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## Improving Access and Mental Health For Youth Using Smart Technologies

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## ORIGINAL RESEARCH PAPER

# Improving Access and Mental Health For Youth Using Smart Technologies

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## Abstract

The overall objective of this research is to evaluate the use of a mobile health smartphone application (app) to improve the mental health of youth between the ages of 14 and 25 years, with symptoms of anxiety and/or depression. This project includes 122 youth who are accessing outpatient mental health services at one of three hospitals and two community agencies. The youth and care providers are using the Smart technology to enhance care. The technology uses mobile questionnaires (Qnaires<sup>TM</sup>) to help promote self-assessment and track changes to support the plan of care. The youth were provided a smartphone and talk/text/data plan, if needed. The majority of participants identified themselves as Caucasian (73.5%). Expectedly, the demographics revealed that Anxiety Disorders and Mood Disorders were highly prevalent within the sample (73.6% and 66.9% respectively). Findings from the qualitative summary established that both staff and youth found having a smartphone and data plan beneficial. Demographic variables such as age, sex, mental health and physical health did not predict which youth were more likely to use the application.

## 1 | INTRODUCTION

In Canada, the total cost of treatment, care and support services for mental health problems exceeds 42.3 billion Canadian dollars per year, [1] with mental health services for young people being the second highest youth healthcare expenditure after injuries [2]. Although 70% of mental health problems develop during childhood and adolescence, [3] only a quarter of the 10%-20% Canadian youth affected by mental illness will receive mental health services [4]. Suicide is the second leading cause of

death among Canadian youth, accounting for 24% of the deaths among individuals aged 15-24 [4].

Research on the integrated use of information technologies has shown strong improvements in the accessibility, quality, and efficiency of health and mental healthcare services [5]. Mobile technologies, in particular, appear to be a promising avenue due to the ubiquitous and portable nature of mobile devices. Smartphones have been successfully used to complement the treatment of a wide range of illnesses such as schizophrenia, [6] bipolar disorder, [7] and social phobia [8]. In one of our previous

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studies, youths were provided smartphones and access to an online personal health record which revealed that individuals with more severe mental illness utilized the health record frequently [9]. Other research has suggested the use of messaging applications can transfer power from the researcher to the youth by allowing them to exercise greater freedom and control over sensitive topics during interviews [10]. Although screen time may be a concern for some, youth at-risk of mental illness have not demonstrated signs of increased risk to their mental health status on days of frequent use [11].

It is highly important to acknowledge the perspective of the population in question. Technology-based supports are becoming more popular as one study reported 62% of participants stating they had used the Internet for mental health support [12]. Previous investigations have revealed that technology must have clear benefits and should complement treatment by not replacing in-person sessions but providing support between appointments. [13] Regarding youth mental health applications, participants have stated they should be interactive, customizable, and have video capabilities. [14] Confidentiality must also be addressed to ease worries regarding data security and privacy. A study among African-American youth of a lower socioeconomic status (SES) revealed concerns regarding messages being seen by peers, privacy breaches during video calls, and the credibility of online resources as opposed to information from their healthcare provider [15]. This highlights the importance of providing a service that means all these criteria to provide a positive experience for participants.

However, youth of a lower SES are more likely to be on the disadvantaged side of the “digital divide” and therefore may experience a lack of access to mental health resources. Youth experiencing marginalization (socially, culturally, and/or economically) have been found to have less access to the Internet at home with almost 50% having to use a library or at school [16]. Similar findings regarding access to technology and SES have reported that youth of a lower SES are significantly less likely to own a computer and are older in age when they first use a computer [17]. Technological literacy can also be a factor for disadvantaged youth. Support workers in a 2016 study conducted in Scotland noted that youth not in education or employment experienced barriers in accessing informational needs [18]. These barriers included isolation, home life, literacy, poor social skills, and low motivation; the latter being the result of substance use, familial unemployment and difficulty focusing [18]. Furthermore, for youth experiencing a lack of housing stability and income, learning how to use the technology may be less of a priority which in turn could lead to further isolation through ‘digital exclusion’ and lower employment opportunities [19].

This ongoing study is integrating a mobile technology solution into routine care for youth who have symptoms of anxiety and depression. We recruited youth from mental health outpatient programs as well as programs working with disadvantaged youth such as those who were homeless, out of school, and/or unemployed. This technology is expected to: 1) promote healthcare outcomes, community inclusion and

quality of life; and 2) reduce healthcare system costs by preventing hospitalization and reducing the need for outpatient visits. This report focuses on baseline data and the initial set of focus group data with youth and their care providers.

## 2 | MATERIALS AND METHODS

### 2.1 | Study Design

This participatory action research project utilized a pre-post, mixed methods design. Semi-structured interviews are being conducted at baseline, 6, and 12 months respectively. Focus groups are held with youth and separate groups with care providers. The primary outcome measure for effectiveness is the Community Integration Questionnaire – Revised [20].

This paper reports on the baseline and 6-months post implementation data from interviews and the initial focus groups after the youth had been using the smartphone with talk/text/data for less than 3 months. The research questions addressed in the preliminary analysis are as follows:

1. What are the demographics of the sample?
2. What are the initial impressions of the application?
3. What characteristics are related to use of the application?

### 2.2 | Participants

This 2-year project has recruited 122 youth participants youth (ages 14-25) from the caseloads of 46 mental healthcare providers in London and Woodstock, Ontario, Canada who are receiving hospital-based or community agency-based outpatient care. Most of the youth participants are at-risk youth who are either homeless or on the verge of homelessness.

Additional inclusion criteria for participants to participate in the study include:

1. Must be on a caseload of a participating staff or care provider.
2. Able to understand English to the degree necessary to participate.
3. Have symptoms of anxiety or depression.
4. Be 14-25 years old.

### 2.3 | Intervention

The lay name for the study is called Youth Telemedicine and Patient-Reported Outcome Measurement (TELEPROM-Y). The intervention provides participants with synchronous and asynchronous communication with their staff/care provider team through the Collaborative Health Record (CHR). After the youth have completed their baseline interview they are trained and download the TELEPROM-Y CHR app developed by InputHealth.

## 2.4 | Smart health

Our previous pilot study, TELEPROM-G, tested a digital system for treating approximately 30 adults (aged 65 or older) with depressive symptoms living in the community using the CHR [21]. The CHR is a cloud-based platform that enables healthcare interactions between youth participants and care providers. The CHR integrates the workflow of the full spectrum of healthcare providers, while also having embedded patient engagement functionality. These functionalities include the ability to: book appointments online; track quality of health and health outcome scores using mobile devices; access tailored educational content pertaining to their mental health; and engage in both synchronous (e.g. video-conferencing) and asynchronous (e.g. secure messaging) virtual visits with their healthcare providers (see Figure 1). The CHR also allows the care providers to view previous messages, Qnaire™ responses, schedule Qnaires™, view appointments, and make notes on the platform (see Figure 2). Youth participants used a smartphone application (app), which is provided to them free of charge if they need one to connect to the CHR, using the free data plan they are provided for the duration of the study. The intervention is designed to facilitate better care and engagement between the patient and their care team by providing the youth with smart technology.

The objective of the CHR is to:

- 1) improve access to care.
- 2) allow youth to monitor their mood to facilitate earlier intervention.
- 3) enhance youth/care provider communication through digital interfaces.
- 4) improve the patient and care providers' care experience.

There are many smart health apps for mental health support that are currently on the market but largely remain unstudied or untested [22,23]. In Canada, the Centre for Addiction and Mental Health recommends apps for users such as PTSD Coach and Mindfulness Coach [24], although both were developed with Veterans in mind. Cognitive behavioural therapy-based (CBT) apps such as MoodKit and MoodMission have both been found to significantly reduce depression but did not have any significant effect on anxiety and did not focus on youth [25]. A mental health app called 'myCompass' provided a similar proof of concept as the CHR through the use of messages and prompts but also offered self-help CBT modules [26]. Despite reporting significant decreases in anxiety and depression, myCompass did not offer connectivity with a care provider like the CHR. The CHR therefore provides an additional level of support who can also use the messaging function to send resources to clients as opposed to set modules. Another app provided to youth, Actissist, focused on more severe mental illness [27]. The findings for the Actissist revealed large effects in improving mood and psychotic symptoms [27]. and although users could track their data over the previous seven days, the app was based on automated responses depending on questionnaire answers and not directly with a clinician. Although clients could simply show their care providers the data and receive responses to the questionnaires in real time, care providers could not provide specific responses to the questionnaires based on the individuals care plan or monitor data outside of appointments.

## 2.5 | Measures

Measures included a demographic questionnaire, the Community Integration Questionnaire (CIQ-R), [20] Lehman's Quality of Life, [28] EQ-5D, Health and Social Services

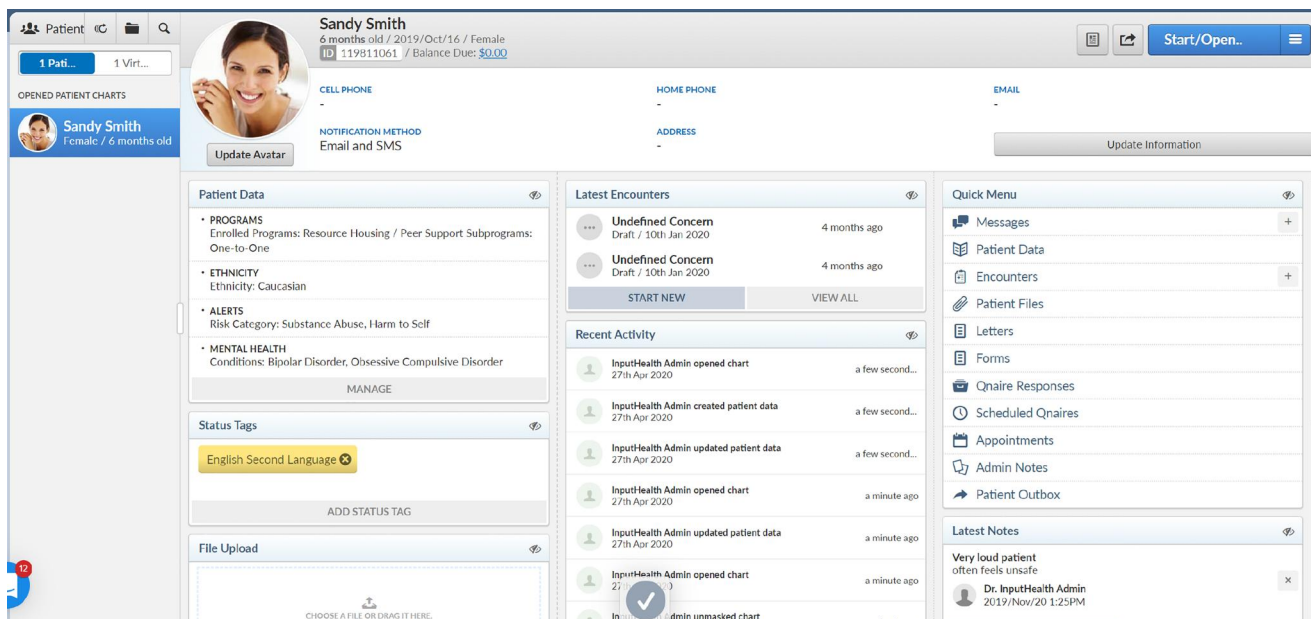
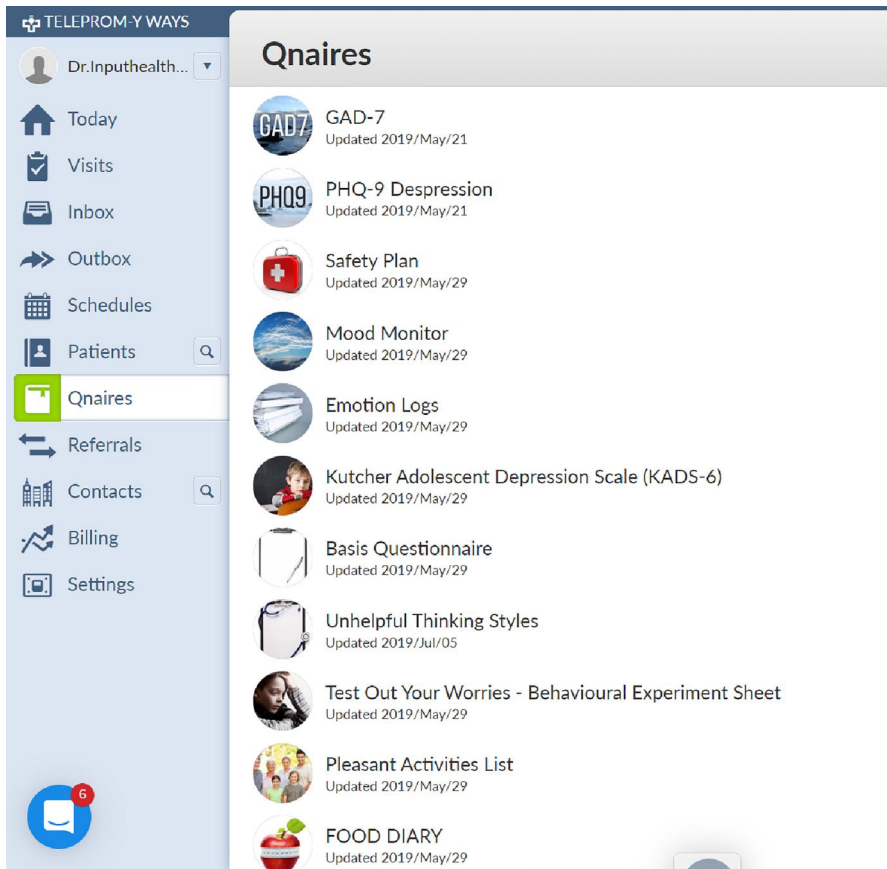


FIGURE 1 The Collaborative Health Record dashboard



**FIGURE 2** Qnaires™ for care providers to send to participants

Utilization, and Likert scales assessing Perception of Smart Technology (PoST), which is a researcher-developed questionnaire that inquires about the participants' attitudes and opinions of the smartphone provided, provided data plan, and the CHR once the study has been completed and data from all three interviews can be analysed.

## 2.6 | Data analysis

The research team used SPSS Statistics Software to generate descriptive statistics and perform a regression to determine usage of the CHR app. The primary outcome measure was the CIQ-R. It is important to note that data from the Qnaires™ on the CHR app were not, and will not, be analysed in order to maintain patient-practitioner confidentiality. Common qualitative items included feedback from participants on what they do and do not like about the having a smartphone, the CHR technology, as well as suggestions for improvement on ethical principles such as autonomy, privacy and beneficence. A thematic analysis [30] using an ethnographic [31] method of analysis will be used to observe the broader social and cultural contexts surrounding individual experiences as well as the impact on staff/care providers and how the intervention influenced their practice.

A standardized evaluation framework will be instituted to facilitate systematic effectiveness, economic, ethical, and policy

analyses [32]. Effectiveness analyses adopted a mixed-methods approach by analysing the quantitative data from all measures to observe changes or improvements to participant community integration, service utilization and quality of life. Qualitative items from the focus groups assessed experiences and opinions of the technologies and recommendations for improvement.

The economic analyses assessed the costs and benefits of the technologies as well as health costs associated with the intervention compared to usual care. In addition, the costs of hospitalizations, emergency room visits, outpatient visits and home care service were evaluated.

The ethical analyses looked at findings related to social inclusion and fairness compared to ethical standards based on welfare theory. The analysis also took into consideration the accepted ethical principles of care providers (i.e. respect, autonomy, and beneficence).

Our policy analyses observed the implications of access to services, service utilization and need for personal resources that arose during individual interviews.

## 3 | RESULTS

A total of 122 participants have been recruited in the study (see Table 1). There was a wide range of ages among the participants on enrolment from 14 to 25. Many of the youth

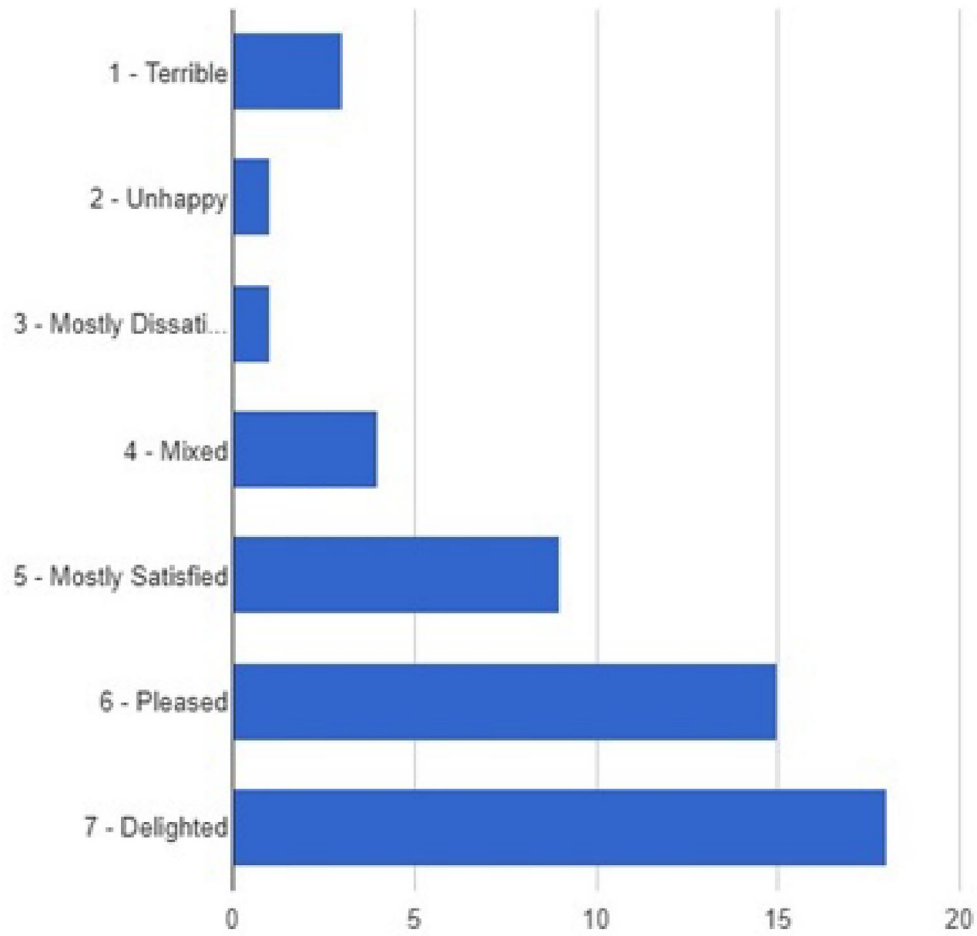
**TABLE 1** Demographics ( $N = 122$ )

<b>Age (Mean)</b>	19.7 years
<b>Sex</b>	
Female	68 (56.2%)
Male	53 (43.8%)
Other	1 (0.8%)
<b>Ethnicity N = 98</b>	
Caucasian	72 (73.5%)
Indigenous	10 (10.2%)
Black	5 (5.1%)
Asian	3 (3.0%)
Latin American	3 (3.1%)
Arab	1 (1.0%)
Other	4 (4.1%)
<b>What is your current living arrangement?</b>	
Live with parent(s)	36 (29.5%)
Live alone	28 (23.0%)
Live with spouse/partner	8 (6.6%)
Live with unrelated person	25 (20.5%)
Live with other relative	2 (1.6%)
Homeless	23 (18.9%)
<b>Psychiatric diagnosis</b>	
Anxiety Disorder	82 (73.6%)
Mood Disorder	81 (66.9%)
Disorder of childhood/adolescence	43 (35.5%)
Personality Disorder	20 (16.5%)
Psychotic Disorder	14 (11.6%)
Substance-related disorder	14 (11.6%)
Developmental handicap	7 (5.8%)
Other	20 (16.5%)
<b>Previous psychiatric hospitalization?</b>	
Yes	75 (62.0%)
No	46 (38.0%)
Missing	1 (0.8%)
<b>Age at first psychiatric hospitalization (mean) (n = 75)</b>	15
<b>Estimated total number of psychiatric hospitalizations (median) (n = 74)</b>	3.0

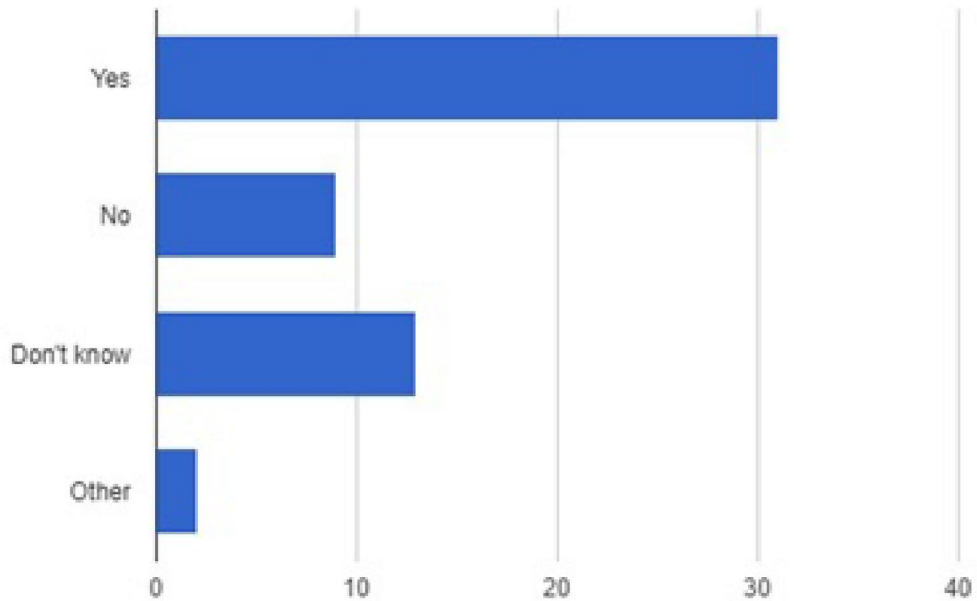
in the study were experiencing poverty and twenty-three (18.9%) reported being homeless with the majority of youth (29.5%) living with parent(s). The majority of participants identified themselves as Caucasian (73.5%). Expectedly, the demographics revealed that Anxiety Disorders and Mood Disorders were highly prevalent within the sample (73.6% and 66.9% respectively). Of this sub-population of the sample who reported prior psychiatric admissions, the mean number

of days since their most recent hospitalization was 50. The PoST found that a lot of the youth participants were not using the CHR, nor had they even downloaded it. The individuals who had used it found that it improved their healthcare. See Figures 3 and 4.

At present, the CIQ-R, as shown in Table 2, found that 44.6% were visiting friends and relatives five or more times a month and the same number (42.1%) were visiting friends and



**FIGURE 3** How do you feel about connecting with your care provider using your smartphone? ( $n = 51$ ). Counts/frequency: 1 - Terrible (3%, 5.9%), 2 - Unhappy (1%, 2.0%), 3 - Mostly Dissatisfied (1%, 2.0%), 4 - Mixed (4%, 7.8%), 5 - Mostly Satisfied (9%, 17.6%), 6 - Pleased (15%, 29.4%), 7 - Delighted (18%, 35.3%)



**FIGURE 4** Has the use of the Smartphone and CHR for personal health information improved your healthcare? ( $n = 55$ ). Counts/frequency: Yes (31%, 56.4%), No (9%, 16.4%), Don't know (13%, 23.6%), Other (2%, 3.6%)



**TABLE 2** Community integration ( $N = 122$ )

<b>Approximately how many times a month do you usually visit friends or relatives?</b>	
Never	16 (13.2%)
1–4 times	51 (42.1%)
5 or more	54 (44.6%)
Missing	1 (0.8%)
<b>When you participate in leisure activities do you usually do this alone or with others?</b>	
Mostly alone	29 (24.0%)
Mostly with friends who have mental health challenges	24 (19.8%)
Mostly with family members	11 (9.1%)
Mostly with friends who do not have mental health challenges	18 (14.9%)
With a combination of family and friends	39 (32.2%)
Missing	1 (0.8%)
<b>How often do you travel outside the home?</b>	
Almost every day	90 (75.0%)
Almost every week	25 (20.8%)
Seldom/never (less than once per week)	5 (4.2%)
Missing	2 (1.6%)
<b>How often do you write to people for social contact using the Internet (e.g. Facebook)?</b>	
Every day/most days	88 (72.1%)
Almost every week	22 (18.0%)
Seldom/never	12 (9.8%)
<b>How often do you make social contact with people by talking or text messaging using your phone?</b>	
Every day/most days	85 (70.2%)
Almost every week	14 (11.6%)
Seldom/never	22 (18.2%)
Missing	1 (0.8%)

relatives 1-4 times a month. When the youth participated in leisure activities 32.2% did these activities with a combination of friends and families, 24% were alone, and 14.9% were with friends who also have mental health challenges. The findings indicated that 75% leave their houses almost every day while 4.2% indicated that they leave the house less than once per week (for the youth that are housed). When asked how often do they make social contact with people by talking or text messaging, 70.2% stated that they do every day/most days.

### 3.1 | Logistic Regression Results

Participants who completed a second interview ( $n = 93$ ) were coded as to whether or not they have used the CHR interface based on the number of questions they had missed answering on the PoST form. Since, the form includes questions on participants' experience of using the app, it was assumed that

**TABLE 3** Number of participants coded as users and non-users of the CHR app

<b>CHR App Usage</b>	<b><i>n</i> (%)</b>
User	54 (58.1)
Non-user	39 (41.9)

those who did not use the app would be unable to answer most questions on the PoST. The number of missing questions on the PoST were graphed and a cut-off of four missing questions was used to determine whether participants used the CHR interface. If participants had missed three or less questions, they were assumed to have used the CHR interface and were coded as a user; if they had four or greater missing questions, they were coded as a non-user (see Table 3).

A logistic regression was completed to determine if sex, age, and degree of mental and physical health influenced

**TABLE 4** Age, sex, physical health, and mental health as predictors of CHR use

Predictor Variables	OR (95% CI)
<b>Age</b>	0.88 (0.75–1.02)
<b>Sex</b>	
Female	1.05 (0.40–2.78)
Male (Reference Category)	
<b>Physical health</b>	1.02 (0.99–1.02)
<b>Mental health</b>	1.00 (0.98–1.04)

**TABLE 5** Descriptives and frequencies of predictor variables

Predictors	Users ( <i>N</i> = 54)	Non-users ( <i>n</i> = 39)
<b>Sex <i>N</i> (%)</b>		
Female	33 (61.1%)	20 (51.3%)
Male	21 (38.9%)	19 (48.7%)
<b>Age M (SD)</b>	19.8 (3.2)	21.1 (3.0)
<b>Physical health M (SD)</b>	70.4 (17.8)	62.4 (26.0)
<b>Mental health M (SD)</b>	53.2 (23.4)	49.8 (29.3)

Note: For Physical/Mental Health Scale 0-100 in which 0 represents worst state and 100 represents best state.

whether or not participants used the CHR interface. The full regression model with all predictors included was not significantly different from the null model ( $\chi^2 [2] (4) = 6.53, p = 0.163$ ). The model explained 9.1% (Nagelkerke's  $R^2$ ) of the variance in participant app usage and accurately classified 63.4% of cases. Predictors were entered as demographic (i.e. age and sex) and health (i.e. physical and mental health) blocks in the regression model to determine the influence of these factors on app use. Neither the demographic ( $\chi^2 [2] (2) = 4.41, p = 0.110$ ) nor health ( $\chi^2 [2] (2) = 2.13, p = 0.346$ ) blocks were significant contributors to an overall improved model fit. None of the variables in the regression were significant predictors of whether participants used the CHR interface (see Table 4). However, CHR interface users were younger in age and have better self-reported physical health (see Table 5).

### 3.2 | Initial focus groups

A staff focus group and 2 youth focus groups have been completed prior to 3 months of implementation.

Youth described the advantages of both the app as well as having a smartphone with a talk/text/data plan. For the application itself, youth identified increased communication with their care provider, primarily through the messaging function. They also appreciated having the availability of information on their phone including safety plan, the ability to set up appointments and, reminders related to wellness plan, as

well as medication prompts. They enjoyed using a paperless format for things such as completing forms online that were sent by the care provider. Examples of comments include:

I liked doing the little survey thing. Cause like when I am bored and or like on a bus or something and I think, need to stop focusing on people, like, probably not staring at me but staring at me. I will go on it. It gives me something to do so, and like it's helpful to so. I will do like the surveys and questionnaires that pop-up ...

Well I mean just yesterday, I was able talk to Dr. (Name), who scheduled an a, an appointment for Friday, which I found really helpful because I wouldn't know how to contact her otherwise

The youth also described areas for improvement. They described that they initially had to take time to figure out the functions. There were several complaints about the cumbersome log-in process. Although they identified that they understood the log-in privacy concerns, they thought it could still be streamlined. Some examples of quotes include:

At first it was confusing, but then figured it out. I don't know, like I don't know exactly how it's confusing but like, it was like, it, it was new, ...

Yeah randomly it signed me out the other day like it was signed in for like a good few weeks now and I was like thank you. And then it just randomly signed out and I was like damn. I remember my stuff but it's just annoying how you would put it in every single time but like I know that's for like confidentiality and like some people can't go on it. But, kinda sucks sometimes.

The other major theme related to the importance of having a phone to connect with support and/or friends and family. The provided smartphones themselves helped youth feel comfortable and connected to other people. They reported the advantage of having being provided with a smartphone. Some examples of quotes include:

When I did not have a phone like I just hate going places and not knowing where I am going, or like I do not know, my anxiety's really bad.

Then, the phones helped me to not only help myself, but to help others in like emergent situations... which I had to do a couple weeks ago and had I not gone to the study, like I wouldn't have been able to help them so it has helped in a lot of ways.

Staff identified similar advantages of their client having a smartphone and the CHR interface, in particular, the ability to

securely message their clients frequently. Specifically, staff identified the advantages were the ability to send questionnaires and to set appointments using the app. They discussed that sometimes the youth felt more comfortable to first raise uncomfortable topics by phone/messaging and this resulted in strengthening the relationship between the youth and the care provider and empowering the youth. Staff supporters also identified the importance of their clients having a phone at all.

Some examples of quotes include:

Yeah I use messaging, especially one time um one of my youth did not have any minutes on their phone so we actually were a couple times messaging through the site.

I think a good one for me is the mood Qnaire™ and the medication one. Um, because a lot of my youth, their mood fluctuates either in a single day – when I see them in the morning they could be doing amazing and then by the afternoon they are just doing horrible. So, I can send them one of those and then kind of see like maybe what a trend is and figure out the trend and then that way I can better support them as well.

So that they do make it to their appointments on time, and at their like right day. I am able to text them ahead of time to remind them.

So, they don't want to like give away things in person like if its ... going to cause them to cry. It ... allows them to be more vulnerable.

If anything it has increased the relationships and made them like stronger and better.

For improvements they noted the app had a medical look to it that was not inviting to youth:

It does, like I feel like if I am a 23-year-old and I am just looking and it has this nice bright blue and white, but...it just reminds me of a doctor's office and a lot of our youth may be triggered by doctor's offices, or have had really bad experiences...

They also noted that they do not spend much time on their computer so they really need a phone app themselves for the provider version.

## 4 | DISCUSSION

The demographic findings from the baseline interviews were characterized by a wide age range (14–25 years) with a comorbidity of psychiatric illnesses. Findings in Table 1 showed that 62% of participants who stated that they had been

admitted to as an inpatient for a psychiatric reason. When asked on the estimate of the total number of psychiatric admissions in their life-time, the median number of hospitalizations among youth who did report a hospitalization was 3.0 times. To further highlight the vulnerability of this population, 18.9% of the sample stated they are homeless when asked about their current living arrangement. Participants reported that being provided with a phone helped to offset anxiety and worry. The additional communicative benefits of the smartphones provided participants with an additional feeling of security and connectivity, including one participant who discussed using the phone in an emergency situation. Through the provision of the smartphone and the app, participants were afforded the ability to overcome barriers to resources as previously noted among at-risk youth [18].

With regard to community integration, the sample appeared to be socially isolated as only 42.1% were visiting friends or relatives at least weekly and 24% were doing leisure activities alone. The majority of the sample used social media on most days.

Our analyses revealed no significant findings to assist in determining which demographic items would predict frequency of using of the application. This suggests more research is needed to identify which subgroups are more likely to use this type of application. Based on the preliminary findings, we report that the use of smart technology and providing participants with a smartphone was deployed with mixed result to a range of youth with symptoms of depression and/or anxiety. Both staff and youth identified strengths of both having the app as well as having a phone. The ability to communicate more easily was noted as a particular strength that has the potential to improve access to care and support the therapeutic relationship. Participants noted that they enjoyed completing the interactive questionnaires on the app. This meets recommendations by youth from previous research into mental health apps, [14] which is a major advantage of the CHR. As previously noted in the literature, smartphones have been found to be successful in assisting individuals with bipolar disorder, [7] and social phobia [8]. It is anticipated that the TELEPROM-Y project will be able to provide greater assistance to individuals with mental illness through enhanced access to resources and supports, as well as further opportunities for communication with care providers. Moreover, the use of smartphones may represent a more convenient approach to mental healthcare as opposed to in-person appointments or printed resources (i.e. brochures, information sheets) that are easily lost or damaged. As described in the preliminary focus groups of this study, some individuals may not wish to visit a healthcare provider's office due to previous negative experiences. The CIQ-R revealed that some youth are not leaving the house every day/most days due to depression and/or anxiety. Some participants voiced that they like receiving care from the comfort of their own environment using the smartphone and/or the CHR app. This can also negate any potential missed appointments or concerns going unchecked, therefore providing early intervention and prevention.

From the perspective of care providers, the CHR also allows for greater monitoring of clients for early intervention and prevention. By using the app to complete the questionnaires in real time, the care providers can be alerted to any potential mental healthcare crises that may have been unreported or unacknowledged otherwise. This approach could allow mental healthcare providers to see and communicate with more individuals in one day. By improving this connectivity with care providers, participants in this study experiencing poverty and/or homelessness can overcome barriers to care such as lack of money or transportation to attend appointments, and difficulty accessing much-needed services. In Canada alone, 64% of street-involved youth have reported difficulty accessing services [33]. Care providers in this study noted that participants tended to message them first concerning sensitive topics, perhaps to offset any uncomfortable notions in starting these conversations in person. This echoes previous studies in providing youth with the option to raise issues virtually that may be difficult to do in person [10].

Our analyses suggest that 41.9% of participants did not use the app. It is unclear whether we can establish causality as to usage among care providers and participants possibly affecting the other (i.e., lack of usage causing the other not to use the app). It was also reported that the login issues had occurred frequently which may have impacted the willingness to use the app.

Another unanticipated expense was the number of smartphones and data plans needed. In our proposal we anticipated purchasing 40 smartphones and 40 data plans but since a lot of the youth participants are living in poverty and/or homeless, an additional 55 had to be provided with a smartphone and 73 with a data plan to participate.

This study was limited by not being controlled other than by the pre/post-intervention design; future research could benefit from a comparison with a similar cohort of participants who do not receive the intervention during the study period, perhaps as part of a waiting list that could later receive the intervention.

## 5 | CONCLUSION

The implications of this study could be far-reaching. This intervention may provide a more efficient approach that enhances connectivity with care services. However, disadvantaged youth found the phone itself was a major benefit. Access to phones as well as the application could represent a more efficient approach to mental healthcare by providing participants with greater opportunities to seek additional support and resources.

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