoder reliability is conducted using two independently coded interviews to establish intercoder reliability is at a minimum of 0.60 or higher as assessed by Cohen kappa [15]. To ensure intercoder reliability is maintained, a random selection of 30% of the interviews are independently coded to make certain that the kappa coefficient remains 0.60 or higher [15]. After each intercoder reliability assessment, coders meet to discuss and resolve coding discrepancies. Examining patterns in the presence and absence of thematic categories allows us to provide empirically grounded explanations for identifying key implementation factors for CSU adoption.

2.2. Aim 2 Study Design

Aim 2: *Develop an implementation guide and pilot test a CSU intervention with mobile and technology-assisted aftercare.*

For aim 2, we are developing an implementation guide, as well as examining the impact of adding a mobile and technology-assisted aftercare intervention to persons diverted from jail and brought to a CSU by LEOs. The first objective of Aim 2 is to develop the implementation guide. The implementation guide is steered by the qualitative data from Aim 1 interviews, and on-going interviews with CSU stakeholders throughout the implementation of the pilot intervention. Continuing to procure feedback from CSU stakeholders allows the development of an implementation guide that is responsive to barriers faced by both law enforcement and mental health professionals.

The second objective of Aim 2 is to examine the trends in outcomes of individuals who are brought to a CSU by LEO decision and referral. There are two study conditions looking at the trends in outcomes of individuals brought to CSUs. One study condition is an innovative mobile and technology-assisted aftercare intervention (treatment group) and the other condition is standard care at the existing CSUs (control group). Participants are recruited into the study by a research team member and are randomly assigned to either the mobile and technology-assisted after intervention or to the standard care services.

Persons randomized into the standard care services group receive standard treatment services available to persons discharging from a CSU. These standard services may include a personalized discharge plan, a follow up appointment within a month of discharge for evaluation and connection to other agency services if applicable. A detailed description of standard services can be found in section 2.2.4. Persons randomized into the mobile and technology-assisted aftercare group receive standard services plus up to 26 sessions with a community support specialist (CSS) aftercare provider and 6 months of access to behavioral health mobile applications available on demand. The CSS is a mental health professional who travels to participants to provide mental health services including counseling, navigation community referrals, motivational interviewing, solution focused therapy, psychoeducation, and social support, up to once a week for six months. Participants randomized to this condition also receive 24/7 access to evidence-based behavioral health mobile applications that are recommended based on the participant's diagnostic status, learning style, and goals. The mobile applications are moodtools-depression aid, virtual hope box, recovery path, and intellicare hub. Each of these applications and the respective types of tools offered within are included in Table 2.

Mobile Application	Resources and Tools Offered
Moodtools- Depression Aid	Psychoeducation Symptom tracking Customized Safety Plans CBT activities Journaling Activities
Intellicare Hub	Psychoeducation Symptom Tracking Goal Setting Relaxation Techniques Positive Thinking Activities Coping Skills
Virtual Hope Box	Relaxation Techniques Positive Thinking Activities Psychoeducation Goal Setting
Recovery Path	Coping Skills Trigger Management Referrals to Recovery Meetings Daily Check-Ins

Table 2: Mobile Applications

Two additional study groups, comparison and observational, are included for comparison and policy and practical implications. The comparison group includes a sample of individuals that are not randomly assigned nor intervened upon by the research team. This study group involves data collected on individuals who were perceived to be in crisis related to behavioral health disorders, but were brought to jail by LEO instead of being brought to a CSU. The fourth group is an observational group that is not randomly assigned and receives no intervention from the research team. For this study group, the researchers work with LEOs to identify circumstances and outcomes of what occurs when LEO comes into contact with a person in behavioral health crisis and does not bring that person to jail nor to a CSU – in essence, the citizen is not detained. Although the two additional study groups are not part of the pilot RCT, the comparison and observational groups, provide a full-spectrum analysis of CSU implementation and decision practices and will be highly valuable toward completing overall study aims.

2.2.1. Sample

The goal for Aim 2 is to recruit 24 adults; 12 individuals in the mobile and technology assisted aftercare group and 12 individuals in the standard services group. These adults are recruited equally across the three participating jurisdictions resulting in eight participants per county. Individuals are allocated to one of two study conditions in equal proportions. The inclusion criteria for Aim 2 participants includes participants aged 18 or older, English speaking, discharging to one of three participating counties and plan to remain in the county for six months, admitted to the CSU through law enforcement, consent, and the cognitive capacity to understand study participation and to consent. This sample size is strategically small due to the feasibility nature of the pilot study. Ultimately, the sample size and factors related to this sample size will help determine necessary sample size requirements for service delivery and the subsequent RCT.

2.2.2. Recruitment

Research participants for Aim two are recruited into the study at our partnering mental health agency's CSU prior to their discharge. CSU patients are flagged as potential research participants by a key agency staff member. This staff member flags CSU patients based on whether a patient meets the inclusion criteria. Once the research team is alerted of potential eligible participants, the research team goes on site and ensure eligibility. Eligible CSU clients are informed of the research study and provided details of participation by the research team member. Informed consent is obtained after performing a cognitive assessment. The cognitive ability to consent is determined through the brief capacity to consent screener, a tool that checks comprehension of participating in the study – cognitive capacity is re-assessed at subsequent data collection points when warranted. Potential participants are given the option to consent to participate by the research team member at this time.

2.2.3. Randomization

Randomization occurs for Aim 2 of the study with participants recruited from participating CSUs. Due to the short length of stay in a CSU, the research team are using a one-to-one randomization procedure and pre-randomize the pool of participants prior to recruitment. Each of the three counties have four participants in treatment and four participants in the control group. Participants are notified of their randomization status at the end of the consent and baseline data collection interview.

2.2.4. Intervention Description

The mobile and technology-assisted intervention is designed as an aftercare program for persons released from a CSU and addresses treatment retention barriers by combining in-person assistance and technology-aided tools. The aftercare program is delivered to participants by Community Support Specialists (CSSs) who are employees of our partnering behavioral health agency and trained in research study protocol. The aftercare program is delivered up to once a week for six month or 26 sessions; the frequency of sessions is determined by the needs of each individual participant.

The mobile and technology-assisted aftercare program entails the CSSs providing in-person assistance by meeting with participants, at their homes or nearby public setting, and providing participants with 24/7 access to behavioral health services in the form of mobile applications. During sessions, the CSSs provide a variety of assistance including identification and guidance on using the mobile apps to support in between session work, provide social support discuss psychoeducation on behavioral health and health management skills relevant to the participant, and assist with the navigation of community resources including housing, meeting basic needs, and other tangible supports that promote community stability. Additionally, CSSs employ motivational interviewing and solution focused brief therapy techniques into the sessions. The mobility of the aftercare program differs from standard services in which persons are expected to return to the behavioral health agency approximately one month after discharge from the CSU. The mobile and technology-assisted aftercare program is based on the Community Health Model (CHW) because of the mobile CHW solutions that provide resources, counseling, education, and assistance to vulnerable and disadvantaged populations [16,17,18]. Similar to CHW programs, a key component of the CSS work is augmenting interventions at our partner mental health agency by providing services in community-based settings and with mobile app support to directly address client barriers to treatment.

The technology-assisted component of the mobile and technology-assisted aftercare program includes 24/7 access to behavioral health mobile applications. The mobile applications serve to augment the in-person support provided by the CSS. The CSS recommends one or more of the mobile applications from a menu of evidence-based applications based on the participant's diagnosis and treatment goals. The intervention strictly differs from standard services in this aspect because standard services do not connect individuals to mental and behavioral health mobile applications. Mobile applications incorporated into this intervention include Moodtools-Depression Aid, Virtual Hope Box, Recovery Path, and Intellicare Hub. All mobile-based applications have undergone thorough investigation in one or a combination of RCTs, clinical trials, were developed with mental health professionals, and have shown positive impact on intended outcomes [18,19,20,21,22,23]. The above mobile applications were chosen for a variety of reasons including their development standards, population geared research, accessibility for download, and range of mental health and substance use related tools and resources that are applicable to our intervention and population.

Standard care for persons discharging the CSU include a personalized discharge plan and are scheduled a follow up appointment with the agency that occurs within a month's time for evaluation and continued mental health services. At the follow-up appointment, participant's may be connected to other agency services. Some of these services include outpatient counseling for behavioral and emotional problems, psychiatric services, group therapy, case management, rehabilitation services, homeless recovery services, employment services, medication-assisted treatment, group-based team building activities, a primary care clinic, and forensic services. Individuals may also receive referrals for applicable healthcare services, access to residential and outpatient substance abuse treatment services, and access to a tablet.

2.2.5. Fidelity Monitoring

Fidelity monitoring is a set of practices that help researchers measure how well an intervention is delivered and the extent to which it is delivered as intended. We conducted fidelity monitoring for participants to ensure participants received the mobile and technology-assisted aftercare as it was designed and be confident that the CSSs have the necessary skills and knowledge to implement the services. Fidelity monitoring is conducted with participants who are engaged with the mobile and technology-assisted aftercare intervention study condition. We adapted the fidelity monitoring used for this study from the Well-Being Development Program Fidelity Tool used in a multisite randomized controlled trial of a behavioral health intervention designed for justice involved individuals [24]. We developed the fidelity tool by adding a section to the Well-Being Development Program Fidelity Tool that assess the use of motivational interviewing with the participants for sessions where the CSSs utilize motivational interviewing techniques. The on-site observation of the intervention is completed by the research project manager at the location of the intervention. Due to the mobile nature of the intervention, the CSS meets with the participants in a variety of settings. The project manager randomly selects one session to monitor each week. After the session, the project manager reviews the fidelity monitoring ratings with the CSS to give feedback. A CSS who scores lower on the fidelity ratings receives additional training in the intervention to improve the likelihood that they are able to maintain fidelity.

2.2.6. Measures

Measures for the Mobile and Technology-Assisted Aftercare Group and Standard Services Group include administrative record as well as direct data collection from participants. The primary outcomes for this feasibility study are participant recruitment, participant retention, feasibility of intervention, and acceptability of intervention. Participant recruitment is measured by the number of eligible participants who consent to participating out of the total number of eligible participants. Participant retention is measured by the proportion of the intervention completed by participants. Feasibility and accessibility are assessed by triangulating the qualitative and quantitative data from study participants – professionals and the CSU patients.

The secondary outcomes include individual stabilization and well-being, frequency of both acute and long-term treatment use, readmission to a crisis stabilization unit, and arrest rates or re-encounters with law enforcement. The secondary outcomes are assessed to find trends that will inform the future RCT. We are examining the feasibility of collecting the data, the sensitivity of the measures, estimates for effect size and sample size, and other factors that may impact our ability to detect outcomes. For the pilot study, the secondary outcomes are not to be used to measure impact, but rather to examine trends in outcomes to inform the design of the intervention and study protocol for a future RCT. Secondary outcomes are measured using screening questions, demographical information, clinical assessment tools, and baseline and follow-up interviews with each participant. Additionally, administrative data from the CSUs and law enforcement is collected on client characteristics including demographics (e.g., race, gender, age, county of residence), criminal history (e.g., current reason for law enforcement contact,

prior arrests and reasons for arrest, and prior CSU stays), and behavioral health status (e.g., diagnoses, prior and current treatment utilization, and medication-assisted treatment). Table 3 shows the measures related to each secondary outcome and they are described below.

Primary Outcomes	Measures
Participant retention	Number of recruited participants who complete the intervention
Participant recruitment	Number of eligible participants who agree to participate out of total Number of eligible participants
Feasibility of intervention	Number of intervention sessions completed by each participant
Acceptability of intervention	Qualitative interviews with CSU stakeholders
Secondary Outcomes	Measures
Individual stabilization and well-being	Brief Symptom Inventory Brief Cope Hearth Hope Index Trauma History Questionnaire Financial Security Education and Employment Education Employment Aspiration and Satisfaction Network Composition survey
Acute and long-term treatment use	Service Assessment for Children/Adults California Psychotherapy Alliance Scale Qualitative CSU Experience Qualitative Technology Use
Admission into CSU	Administrative data of re-admission into CSU
Arrest rates/re-encounters with law enforcement	Administrative data of Arrest Rates Lawbreaking Police-Community Interaction Survey

Table 3: Primary and Secondary Measures

The Brief Symptom Inventory [25] is a 53-item assessment that covers nine dimensions through subscales that include somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Scores for each subscale range from 0 to 4 with higher scores meaning more symptoms reported. Reported internal consistency reliability ranged from $\alpha=0.75$ to 0.89 [26], test-retest reliabilities ranged from 0.68 to 0.91, acceptable convergent validity and construct validity [27].

The Brief COPE [28] assessment is a 28-item index assesses coping self-efficacy and confidence coping with stress using an intensity scale of 1 to 4, where the higher the score, the greater the coping self-efficacy. The Brief COPE has been found to have acceptable reliability $\alpha=0.81$ [29].

The Herth Hope Index [30] is a 12-item measurement tool assesses hope, self-efficacy, and the respondent's outlook on life. The tool uses an intensity scale from 1 to 4, where the higher reported scores indicate a higher level of hope. The Herth Hope Index has been used in 10 different countries and has shown acceptable reliability and acceptability across 13 different studies [31].

The 25-item Trauma History Questionnaire (THQ) assess the occurrence of specific traumatic experiences including interpersonal violence, accidents and disasters, serious illness, traumatic loss, and criminal victimization. Participants indicate if they have experienced the event with dichotomous "yes" or "no" questions, then respondents are asked to self-report the age they were at the time of the incident and frequency the trauma occurred. The THQ operationalizes Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5) criteria for trauma exposures. The THQ has been found to be a reliable measure of trauma exposure (3-month test-retest coefficients=.51-.91) and has strong convergent validity to other measures ($k=.61-1.00$) [32].

The eight-item Financial Security measure was conceptually created from the work of Mills et al. [33] and adapted for an RCT trial of a behavioral health focused intervention for justice involved individuals [34]. The measure assesses an individual's ability to pay for one's bills, basic needs, and a potential unexpected expense without difficulty. Various intensity scales (0 = none/never to 5 = all of the time) are included alongside dichotomous "yes" "no" questions. The lower the score the more financial stability.

The Education and Employment assessment is an 11-item questionnaire that measures past and current employment, sources of income, and education level. The Education Employment Aspiration and Satisfaction [35] survey is a 13-item assessment that measures an individual's satisfaction with their current levels of employment and education. The assessment uses an intensity scale of 1 to 4 for both the education subscale and the employment subscale. Higher scores for the education subscale indicate higher satisfaction and aspiration to obtain additional education. Higher scores for the employment scale indicate higher levels of satisfaction and aspirations to improve their work situation. The scale has been shown to have acceptable reliability ($\alpha=0.79$ to 0.90) across the four subscales as well as sufficient criterion-related validity [35].

The Network Composition Survey is a 23-item questionnaire that first has respondents identify 3 individuals who are in the participant's "social network". Then the participant is asked an identical set of 23 questions about these 3 people to capture their perception of the presence of socially supportive characteristics. Various intensity scales are used where (0= the least perception or never to 5 = the most perception of support or always). The higher the score the greater the perception of social support. Dichotomous "yes" and "no" questions are also used to capture participant's perception of the social support characteristics within their social network.

The Service Assessment for Children/Adults [36] is a 45-item assessment tool measures the use and need of services for cognitive, housing, relationships, health, education, job readiness, substance abuse, mental health, and life skills. The tool uses dichotomous "yes" and "no" questions and then respondents report how many times they have received the service. The measure is reported to have acceptable test-retest reliability with kappa scores ranging from .75 to .94 [36].

The California Psychotherapy Alliance Scale [37] is a 24-item assessment measures therapeutic alliance through goal consensus between the counselor and client, collaboration on counseling-related tasks, and emotional bond. The measure utilizes intensity scale of 1 to 7, where the higher the reported score, the greater the therapeutic alliance. The scale is reported to have internal consistency reliability of $\alpha=0.84$ and sufficient criterion-related validity [38].

Qualitative CSU experience is a five-item qualitative questionnaire explores the respondents' experience while admitted to the CSU. The questionnaire asks about history of use of CSUs, what was beneficial about their stay, what was not helpful during their experience and what they would change about the program. The Qualitative Technology use is a four-item qualitative questionnaire explores the respondents' frequency of use, likes and dislikes of the behavioral health mobile applications used in the

Administrative data will be collected by our partnering mental health agency to record any re-admissions into the CSUs by participants. In case participants are admitted into a CSU out of our partnering mental health agency jurisdiction, the Qualitative CSU experience survey also captures any CSU admission by participants during study participation.

The Lawbreaking assessment is a 10-item questionnaire is a dichotomous "yes" or "no" survey in which participants are asked about law breaking behavior including if they had contact with police, if they participated in an activity that would have resulted in legal consequence had they been caught, or if they failed to pay child support.

The Police-Community Interaction Survey [39] is a 30-item survey captures reported interaction between the respondent and law enforcement. The survey includes dichotomous "yes" or "no" questions where respondents identify if the police officer did a certain action as well as intensity scales ranging from 1 to 4, where higher reports indicate more satisfaction with the police interaction. The measure has good reliability with subscales each above >0.70 and construct validity [39].

The comparison and observational study group measures entail a combination of administrative data and data collection from law enforcement officers. The comparison condition data includes data on screening for behavioral health disorders at intake and subsequent LEO contact. The observational data is collected from case scenarios presented by officers and data on future LEO contact.

2.2.7. Data collection

Data collection with recruited participants in the treatment and control groups occurs approximately four times throughout participation. The baseline interview occurs immediately following enrollment and consent prior to the participant discharging from the CSU. The remaining three data collection points include the complete data collection tool set. The first of these data collection sessions (T1) occurs two weeks post-discharge from the CSU. The second data collection point (T2) occurs three months post-discharge from the CSU. Lastly, the third data collection session with recruited participants occurs six months post-discharge from the CSU (T3). These data collection sessions occur at the participant's home or a nearby public location that the participant requests.

Data from recruited participants is collected using validated assessment tools, qualitative surveys, and administrative data. These data collection methods are consistent throughout T1-T3 sessions for the mobile and technology assisted group and the standard services group. However, the qualitative surveys (a survey on one's experience while receiving services at the CSU, and a survey on use of behavioral health mobile applications) may vary in their deployment based on the participant's situation. Specifically, the CSU experience survey is collected only at the T1 interview unless a participant is readmitted to the CSU. In that case, the CSU experience survey is re-asked following each subsequent CSU admission. The qualitative survey on the use of and experience with behavioral health mobile applications is collected at T1, T2, and T3 sessions.

Administrative data is collected for six months following enrollment. Additional administrative data is collected from law enforcement agencies to procure arrests and police contact of participants. Although we are not assessing for causality in the current proposal, it is critical for us to pilot the collection of these data as they are integral to the follow-up multisite RCT. Data is collected from the comparison and observational groups throughout the duration of the study.

2.2.8. Analysis strategy

Data collected from the Mobile and Technology-Assisted Aftercare and Standard Services Groups allows researchers to gather preliminary data comparing those that receive standard CSU services to those that receive CSU services that include the mobile and technology-assisted aftercare support. Patterns are monitored to assess the primary and secondary outcomes listed in Table 3. To capture the range of qualitative and quantitative data present in the primary and secondary outcomes of this study, a mixed-data analysis plan is utilized including descriptive statistics and bi-variate analysis. The study is not designed to detect

differences in clinical outcomes; thus, the focus of the analysis provides preliminary information on trends in outcomes and some potential underlying contributors to those trends. These data provide important information for advancing knowledge of CSUs as well as information necessary to inform the future RCT. Qualitative data related to the primary outcomes is analyzed using the approach described in the Aim 1 analysis strategy. Quantitative analysis for primary outcomes will be focused on descriptive statistics and bivariate analysis. Additionally, preliminary ANOVAs is used to assess trends of participants across time and across groups.

Mixed methods analysis is used to assess both primary and secondary outcomes. We are integrating the findings from each the quantitative and qualitative components [40] by conducting comparative analyses both within and across groups, over time, so that we may examine differences at the county level in terms of quality and fidelity of the intervention. These data are integrated with quantitative outcome measures, fidelity data and qualitative interviews using a sequential mixed methods design with equal weight given to qualitative and quantitative data sources [40, 41]. Data is assessed for significant variations and qualitative data is used to help us to understand trends in the quantitative data when warranted.

2.3. Aim 3 Study Design

Aim 3: *Design a multisite RCT to compare the relative impact of CSUs with mobile and technology assisted aftercare to CSUs without mobile and technology-assisted aftercare on the following short and long-term outcomes.*

The goal of Aim three is to design a multisite RCT to compare CSUs with and without mobile technology-assisted aftercare on short and long-term outcomes. It is anticipated that the outcomes in the future RCT will include: individual stabilization post-crisis, arrest rates, use of acute services, and increased engagement with longer term treatment. We anticipate that our hypotheses will be that there will be improvements on each of these outcomes in addition to increased referrals to CSUs when mobile and technology-assisted aftercare is included.

The overarching objective to reach the goal of Aim three is the analysis of data from Aims one and two which is fundamental to the development of the study design and study protocol for the follow-up multisite RCT. From these analyses, we will be able to articulate the following information: sample size details for adequacy including number and type of jurisdictions; sample size necessary requirements for statistical significance; referral, retention, and attrition challenges that will need to be resolved prior to conducting an RCT; appropriate randomization procedures including timeline, sample size, and whether randomizing to follow up mobile supports is the correct variable to randomize on or if there is a more appropriate randomization variable; training needs with police officers to refine appropriateness and quantity of referrals; and assess for the sensitivity of the measures of individual stabilization factors and identify additional measures if needed.

The development of the study protocol to be used in the subsequent RCT will be updated throughout the course of the feasibility study and will specify the RCT objectives, study design, enrollment and withdrawal, schedule, procedures and evaluations, safety and clinical monitoring,

ethical considerations, database management plans, and quality assurance, and finalized data collection instruments. The completed study protocol will also include study window, sampling frame, data collection time points, outcome research measures, and implementation and dissemination strategies to inform the adoption of CSUs on a national scale.

1. Study Timeline

This study is estimated to take approximately 2 years to complete. The estimated time necessary to complete each of the three aims is detailed in Table 4. This study does not operate on a strict linear timeline and the data collection and analysis of Aims one and two may overlap or occur coincidingly. However, Aim 3 will not begin until Aims one and two have been completed.

Study Timeline	2 mths	4	6	8	10	12	14	16	18	20	22	24
Aim 1												
Research preparation and stakeholder establishment	x											
Qualitative interviews w/ CSU stakeholders & iterative analysis		x	x	x	x	x	x	x	x	x		
Aim 2												
Pilot test activities				x	x	x	x	x				
Data analysis and implementation guide								x	x	x		
Aim 3												
Study protocol development and completion										x	x	x

Table 4: Study timeline

2. Discussion

Because CSUs are increasingly implemented into communities, it's critical to understand how these facilities operate as a jail alternative for law enforcement whom have frequent contact with persons experiencing a behavioral health disorder related crisis [2,4]. Similarly, research must discern CSU processes and how community care systems may minimize subsequent contacts with law enforcement and readmission into CSUs for CSU patients. This study responds to this need by initiating a feasibility study examining critical elements of CSU implementation and adoption, and piloting an aftercare program for persons specifically brought to the CSU by choice of law enforcement.

The combination of qualitative and administrative data from CSU stakeholders provides a thorough examination of CSU critical elements and allow for identification of barriers to CSU dissemination. Additionally, the small-scale RCT of an innovative CSU aftercare program, mobile and technology-assisted aftercare, enables any adjustments to be addressed and revised prior to investing in a multi-site RCT and may suggest promising innovations that build upon current CSU approaches. Participants may also benefit from participation in the piloted innovation which is designed to improve CSU patient outcomes by providing at-home services that are augmented by access to behavioral health applications available 24 hours a day.

Conducting and exploring the feasibility and acceptability of CSUs and their aftercare services is a critical first step in identifying how to implement CSUs realistically and most effectively in diverse jurisdictions across the country. This study enhances our feasibility and acceptability data by engaging perspectives from a variety of stakeholders involved in CSU processes including law enforcement, behavioral health staff, and CSU patients. Feasibility and acceptability data comes from a combination of qualitative interviews and quantitative analysis of the deployment of intervention specific techniques and outcomes trends.

This study comes at an important moment in time as policymakers seek police reforms and alternative responses to issues that more squarely follow into matters of public health rather than public safety. Results from this study will advance identification and dissemination of evidence-driven CSUs and yields three important products: 1) Feasibility evaluation results that address jurisdictional variation and establish important feasibility guidance for practitioners and policymakers; 2) An implementation guide for future refinement and adopters of CSUs initially to be used to pilot test the CSU with follow-up mobile and technology-assisted aftercare; and 3) Study protocol design for a future RCT of CSUs with follow-up mobile and technology-assisted aftercare. If the pilot intervention of mobile and technology-assisted aftercare demonstrates significant feasibility and acceptability we are prepared to develop a large-scale RCT. An expansive RCT will further the evaluation of CSUs and enable a more generalizable analysis of CSU aftercare services on the persons who are recipient of them. Understanding the effects of CSU aftercare services on persons may guide policy and national understanding of effective criminal justice diversion for persons with behavioral health disorders.

Disclosures

The authors declare no conflicting interests.

Ethics Approval and Trial Registration

This protocol is a feasibility study that is recruiting a vulnerable population of individuals discharging from a CSU. The entire study was approved by a large Southeastern University's Institutional Review Board (STUDY00001570). Additionally, the feasibility study of mobile and technology-assisted aftercare was registered on ClinicalTrials.gov (reference #NCT04899934) on May 25th 2021.

Funding

This work is supported by Arnold Venture LLC (grant ID: 19-02811). The funder has no role in the design, analysis, or execution of this study.

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