


Clinician Perspectives on Barriers and Facilitators to Implementing e-Health Technology in Substance Use Disorder (SUD) Treatment Facilities

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ABSTRACT

BACKGROUND: Substance use disorders (SUDs) in the United States cause many preventable deaths each year. Finding effective ways to manage SUDs is vital to improving outcomes for individuals seeking treatment. This has increased interest in using e-health technologies in behavioral healthcare settings. This research is part of a larger study evaluating the efficacy of the NIATx coaching intervention for implementing RISE Iowa, an e-health patient recovery app, in SUD treatment organizations and seeks to examine clinician perspectives of the barriers and facilitators to its implementation.

METHOD: Semi-structured qualitative interviews were conducted with 13 clinicians from 9 different intervention sites involved in the study.

RESULTS: Major barriers to implementing e-health technology include inability to access the technology, lack of time for both patients and clinicians, and a perceived lack of patient motivation to make changes. Facilitators to implementation include collaboration with other staff using e-health technology and integrating technology use into typical workflows.

CONCLUSIONS: Implementation of e-health technology in SUD treatment will require integrating the technology into clinical workflows and improving patient access to the technology.

KEYWORDS: Substance use disorder, e-health, SUD, mobile app

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study will have no affiliation with CHESS Health. Also, parts of the NIATx organizational change model used in part of this trial were developed by the Center for Health Enhancement System Studies (CHESS) at the University of Wisconsin-Madison, where Dr. Molfenter is a faculty member. Dr. Molfenter is also affiliated with the NIATx Foundation, the organization responsible for making the NIATx organizational change model available to the public. For this scenario, Dr. Molfenter also has an institutionally approved plan to manage potential conflicts of interest. The individuals who will conduct the data collection and interpretation for this study manuscript will have no affiliation with the NIATx Foundation. David Gustafson is a part-owner of CHESS Health, devoted to marketing information technologies to agencies that deliver addiction treatment. He is also on the board of directors of the not-for-profit NIATx Foundation, as well as a small consulting company doing business as David H. Gustafson and Associates. These relationships do not carry with them any restrictions on publication, and any associated intellectual property will be disclosed and processed according to his institution's policies.

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Background

Excessive drinking increased by 21% during the COVID-19 pandemic¹ and the largest number of overdose deaths ever recorded in the United States occurred during the 12 months ending in May 2020.² Substance misuse causes or exacerbates many illnesses, including cancer, diabetes, HIV/AIDS, mental illnesses, and pregnancy complications.³ In addition, the costs of substance misuse are estimated at \$562 billion per year in healthcare and law enforcement expenses and in the costs of lost workplace productivity.⁴ Despite these health and societal consequences, the 2019 National Survey on Drug Use and Health (NSDUH) found that only 19% of individuals who needed treatment for substance use disorder (SUD) received it,⁵ and relapse rates remain high, with 40% to 60% of

individuals in treatment relapsing.⁶ New, more efficient approaches are required to fill the gaps in use and effectiveness of SUD treatment.

Mobile e-health technologies offer innovative ways to enhance treatment and recovery for SUDs.⁷ As of February 2021, 85% of the adult population and 96% of people aged 18 to 34 in the USA owned a smartphone,⁸ including 76% of US adults making less than \$30,000 annually.⁸ Meanwhile, several studies have shown improved treatment outcomes for managing SUDs, anxiety, and depression for individuals using e-health behavioral interventions.^{9–14} E-health interventions have been especially helpful during the COVID-19 pandemic, as healthcare providers sought new ways to support their patients while they were not able to meet in person.¹⁵ Although



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evidence-based e-health tools, such as the Drinker's Check-up,^{16,17} Therapeutic Education System (TES),¹⁸ CBT4CBT,¹⁹ and A-CHESS,¹⁸ have been available for some time, these technologies are used by <0.01% of SUD treatment providers.²⁰ This research seeks to examine clinician perspectives on implementing a recovery app within SUD treatment organizations in order to better understand how to reduce the gap between patient-centered e-health evidence and practice.

The RISE Iowa app was developed to provide peer support, enhance intrinsic motivation, and improve capability to cope with the stressors of recovery for individuals ages 18 and older in recovery from addiction. Clinicians at SUD treatment organizations in Iowa participating in the study offer RISE Iowa to their patients as an additional tool to assist in recovery. Patients have access to the app 24/7 through a smartphone. RISE Iowa contains features to assist patients as they navigate their recovery, including articles, podcasts, and guided meditations, ideas for coping with cravings, and access to individuals with similar experiences through the discussion board and personal messaging with peer recovery coaches, treatment providers, and other app users. Patients can track their recovery through weekly check-ins based on the Brief Addiction Monitor (BAM),²¹ which assesses recovery strength and risks. Clinicians can use the app collaboratively with their patients by viewing the results of their check-ins and their use of the app through a clinician portal in their account, allowing them to pinpoint issues a patient is struggling with and identify potential options to enhance coping. This technology, referred to as A-CHESS in previous studies, has been extensively tested and shown to be an effective recovery tool.^{18,22,23} However, how to promote A-CHESS implementation in SUD treatment organizations has not yet been studied.

Several technology implementation frameworks have been developed for implementation of other types of innovations in healthcare settings. A widely used framework is the Consolidated Framework for Implementation Research (CFIR). The CFIR outlines several constructs across 5 domains that organizations can consider when planning an implementation project or troubleshooting issues that occur during implementation.²⁴ The CFIR constructs fall into 5 domains: intervention characteristics, outer setting, inner setting, characteristics of individuals, and process. Studies attempting to increase the use of telehealth and shared patient-provider decision-making found the use of the CFIR to be especially effective as a framework for their implementation projects.²⁵⁻²⁷ Some of the most cited constructs that impacted implementation include complexity and source of the intervention, patient need for the intervention and access to the technology required, available resources to successfully implement the intervention, and compatibility of the intervention with the work and structure of the organization.^{25,26,28,29} Organizations that assessed the alignment of their organizational characteristics with the

CFIR constructs and used strategies presented by the CFIR for overcoming these barriers had more success with implementation.

The research reported in this paper is part of a larger randomized controlled trial of the NIATx coaching model as an implementation intervention. This larger study is the first research to focus specifically on utilization of an implementation framework to improve the uptake of a phone application for recovery support within an SUD treatment organization. In this study, 11 SUD treatment organizations in Iowa were randomized to receive standard product training or monthly coaching for support in implementing the app.³⁰ Organizations in the intervention arm received coaching using the NIATx³¹ model, an evidence-based practice that uses rapid-cycle changes to implement organizational change. Twenty-one sites from 6 SUD treatment organizations were placed in the intervention arm of the study.

Organizations in both arms of the study were given access to RISE Iowa for 3 years, with those in the intervention arm receiving 18 months of NIATx coaching followed by a 10-month sustainability period where no coaching occurs but access to RISE Iowa continues. Interviews were conducted during the intervention period. Shortly after being trained on the RISE Iowa app, clinicians at these organizations experienced success encouraging patients to create accounts on RISE Iowa. Some clinicians were highly engaged in using RISE Iowa with their patients, while others were less successful in making it a part of their work routine. This paper seeks to examine these variations in clinician adoption.

Methods

Interviews were conducted with clinicians from 9 treatment sites in the intervention arm that had implemented RISE Iowa prior to August 2020. Most of the organizations have multiple sites but an interview was not done at every site. Clinicians in the intervention arm who had created accounts on RISE Iowa were classified according to how many patients were paired with them on the app. Clinicians were grouped into "high performers," "average performers," and "low performers" based on this classification. Clinicians who had more than 10 patients paired with them were considered "high performers," those with between 5 and 10 were considered "average performers," and those with fewer than 5 were considered "low performers." Five clinicians from each of these performance groups were invited to be interviewed. One high performer and 1 low performer did not respond to the invitation, so 13 total clinicians were interviewed. Only 1 clinician was interviewed from most clinical sites, but 2 or 3 clinicians were interviewed at each of 3 sites.

Semi-structured telephone interviews were conducted by trained research interviewers using an interview guide. The interview guide focused on barriers and facilitators to engagement with the RISE Iowa app for both patients and clinicians.

Table 1. Summary of coding categories and findings.

Adoption of RISE Iowa by organizations and clinicians	Barriers	Lack of time Competing priorities Privacy and confidentiality concerns Technology use difficulties Lack of organizational support and engagement
	Facilitators	Ongoing training about RISE Iowa Incorporating RISE Iowa into clinical routines
Adoption of RISE Iowa by patients	Barriers	Lack of motivation or interest in change Unwillingness to change routines Inability to use or lack of confidence in using technology Lack of access to technology Virtual treatment and transitions between treatment modalities
	Facilitators	Connecting use of app to patient circumstances and concerns Technological support Frequent discussion of RISE Iowa during individual and group therapy
Ongoing use of RISE Iowa by patients and clinicians	Barriers	Competition from other recovery apps Lack of relatable content on RISE Iowa
	Facilitators	Connecting use of app to patient circumstances Significant levels of clinician engagement

Suggestions for improvements to the app, and accounts of the effects of the pandemic on implementation of the app were also sought. All interviews were conducted in October 2020. Interviews lasted between 13 and 37 minutes, with a median length of 26 minutes. Participants provided oral informed consent. The conversations were audio-recorded and transcribed verbatim.

Interview transcripts were analyzed using NVivo qualitative coding software. Coding was completed in multiple stages using both inductive and deductive approaches. Initial codes were derived from the interview guide. Later rounds of coding populated sub-categories of these codes. Additional major categories were also added to capture significant factors that clinicians believed affected implementation of RISE Iowa, including involvement of leadership at the organizations, issues related to technology, and patient characteristics such as involvement with the criminal justice system and perceived motivation for change. At each stage of the analysis, the research team reviewed the codes and discussed the development of emergent and higher order categories. Coding of all transcripts was completed by a single coder (KF) and was reviewed by 3 other members of the research team (NJ, JH, TM) periodically. Data were not triangulated.

Results

The clinicians interviewed for this research were between the ages of 35 and 50. Twelve of the 13 were female. Twelve identified as white, with 1 identifying as Native Hawaiian/other Pacific Islander. The group was almost evenly split between those with bachelor's degrees and those who had master's degrees.

All clinical sites in the study provided extended outpatient treatment, 6 provided intensive outpatient treatment, 2 provided

residential treatment, and 2 provided medication-assisted treatment (MAT). Five sites were classified as small (fewer than 5 clinicians serving fewer than 100 patients), 2 were classified as medium (more than 5 clinicians serving fewer than 1000 patients), and 2 were classified as large (more than 5 clinicians serving more than 1000 patients). Four of the cities where the sites are located were considered small (population less than 10000), 3 were considered medium (population between 10000 and 50000), and 2 were considered large (population greater than 50000).

Implementation of RISE Iowa in treatment organizations

Table 1 provides a summary of the findings by category. A complete discussion of each of these categories can be found below.

Adoption of RISE Iowa by organizations and clinicians

Barriers. According to clinicians interviewed, factors such as lack of time, concerns about privacy and confidentiality, and lack of implementation support hindered adoption of RISE Iowa. Given the constraints on clinician time, including meetings, documentation, and actual treatment provision, finding time to become knowledgeable about RISE Iowa was difficult. Many clinicians found that they did not have time to learn enough about the app to promote its benefits to their clients. In addition, while clinicians appreciated the frequent new resources that are added to the app, they also found it challenging to keep up with these additions, leaving them feeling less able to direct patients to resources that could help their recovery.

A second barrier was the uncertainty that many clinicians felt about privacy and confidentiality related to use of the app. Many clinicians were hesitant to use the Recovery Tracker to monitor their patients' use of the app as they were unsure whether patients knew how much their clinicians could see of the patients' app use. While clinicians saw the benefit of using those features of the app, they were concerned about violating patient privacy, stating that "if a client is on my caseload, I can automatically see what they're doing and I want their permission to be able to do that. So, if there was some sort of way [. . .] to be able to, like, check a box and say 'I'm okay with my counselor seeing this information' or to check a box that says, 'I don't want my counselor to see this information', I would feel better, ethically, about it" (Clinician 9).

Finally, many clinicians found navigating the technology of RISE Iowa to be challenging and could not find support in their organizations to successfully use RISE Iowa themselves and introduce it to their patients. Several clinicians did not view themselves as technologically savvy and often had a hard time using technology. Because of this, they were not comfortable using RISE Iowa and did not feel that they had the ability to support patients who were having difficulties with the technology. As 1 clinician said, "I don't have a lot of technological savvy so sometimes I have to have people, like, really walk me through it" (Clinician 4). This lack of confidence with technology keeps clinicians from using the app themselves but also carries over to their patients not using the app as effectively because they lack clinician support.

Additionally, some clinicians felt that they were one of few clinicians at their clinic who actively used RISE Iowa and encouraged their patients to use it. This left them feeling alone and without help, stating, "it's just not part of the whole climate here, so it's difficult for me to remember to do it" (Clinician 11). If leadership at the organization was not excited about the app or promoting its use, clinicians felt that encouraging patient use of the app was not prioritized, making it difficult for them to find the time to talk about it with patients.

More broadly, the structures and workflows within an organization that dictate the clinicians' work posed a significant barrier to implementation. Clinicians have many tasks to complete during a session and their organizations have expectations for treatment processes such as safety planning and documentation through clinical notes. Thus, finding time to introduce RISE Iowa to patients and address their concerns about using it was challenging and often prohibited clinicians from getting patients started using the app. One clinician outlined this concern, saying:

there's so many things that we need to cover or go over with people [in our sessions] and I think sometimes the priority of one thing to go over might be more important than another at the moment. [. . .] Maybe we really needed to talk with our patients and get them involved with their safety planning or their treatment plan reviews [. . .] and if that at the moment was kind of an emphasis or

a priority, you know, the RISE app might have been less of a priority. (Clinician 10)

Involvement of leadership is essential to making these changes to workflows, so when leadership is not learning about the app or does not see the value of clinicians promoting it with their patients, workflows are not modified, often causing use of the app to fall by the wayside.

Facilitators. Clinicians also identified changes that could be made in their organizations and practices that would facilitate their involvement with the app. Clinicians felt that having thorough training about the app and its contents would give them a better understanding of how to engage patients. Though study staff conducted an introductory 2-hour training with clinicians at each organization, additional longer-term training may have helped better engage clinical staff. Some organizations discussed RISE Iowa during weekly staffing meetings and encouraged staff to share their experiences and challenges using the app to help clinicians become more comfortable with and excited about using the app. These meetings also allowed clinicians to give and receive technological support to facilitate greater engagement.

Some clinicians who worried about the introduction of RISE Iowa getting lost in initial sessions due to other priorities attempted to make the app part of their routine with new patients. Some did this by including a brochure for RISE Iowa with other paperwork that patients are given at their first appointment. Though this was helpful in some cases, worries persisted that patients received so much paperwork during those initial sessions that the brochure might get lost in the shuffle and RISE Iowa would be forgotten.

Adoption of RISE Iowa by patients

Barriers. Finding ways to encourage patients to use RISE Iowa is challenging. Clinicians found that issues of motivation to make changes, accessibility of the technology, and the impact of circumstances outside of treatment play a significant role in adoption of RISE Iowa by patients. While these results may provide perspective on what barriers and facilitators exist to getting patients engaged with RISE Iowa, interviews were only conducted with clinicians. They cannot represent patient views on this topic.

Most clinicians agreed that one of the most common barriers to getting patients to use RISE Iowa was a perceived lack of motivation. Though many patients receiving treatment from these clinicians are engaged in their recovery and are motivated to achieve sobriety, not every patient in treatment has those characteristics. Nearly all the organizations we spoke with served some individuals who were mandated to treatment due to involvement with the criminal justice system or child protective services, and clinicians perceived that many of these patients may not be ready for or interested in sobriety. Many of

these patients do not feel that they have a problem or need treatment and only attend to avoid a harsher punishment. This presents a challenge for clinicians, as they may struggle to motivate their patients to be actively involved in treatment.

Many clinicians also believe that their patients' motivation for recovery depends on where the patient is in the stages of change. Clinicians often feel that patients who are still in a contemplative stage of change are not ready to use additional support tools for their recovery, while those in a later stage of change are more likely to be committed to recovery and willing to use new tools. One clinician outlined the effect of this on sign-ups for RISE Iowa, stating, "those [patients] that I know aren't really in an action stage of change, maybe they are still contemplative, they don't want to be there, maybe they are just not fully ready to engage [with their treatment]. Those are the ones that aren't signing up" (Clinician 13). As patients typically view the app as being for individuals seeking to achieve sobriety, they are unlikely to want to engage with the app if that is not their goal at the time.

In addition, clinicians reported that some patients are resistant to changing their routines and trying out new support tools which makes getting them engaged in using a new recovery tool more difficult. One clinician outlined how this affected their patients' likelihood of using RISE Iowa, saying "people just had their routine, they already had, like, their 12-step meetings that they were going to, they had their mental health appointments, . . . , they just didn't feel like RISE, . . . they just didn't feel like they needed to add another tool to their recovery even though we always talk about adding tools" (Clinician 1). When patients have found tools that help them to remain sober, many are hesitant to try something new or add an additional tool to their routine because they are unsure about upsetting the system they have created. Though these patients may be good candidates for the app, and their clinicians are confident that the app would support their recovery, patients will often remain resistant to adding something new into their toolbox.

Clinicians reported that issues relating to using the technology for RISE Iowa were one of the most common barriers to getting patients onto the app. As 1 clinician said, "I also have clients that either don't have phones or some of my, you know, late-middle age or older clients still have flip phones or no cell phones or don't use internet" (Clinician 6). In addition, clinicians noted that even patients who do have the technology to access the app may choose not to because they have different priorities for using their limited data each month. For example, clinicians suggested that younger patients may prefer to use social media apps when they have access to Wi-Fi rather than spending time on RISE Iowa, stating "people are going to prioritize what's important to them, and especially the teens and twenty-year-olds are much going to prefer using Snapchat on their phones than this recovery app" (Clinician 9). Lack of adequate access to the technology needed for use of RISE Iowa

frequently stood in the way of patients being able to use the app for support.

A related but more difficult challenge to overcome is technological know-how. Older patients may lack the technology skills that younger generations have grown up learning. Many of these patients are unsure how to navigate through RISE Iowa and access the parts that are helpful to them. Some were unwilling to try the app because of a lack of confidence in using technology. One clinician described this issue, saying "I have a few people who are older and don't use a smartphone. So, it wouldn't, like – I think that the support would be beneficial for a specific client that I have in mind, but he does not know how to use a computer or a smartphone so it's just not an option for him" (Clinician 9). Without experience with downloading an app, making a profile, and navigating through it, many patients cannot use RISE Iowa well enough to get benefits for their recovery.

The COVID-19 pandemic was another significant barrier to clinicians' ability to get patients to use RISE Iowa. As clinics transitioned to virtual treatment, clinicians noted a reduction in new admissions and a decrease in the number of patients on their caseload, with 1 clinician noting "things were dropping off in May and June [2020], and my experience is because we weren't open for face-to-face appointments, I was not conducting in-take appointments, and so, my new patient caseload was very, very small" (Clinician 12). While this is typical of any time there is a disruption to provision of services, the disruption from the pandemic has had more of an impact than most.

Clinicians also noted that providing treatment virtually during the pandemic made it more difficult to get buy-in from patients to use RISE Iowa. Without in-person visits, it was harder to help patients download it and sign up. As 1 clinician said, "part of that is actually physically being in the same room with them, and helping them to download it and making sure that they got signed in, because when they're just on the other side of a screen and they're like, 'Oh yeah, that sounds cool, I'll download it later', um, they tend to not do that" (Clinician 9). In addition, clinicians identified peer encouragement as key to getting new patients to use the app and found it was much harder to get this peer support when treatment groups were held virtually. One clinician outlined this problem, saying, "There was no positive feedback from peers about how resourceful it could be" (Clinician 7). Lastly, clinicians often felt hesitant to add another thing requiring technology to a patient's plate. Many of them were already receiving treatment and interacting with their peers virtually, so although clinicians were confident that RISE Iowa could help them navigate some impacts of the pandemic, they were uncertain whether patients would be willing to do anything else using technology.

Facilitators. Most clinicians found that tying the app to a patient's circumstances and their challenges was a good way to get patients to use RISE Iowa. For patients who were struggling

with the isolation of COVID-19, for example, clinicians promoted using the app to foster connection and manage the challenges of being unable to access their usual forms of treatment. One clinician noted that:

the importance of the app during that period of time [lockdowns during the COVID-19 pandemic] was that too many of our patients were basically confined to their homes, and so many of our patients also have underlying mental health issues. And for people especially struggling with mental health issues, that need for social contact is really important. And so, I think, you know, the RISE app was one way that they didn't have to leave their house, but they could basically have 24/7 support if they needed to. (Clinician 10)

In addition, some patients who lacked motivation for recovery but were mandated to treatment were encouraged to use RISE Iowa to show law enforcement that they were following through with requirements for their release and were trying to improve themselves. By connecting a patient's use of the app to other expectations of them or situations they were experiencing, clinicians overcame resistance to using the app in some patients.

Helping patients overcome technology access and use issues was also an important facilitator. For patients who were not experienced with technology and were unsure how to use the app, clinicians found that taking the time during sessions to help them download it and create an account, as well as pointing out helpful features, was important to getting patients to use the app. To do this, 1 clinician stated that they would "hook it up on the screen [during treatment sessions] and show what all it offers and how to navigate it" (Clinician 3). Not every clinician feels comfortable enough with technology to do this, but those who do have found that this type of assistance makes patients more likely to use the app. Making time to use the app during in-person sessions was also helpful for patients who did not have internet access or did not have a smartphone. Many treatment organizations have public internet access in their offices, which allowed patients to access RISE Iowa and engage with its content during their appointments. Making time to do this was an important facilitator to patient use of the app.

Clinicians incorporated many of these strategies to promote greater engagement by finding ways to include the app in their practice, by using it in group and individual sessions, making it a part of patients' treatment plans, and giving homework assignments that required use of the app. When clinicians devoted time in their sessions to discussing RISE Iowa, patients were able to get help they needed and were able to hear from their peers about why they use the app. By giving time to talk about the app, clinicians allowed peer encouragement to assist more hesitant patients with using the app.

Ongoing use of RISE Iowa by patients and clinicians

Promoting sustainability of RISE Iowa use was another challenge identified by clinicians and most had fewer strategies for

doing so than for promoting initial use. Many barriers and facilitators to initial implementation continued during the sustainability phase. Additionally, because these interviews were conducted midway through the intervention period, many clinicians had not given much thought to promoting sustainability and what challenges they might experience in doing so. This caused there to be fewer identified barriers and facilitators to sustainability than for other aspects of implementation.

Barriers. The issues that impact initial use of the app continue when encouraging long-term use but manifest in different ways. Motivation, accessibility, and time for engagement are significant barriers to sustaining use of RISE Iowa. Moreover, outside circumstances, like the effects of COVID-19, play a significant role in the continuing engagement. Because of this overlap, this section will focus on factors that impact only long-term use of RISE Iowa.

Several clinicians noted that many recovery apps are available for SUD patients and many of the resources provided on RISE Iowa can be accessed elsewhere. As 1 clinician said, "there's just so many apps for the things that are in RISE Iowa that are already stand-alone apps, [. . .] there's, you know, meditation apps and there's - you know, you have - you can download YouTube, you don't need to go to a - RISE Iowa to find podcasts 'cause you - or videos, 'cause you can go right to YouTube and get them" (Clinician 5). For patients struggling with technology, it may be easier to find other resources that are more accessible that still meet their needs, rather than learning how to download RISE Iowa, even though it provides all these resources in 1 place. They may also have a recovery app that they have been using or that has been recommended by their peers and not be interested in trying something new.

Another significant barrier to sustained engagement is patient concerns that they cannot relate to the content provided in the app. While RISE Iowa is designed to cater to people with all kinds of SUDs, clinicians heard that some patients could not find content that related to their recovery. One clinician stated that "even though addiction is addiction, a person who's struggling with a drug addiction doesn't really - can't really relate to somebody that's struggling with alcohol" (Clinician 1). If a patient finds that the content is not relatable to what they are struggling with, they are unlikely to continue using the app. Therefore, ensuring that RISE Iowa offers content covering different substances is vital to promoting sustained use of the app.

Facilitators. Some clinicians motivated mandated patients to use RISE Iowa by discussing how using the app demonstrates engagement in treatment, which may encourage longer-term RISE Iowa use. One clinician outlined how they brought this up with patients, saying "Some folks who are mandated [. . .], I do often suggest, 'Hey, this is one way to show your probation officer that you are trying to access whatever support you can

... downloading this and having us talk about it in session [...] that is something I can let the parole officer know that you are checking out” (Clinician 12). This strategy may encourage continued engagement for the length of time a patient is mandated into treatment.

Additionally, many clinicians felt that their level of engagement with RISE Iowa significantly impacted their patients’ engagement with and willingness to use the app. The more involved the clinician was with RISE Iowa, the easier it was to encourage patient use. Facilitators to clinician engagement have been discussed previously, and these strategies may support patient engagement over time. Using the strategies identified to encourage greater clinician engagement will likely lead to greater patient engagement with the app over the long-term.

Discussion

As technology becomes more commonplace in all areas of life, including healthcare, finding ways to ensure that it is being utilized efficiently and effectively is important to improving outcomes in these settings. However, changing systems is always difficult, and many factors contribute to whether the implementation of a new way of doing things will succeed. Understanding these factors and how they can be influenced will allow future implementation of technology-based changes within healthcare systems to be more effective.

Most barriers and facilitators discussed in this paper were endorsed by several different clinicians interviewed and were not common to only those clinicians in 1 “performance” group. Barriers in particular were common across most or all clinicians, regardless of whether they had high, medium, or low amounts of patient engagement with RISE Iowa. Many of the facilitators were also common across performance level, though medium or high performing clinicians were more likely to identify strategies that were helpful to the implementation process.

In many ways, the biggest barrier to implementing e-health technologies is initial adoption of the technology by healthcare organizations. Overcoming the challenges to implementation is necessary before attention can be turned to adoption by patients or sustaining use. These inner setting barriers are commonly cited in studies using the CFIR, with strategies suggested for overcoming them including using small cycles of change and identifying and utilizing champions within the organization to encourage other members of the team.³² These were common strategies identified by RISE Iowa clinicians that were used to overcome the challenges associated with a lack of organizational readiness for change. Without shifts in organizational workflows to accommodate the time necessary to introduce RISE Iowa to patients and inform them how to use the app, implementation will remain a significant challenge. Instilling this awareness into treatment organizations and ensuring appropriate levels of involvement and support

from management is essential to improving engagement with RISE Iowa by patients and clinicians.

Additionally, it is clear from these interviews that many challenges exist to patient adoption of an e-health technology like RISE Iowa, and some of these are not easily overcome. Demographic and societal challenges, like access to internet and technological skills, are less easily influenced by clinicians, though they can help. In general, factors like age, income, and location can play a significant role in access to and ability to use technology. Individuals who are 65 and older, who have a yearly income of less than \$30000, and who live in rural areas tend to have less access to technology and less experience using it.³³ At organizations participating in this study, approximately 90% of patients made less than \$30000 per year. In addition, based on population estimates for Iowa, it is likely that roughly 40% of RISE Iowa patients live in rural areas.³⁴

To effectively implement an e-health technology, these factors must be considered and strategies to mitigate their impact will need to be employed. Some of these barriers, like having regular access to a smartphone or computer and having enough data or access to Wi-Fi, can be mitigated through implementation design, while others, like age and lack of technological experience, are issues that clinicians cannot influence significantly. One strategy that the CFIR recommends for overcoming challenges related to constructs of characteristics of individuals, like access and technological know-how, is changing the structure of and access to equipment that patients have within the organization.³² Several clinicians also identified this as a facilitator to promoting patient engagement by allowing patients to use clinic internet and computers to use RISE Iowa.

The CFIR provides additional strategies that were not identified by clinicians in these interviews that could be useful in overcoming outer setting barriers brought up by the clinicians. Utilizing incentives is a strategy likely to be helpful both for encouraging initial use and sustaining use over time. While some organizations may be resistant to their use, providing incentives can be a simple way to overcome initial resistance to trying RISE and promote long-term use, as patients may be more likely to stay engaged if they are being rewarded for doing so. Developing a formal implementation plan and allowing collaboration among clinicians at different organizations involved in the project are also CFIR strategies that could be helpful to clinicians in overcoming organizational structures that prevent implementation of the technology and in engaging patients long-term with the app.

Lastly, it is important to consider that the COVID-19 pandemic had significant effects on implementation of RISE Iowa. Clinicians identified numerous pandemic-related challenges for both their organizations and the patients receiving treatment including difficulty with switching to hybrid or remote treatment delivery, and difficulty with retaining patients, which likely impacted the uptake of RISE Iowa. The priority for clinicians often had to be pressing issues that clients were

experiencing outside of treatment, rather than starting and sustaining patient use of an app.

Limitations

There are limits to this paper's generalizability. Results are based on a relatively small number of interviews, all from 1 state and conducted midway through the intervention period. Hence, we are not able to comprehensively examine sustainability. Moreover, since these interviews, and the greater research project, occurred during the COVID-19 pandemic, we do not know how well the results will carry over to the new world we will eventually enter. The pandemic made RISE Iowa implementation very challenging as treatment providers were dealing with other disruptions that took priority over promoting RISE Iowa. Despite these challenges, the pandemic made obvious the importance of finding new ways, like the use of e-health technologies, to serve those in need.

Future research

Understanding facilitators and barriers to implementation is an ongoing process. Future research should test the effectiveness of clinician-identified facilitators to implementation and seek strategies that help clinicians navigate the identified barriers, while moving beyond understanding them to create tools and strategies that overcome these barriers and build on the facilitators.

Conclusion

Addiction can be a life-long struggle and its presence is worsening in many areas of the country. Some individuals with SUDs access treatment but current treatment is not always successful. E-health technologies such as RISE Iowa can help lessen drug or alcohol abuse. Finding ways to embed e-technologies, like RISE Iowa, into a new standard of care, rather than being an add-on, could greatly improve treatment engagement and recovery rates. This study illustrates the challenges that organizations, clinicians, and patients face as they implement new technology and provides insights into potential solutions to these issues. Progress is being made but finding faster and better ways to disseminate proven innovations is essential.

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Author Contributions

KF conducted the data analysis and wrote the paper. NJ supervised data collection and conceptualized and wrote the paper. JH supervised data collection and contributed to the data analysis and the writing of the paper. TM was the study PI, conceptualized the paper, contributed to the data analysis, and wrote

the paper. DB, MR, and CR provided coaching to organizations participating in this project and contributed to the writing of the paper. EP contributed to the writing of the paper. All authors reviewed the paper before submission.

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