ORIGINAL ARTICLE

Cell phone ownership and use among mental health outpatients in the USA

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Abstract Cell phone technology is in the hands of millions of Americans, and early research indicates that this technology can be useful to help Americans who are suffering from some form of mental illness. Like with the design of any technology from a human-centered perspective, we aim to determine how to best utilize technology so that it is both easy to use and works for its intended purpose. To accomplish this, we surveyed 325 patients currently receiving treatment at community-based outpatient clinics for mental illness to determine their cell phone ownership and usage patterns. Our results showed that cell phone ownership among these mental health patients was comparable with ownership among a nationally representative sample, with the exception that more patients than non-patients shared their mobile phones. Among mental health patients, we found that texting was the most popular feature used and downloading apps was the least popular. Based on these results, we concluded that texting may be a feasible form of treatment aid for those with mental illness and may be useful as a supplementary treatment for those with low income or little to no access to treatment. Further research should investigate privacy measures for using mobile technology as a treatment aid, especially for those who share a phone, and explore the types of mHealth treatment aids that could be the most effective.

Keywords Cell phones · Mental illness · Mobile technology · Health technology · mHealth

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1 Introduction

Cell phone technology has become a familiar accessory in American culture. According to the Pew Internet and American Life Project, 83 % of Americans over the age of 18 reported owning some form of cell phone in 2011 [1], and that number climbed to 91 % of Americans in 2014 [2]. Cell phones have moved beyond just a means of communication, becoming a source for news and entertainment.

Meanwhile, over a quarter of Americans suffer from some form of diagnosable mental illness each year [3], while almost half of Americans will suffer from some form of diagnosable mental illness during their lifetime [3]. According to the Substance Abuse and Mental Health Services Administration (SAMHSA), the prevalence of mental illness is growing and 62 % of those suffering do not receive treatment for their illness [4]. Our goal was to determine how to take advantage of a technology at the fingertips of so many Americans to supplement the treatment of patients suffering from mental illness.

In recent years, technology has been used for a variety of remote health monitoring and care delivery

applications, including diabetes management [5, 6], aging-in-place [7, 8], cancer [9], and rehabilitation services [10]. Remote monitoring can include an assortment of mobile and embedded technologies that collect health-related data either through active user input, or passively (automatically) through sensors. Examples include smartphones where users input their nutritional intake [11, 12], tablets that patients can use to complete symptoms checklists [13], cell phone applications (apps) that determine movement around the community [14], and novel displays that provide feedback to patients so they better understand their own health [15, 16]. While there has been a plethora of research from the technology community regarding health monitoring and care delivery applications for older adults, chronic disease management, and preventive health, there have been few investigations of ways that readily available technologies—such as cell phones—can be used to assist in the treatment of mental health disorders [17]. At the same time, there has been an explosion of commercial technologies that provide patients with information about treatments for depression, and some that provide mechanisms for recording and obtaining feedback about their own behavior [18]. However, very few have been developed using empirical evidence or evaluation [19].

Furthermore, the need to address human factors [20], ethical issues, and privacy [21] in the design of health information systems, as well as the danger posed by failing to address these questions, has been widely recognized in the literature [22]. Thus, a system which does not take into account patients' perspectives will be avoided by patients, while a system that reflects their input during usability testing is more likely to be adopted [23]. With proper foresight and attention to these issues, innovative technology can support patients in making informed decisions about participation in their own care, and providers in delivering evidence-based care.

Evidence is growing regarding patients' preferences for involvement in their treatment and for access to mobile technology for managing depression [24–26]. Indeed, evidence suggests that individuals with depressive symptoms are more receptive to using their cell phones for monitoring and managing their mental health care than individuals without current mental health issues [26, 27]. However, it remains unclear what the technology needs of patients with mental health issues are as compared to the general population. How might successful design of a mobile app for use in mental healthcare be similar to or different from mobile app development in general? This paper takes a first step at examining that question by investigating the ownership and usage patterns of mental health patients and comparing it with patterns among the general population.

2 Methods

2.1 Overview

Surveys were offered to patients in the lobby of a set of behavioral health clinics in the Midwest. The Centerstone IRB approved the entire study.

2.2 Participants

Three hundred and twenty-five people who were either seeking treatment or currently being treated for a behavioral health condition at one of five outpatient behavioral health clinic locations in Tennessee volunteered to fill out the survey. Three locations were urban, and two of the locations were rural. All participants were outpatients and had an appointment on the day they received the survey. Participants ranged in age from 18 to over 65 years, but most were between 30 and 49 years old. There were more women (69 %) than men, more whites (70 %) than blacks (19 %), or hispanics (2 %), and the large majority of the sample was low-socioeconomic status (low SES, i.e., 75 % reported an annual income of <$30,000), and all lived in rural or urban Tennessee. Participation was voluntary, and participants were not offered compensation for participation.

2.3 Materials

A 30-item survey was constructed and used to gather information on the cell phone ownership and usage of behavioral health patients. Results were compared with the Pew Internet and American Life Project, which report on the results from telephone surveys conducted each year among a nationally representative sample [1, 2]. The Pew surveys cover a variety of topics that include cell phone ownership and usage, along with questions related to Internet use, online dating, etc. [1, 2]. To maintain consistency for the purpose of comparing results with a national sample, the survey questions for this study covering cell phone ownership and cell phone feature use were adapted from questions on the Pew Research Center's "Americans and Their Cell Phones" survey [1]; the demographic questions, excluding mental health diagnosis, were adapted from the "Americans and their Gadgets" survey [28]. The questions in our survey cover four main categories: demographics, phone ownership details, phone usage, and comfort with different phone features usage. The last two questions applied only to participants who did not own a cell phone and inquired about why the patient did not own a phone and whether anyone in their household owned a phone. Unlike the Pew survey, we also queried participants to provide a self-report of their mental health diagnosis. A sample of this survey is included in "Appendix."

Table 1 Weights (obtained by: % income mental health patients/% income pew)

	2011 Pew (%)	2013 Pew (%)
	2.56	2.65
	0.26	0.25
	0.21	0.19
	0.03	0.02

2.4 Procedure

The front desk staff at each of the five behavioral health clinics placed surveys in the lobby of the clinic along with a sign that read, "Clients are invited to complete a brief, anonymous survey to help us improve care. Please put your completed survey in this box." Clients were invited to fill out the survey using paper and pencil. The surveys were only available for the duration of 2 weeks. Because patients are typically seen less frequently than once every 2 weeks, we expect that patients would have been unable to take the survey more than once. Instructions were provided on the survey itself that stated, "You are invited to respond to the following survey. Any data you provide will remain anonymous. The survey will take less than 10 min." The entire survey took less than 10 min to complete. The question regarding mental health diagnosis provided a list of options that included Depression, Bipolar Disorder, Schizophrenia, Anxiety, and Other. Participation was entirely voluntary, and data were collected anonymously (no space for entering a name or other identifying information was provided on the survey). Since the study was entirely voluntary, patients were encouraged not to answer any questions they did not want to answer. We chose this method to encourage accurate answers that avoided participants from supplying inaccurate data for questions they were uncomfortable answering, but felt compelled to answer. As a result, we included responses in our analyses from questionnaires even when those contained some missing responses.

3 Results

3.1 Weighting

Given that less than 10 % of our sample reported an income greater than $30,000 a year (see Table 2), we needed to align the data provided by the Pew Internet and American Life Project with our sample. Therefore, for the purpose of analysis, we weighted both sets of Pew data (2011 [1] and 2013 [2]) by income. We obtained the weight by dividing the percentage of individuals in each income category from the sample of mental health patients by the percentage of individuals in the respective category from each Pew sample. The resulting weights are shown in

Table 1. The weights were then applied to the data for each individual's response in both Pew samples based on their income.

3.2 Demographics

The key demographic differences between the three samples are that the mental health patients we surveyed were composed of more women than men; the majority of participants were between 26 and 49 years old; most were white; 75 % reported earning less than $30,000 per year; and although a variety of educational levels were attained, very few graduated from college.

After applying the weight based on income, income is fairly well matched between the three samples (see Table 2). Race and education are also fairly well matched, and gender is more closely matched. The age differences between samples still remained even after weighting.

For self-reported mental health diagnoses, almost half of participants in our sample reported depression and nearly 40 % reported anxiety. Because the Pew data did not contain information about mental illness, we computed the percentage of participants in the 2011 Pew sample who may be suffering from mental illness [3, 29, 30]. To do this, we assumed that the Pew data match a nationally representative sample in terms of overall prevalence of mental illness (see Table 2).

3.3 Cell phone ownership

Seventy-seven percent of mental health patients reported owning a cell phone. After weighting for income, phone ownership between mental health patients and non-patients (2011 Pew) is nearly identical (see Table 3). This indicates that phone ownership among mental health patients in our sample is similar to non-patients. If phone ownership among mental health patients and non-patients changes in a similar pattern around the country over time, this means it may be possible to use a nationally representative sample to understand cell phone ownership and usage among mental health patients in the future (see Table 3).

3.4 Cell phone sharing

Because the Pew data did not contain information about cell phone sharing, we used data from a 2007 cell phone usage survey [31] of over 600 participants with no reported mental illness to compute the percentage of participants in the 2011 Pew sample who likely shared cell phones. While nearly one-fifth of mental health patients who own a phone reported sharing cell phone with other members of their household, only one-tenth of non-patients reported sharing a cell phone (see Table 3).

Table 2 Descriptive Statistics for sample demographics (percentages) weighted by income

	Mental health patients (N = 325) (%)	2011 Pew weighted (N = 2,398) (%)	2013 Pew weighted (N = 2,117) (%)
Gender			
Male	24	40	39
Female	69	60	61
Other	0	0	0
Prefer not to answer	1	0	0
Missing	5	0	0
Age			
18–29	26	18	22
30–49	45	22	23
50–64	19	24	23
65+	2	33	30
Prefer not to answer	2	3	3
Missing	6	0	0
Race			
White	70	74	71
Black	19	17	17
Hispanic	2	12[a]	15[a]
Other	3	6	9
Prefer not to answer	2	2	2
Missing	4	1	1
Income			
Less than $30,000	75	72	73
$30,000–$49,999	4	4	4
$50,000–$74,999	2	2	3
$75,000+	1	1	1
Prefer not to answer	9	15	14
Missing	9	7	6
Education			
Less than high school	26	18	14
High school diploma	31	38	36
Tech/trade/voc school after H.S.	n/a	3	n/a
Some college	23	22	18
College degree	9	12	22
Postgraduate training	n/a	6	9
Prefer not to answer	2	0	1
Missing	9	1	1
Diagnosis			
Anxiety	38[b]	18[c]	n/a[d]
Bipolar	33[b]	3[c]	n/a[d]
Depression	49[b]	7[c]	n/a[d]
Schizophrenia	6[b]	1[c]	n/a[d]
Other	11[b]	n/a	n/a
More than one diagnosis	43[b]	n/a	n/a
Missing	26[b]	n/a	n/a

"n/a" indicates a category for which data were not available

[a] The Pew studies ask whether an individual is Hispanic as a separate question from race, so these columns will not add up to 100 %

[b] Since we allowed participants to choose more than one diagnosis, this column will not add up to 100 %

[c] Approximate percentages of people in the USA over the age of 18 with this diagnosis (http://www.nimh.nih.gov/health/publications/the-numbers-count-mental-disorders-in-america/index.shtml#RegierService System) [3, 29, 30]

[d] Approximate percentages of people in the USA over the age of 18 with this diagnosis not available for 2013 at time of this paper's publication

Table 3 Cell phone ownership

	Mental health patients (N = 325) (%)	2011 Pew weighted (N = 2,398) (%)	2013 Pew weighted (N = 2,117) (%)
Own a cell phone?			
Yes	76	77	88
Do not share	58	67[a]	n/a
Share	18	10[a]	n/a
No	19	23	12
Missing	4	0	0
Prefer not to answer	2	0	0

[a] Computed based on phone sharing reported by participants without known mental illness [31]

3.5 Reasons for not owning a phone and household cell phone ownership

For those 18 % of mental health patients who do not own or share a cell phone, the most commonly cited reason was cost (see Table 4). Notably, for almost 50 % of mental health patients who do not own a cell phone, no one in their household owned a cell phone either (see Table 5). For those 23 % of 2011 Pew participants who did not own a phone, over 70 % also reported that no one in their household owned a cell phone (see Table 5).

3.6 Smart phone ownership

The types of phones people owned were similar across groups. A comparable number of mental health patients and participants in the 2011 Pew survey owned smart phones versus feature phones. Only 17 % of mental health patients reported having a smart phone, while 52 % said they owned a feature phone. It is also notable that despite the 18 % point increase in smart phone ownership of non-

Table 4 Reasons for not owning a cell phone

	Mental health patients (N = 60) (%)
Why do you not have a cell phone?	
Too expensive	40
Don't need it	12
Got tired of it	7
Broke it	2
Other	5
Too intrusive	2
Stolen	2
More than one of the above	5
Don't know	2
Missing	25

Table 5 Household cell phone ownership (based on those who did not own a phone)

	Mental health patients (N = 60) (%)	2011 Pew weighted (N = 546) (%)	2013 Pew weighted (N = 261)
Does someone in your household have a cell phone?			
Yes	30	28	n/a
No	45	72	n/a
Missing	22	0	n/a
Prefer not to answer	3	0	n/a

"n/a" indicates a category for which data were not available

patients between 2011 and 2013, over 50 % of participants reported still owning a feature phone in 2013 (see Table 6).

3.7 Cell phone feature usage

Cell phone feature usage was fairly comparable across groups. Texting was the most popular feature among mental health patients, and the second most popular feature was taking pictures (see Table 7). A higher percentage of the mental health patients text in comparison with the percentage of participants who reported texting in both Pew samples. The 2011 and 2013 Pew populations reported more application downloads than the mental health sample; however, over 60 % of non-patients have never downloaded an application (see Table 7).

3.8 Comfort texting

We investigated how comfortable patients were with the idea of texting in general and texting with their clinician. Sixty-five percent of patients were comfortable with texting in general, and fifty-five percent were comfortable with the idea of texting with a clinician. There was a

Table 6 Phone type (based on those that own or share a phone)

	Mental health patients (N = 249) (%)	2011 Pew weighted (N = 1,852) (%)	2013 Pew weighted (N = 1,832) (%)
Phone type?			
Smart phone	17	20	38
Feature phone	52	60	54
Don't know	6	20	8
Missing	25	0	0
Prefer not to answer	1	0	0

Table 7 Phone usage (based on those that own or share a phone)

	Mental health patients (N = 249) (%)	2011 Pew weighted (N = 1,852) (%)	2013 Pew weighted (N = 1,832) (%)
Activity			
Text	78	57	68
Email	37	23	37
Take pictures	68	60	n/a
Music	41	25	36
Record video	31	23	n/a
Games	26	23	n/a
Internet	43	30	45
Social network	31	19	n/a
Apps	20	18	35

"n/a" indicates a category for which data were not available

positive relationship between comfort texting in general and comfort texting with a clinician ($p < 0.01$) such that the more comfortable patients were with texting in general, the more comfortable they were with the idea of texting a clinician (see Table 8). There was also a positive relationship between the type of texting plan and comfort texting with a clinician ($p < 0.05$), suggesting that the flexibility of the patients' texting plan is related to their comfort with the idea of texting a clinician (see Table 8).

4 Discussion

Our results have implications for the use of mobile technology as a potential treatment aid for mental illness. In this section, we describe the types of phones people own and features they use, the prevalence of sharing phones with others and the implications of this knowledge for design of phone ownership.

Since 59 patients reported sharing their cell phone with other members of their household, meaning approximately a fifth of individuals who reported owning a cell phone also shared that phone, it will be crucial to consider enhancing mobile security to ensure privacy. The second major technological implication that can be drawn from

Table 8 Pearson correlations between comfort texting clinicians and comfort texting, and comfort texting clinicians and texting plan

	Comfort texting		Texting plan	
	r	p<	r	p<
Comfort texting clinicians	0.739	0.01	0.108	0.05

our results is that downloadable applications for smartphones may not be the most accessible treatment aid for the majority of patients in the socioeconomic demographic represented by our sample. Only 17 % of patients reported owning a smartphone, and this percentage matches closely with the 20 % who reported downloading applications. Since the majority do not have access to downloadable apps, it may be best to focus on a cell phone feature that the majority can use and are familiar with using. In our sample, almost 80 % of patients used texting, meaning it may be accessible to the majority of patients and may therefore make a better treatment aid. Finally, another aspect that is important to consider is that a patient's texting plan is related to their attitude about texting with their clinicians. The more flexible their plan, the more likely they are to be comfortable with the idea of texting their clinician.

It should also be noted that individuals 65 years of age and older (not represented in our sample) have lower phone ownership than other age-groups according to the 2013 Pew data [2]. The data show that 97 % of individuals age 18–29 own a cell phone, 95 % age 30–49 own a cell phone, 87 % age 50–64 own a cell phone, and only 77 % own a cell phone age 65 or older. Additionally, less than 40 % of individuals 65 years of age or older who owned a cell phone used that cell phone for texting compared with the 75, 94, and 97 % of individuals in the younger age-groups, respectively. Special care should be taken when considering using a mobile device as a mHealth intervention for older age-groups.

4.1 Mobile phones as a mHealth intervention platform

Our results suggest that those suffering from mental illness report cell phone ownership that is consistent with the national average for cell phone ownership. Our data indicated there is a non-trivial number (nearly half) of the people, who do not own phones, do not own them because of their cost.

> Implication 1: Mental health patients and non-mental health patients are similar in terms of cell phone ownership when controlling for demographic factors such as socio-economic status.
> Implication 2: Like their non-mental health peers, many mental health patients do have access to mobile phones, making it a viable platform for mHealth treatments.
> Implication 3: For the population who do not currently own phones, research is necessary to determine if it would be cost-effective to provide phones to low-income patients as a means of treatment support for mental illness.

4.2 Phone features appropriate for mHealth interventions

While smartphone ownership is on the rise, there are a substantial number of individuals (both in 2011 and 2013) who only own basic feature phones. According to the 2013 Pew data, people in lower income brackets are less likely to own a smartphone than higher income brackets [2]; the lower income brackets were represented by 75 % of our mental health population.

Further, looking closer at the mental health population in the current study, participants who were already comfortable with texting were also comfortable with the concept of texting their mental health provider. This implies that texting may be appropriate feature for mental health mHealth interventions.

Finally, the usage data from both the mental health population and the Pew sample indicate that over two-thirds of the sample text and take photos with their phones. Conversely, popular mHealth intervention strategies, such as gaming, relying on social networks and apps, are used by less than one-third of both populations.

> Implication 4: To reach a broad range of phone owners, designers of mHealth interventions targeting mental health patients should make use of common phone features (e.g., texting and photos), and not rely exclusively on smartphone features (e.g., "apps," gaming or social networks).

Current mHealth solutions that use texting have reported results that texting can be a successful intervention [32]. One such intervention is "text4baby," a program that involves sending text messages containing health topics including prenatal care, nutrition, safe sleep, etc., to pregnant women at specific times throughout and after their pregnancy [33]. An evaluation of the "text4-baby" program found that women who were enrolled had changes in specific beliefs targeted by the text messages they received [32]. It is possible that a similar intervention for mental health patients could be implemented with text messages providing information in regards to their specific diagnosis or reminders about tips discussed during a session, such as relaxation techniques for anxiety.

4.3 Mobile phone sharing

Eighteen percent of the mental health patients we surveyed who owned a mobile phone shared that phone with someone else. This finding runs counter to the conceptualization of mobile phones as personal devices [34] and has important implications for the use of cell phones as facilitators to mental health treatment. Issues include privacy and efficacy. If a patient is sharing a mobile phone with another person who does not know that they suffer from a mental health issue, then using the phone for any kind of treatment purposes could violate the patient's privacy. In terms of efficacy, many of the potential mHealth solutions for mental health [35] assume that a cell phone is carried by a patient at all times or most of the time, and do not consider that the phone might be shared. If a phone is shared, this could affect the quality of the data sensed by the phone. For example, if the mHealth technology relies on counting the number of social interactions per day, if the phone is shared, the count will include people that the person sharing the phone encounters, in addition to the mental health patient.

While we do not have data from a nationally representative sample (e.g., from a Pew survey) on how many non-patients share their cell phones, a survey of over 600 non-patients in the USA in 2007 revealed that 13 % of cell phone owners shared their mobile phone [36]. The finding that such a large percentage of cell phone owners share their phone means that this implication goes beyond only mental health mHealth treatments, but should also be considered in the design of other mHealth solutions that rely on mobile phones.

> Implication 5: When designing a mHealth treatment that relies on a cell phone, at minimum, it is necessary to ask patients if they share a phone. Future research should consider how to design phones such that they can be used privately by multiple people.

We know of little research that has considered phone sharing in the USA and no research that has considered the implications of phone sharing for mHealth. However, phone sharing has been considered in the context of developing countries. For example, in Asia, while mobile use is usually focused on individual use, families often share phones [37]. In India, mobile phones are shared [38] sometimes between spouses, friends, and families [39]. In Africa, phones are often shared among families, friends and neighbors [40]. While more research is required to understand the specific dynamics of mobile sharing in the USA, it is likely the mobile sharing in the USA is also between family and close friends. There is an opportunity to build on these strong relationships and enhance them through a mHealth intervention that interacts with both the patient, and the loved ones who share their phone.

> Implication 6: Further research is needed to determine how a mHealth intervention might take advantage of the mobile phone sharing patterns in order to involve loved ones in the treatment of a patient, while still respecting their privacy and autonomy.

5 Limitations

There are a number of limitations of this work. First, our patient sample is limited to participants from the USA. Therefore, the data and implications presented here likely do not apply to mental health patients around the world. As one example of this, we know that patterns of mobile phone sharing differ in different parts of the world. In India and Africa, phones are regularly shared rather than used by only one individual (e.g., [39, 40] but cf., [34]). Furthermore, the sample was drawn from patients living in rural and urban Tennessee within the USA and may therefore be regionally specific. With regard to diagnosis, this sample was not representative of the behavioral health clinics in Tennessee's patients overall, for whom 22.6 % have a diagnosis of depression. The sample also does not represent older age-groups, with only 2 % of the sample being 65 or older. Thus, these participants are not representative of a national sample and therefore may not be representative of phone ownership and usage of other patients around the USA. Despite these limitations, the data do provide insights into the ownership and usage patterns among a large and understudied population of mental health patients and suggest that future research with a national sample would be useful.

Another limiting factor was the fact that participants self-selected whether or not to take part in the study. Thus, it was a convenience sample with survey response bias (not everyone offered to participate accepts) and item response bias (lots of skipped items), so the results may not be representative of the total outpatient clinic population. This means that the participant population was not randomly selected from the entire population of mental health patients served by selected clinics. While random selection, rather than self-selection, is preferable in terms of representativeness, we prioritized patient autonomy for this survey. We do not consider this a significant limitation because we do not expect self-selection to relate to cell phone ownership or usage. The one area we may see a potential relationship of self-selection to the data is in the area of comfort texting physicians. Patients who would self-select to participate in a survey may be more comfortable communicating about their mental illness in general.

Participants self-reported their diagnosis, a consequence of which could be that participants provided incorrect information on the survey. We do not consider this a major limitation because we are interested in mental illness in general, rather than by specific diagnoses (e.g., major depression). Furthermore, patients completed the survey in a behavioral health clinic, so we can assume they meet criteria for at least one mental illness. Finally, since the surveys were anonymized, we do not foresee participants having any reason to report their diagnosis incorrectly on purpose.

Lastly, although the results suggest that low-SES mental health population can and do use a variety of cell phone services, our survey did not include any questions about the costs of such services. Had the survey included these questions, the results would have reflected the range of costs that would be prohibitive for adoption of certain cell phone services for this population. We encourage designers to consider this explicitly in their design of interventions for their particular population by either performing additional research on the population to determine their price barrier, or designing an intervention which helps pay for additional incurred costs.

6 Conclusions

In this paper, we have compared cell phone ownership and usage between a low-SES mental health population and the national average. We enhanced this comparison by applying weights to the national average data so that the two would align in terms of SES, and therefore, difference in patterns was likely to represent differences due to mental illness, rather than SES. Our results have implications for the use of mobile devices as a treatment aid for mental illness. We found that mental health patients have similar phone ownership patterns to the population as a whole, indicating that designers may consider data about the population as a whole for guidance about cell phone ownership among mental health patients. However, cell phone sharing within households creates a need for enhanced mobile security to ensure privacy, but also allows for potential family involvement in treatment. For those patients who owned or shared a cell phone, very few owned a smart phone. This means that designing downloadable applications may not be the best strategy for designers hoping to reach the majority of patients. Patients who did not own a cell phone reported it was due to cost. This means that for mHealth solutions to be accessible to low-SES patients, it may be necessary to provide patients with access to cell phones.

Cell phones and other mHealth technologies that are designed considering the ownership, usage patterns, and needs of patients have the potential to be greatly successful treatment aids. By utilizing a technology that is readily available and familiar to so many Americans, we see huge potential to improve treatment outcomes and provide patients who currently have only limited access to treatment, additional treatment options. When designed from a patient-centered perspective, these technologies may be a significant step toward relieving patients from the devastating impacts of untreated mental illness.

7 Future research

One of the biggest obstacles for using texting as a treatment aid on a patient's cell phone is protecting their privacy. Mobile security needs to be applied to any treatment plan put into place, and research should be conducted to determine the effectiveness of the security measures. Another area for expansion on this research is to further explore the types of treatment aids texting can offer. One-on-one texting with clinicians seems reasonable, but another option for example is a mobile support group of other patients suffering from similar disorders. Conducting a study with an urban demographic, or with a larger geographic scope, may provide insight as to whether the results presented here are representative of US mental health patients or simply those from a rural geographic area. Further analysis should be conducted for specific diagnoses to determine if individuals with a particular diagnosis are more comfortable with using their cell phone as a treatment aid than others, and if cell phones as a treatment aid are more effective for one diagnosis versus another.

Appendix

Cell phone use survey

As a way for us to provide better and more convenient service, we would like to learn about your use of cell phones. You are invited to respond to the following survey. Any data you provide will remain anonymous. The survey will take less than 10 min and your participation is completely voluntary. Please complete this survey only one time. If you have questions about this survey, please contact Rebecca Selove, Ph.D. at 615-463-6248 or rebecca.selove@centerstone.org.

Demographics (circle one)	(please circle your answer below)				
Gender	Male	Female	Other		Prefer not to answer
Age	18-29	30-49	50-64	65+	Prefer not to answer
Race/Ethnicity	White	Black	Hispanic	Other	Prefer not to answer
Household income	Less than $30,000	$30,000-$49,99	$50,000-$74,99	$75,000+	Prefer not to answer
Education level	Less than High School	High School Diploma	Some College	College Degree	Prefer not to answer
Diagnosis (VOLUNTARY)	Depression	Bipolar Disorder	Schizophrenia	Anxiety	Other
Cell Phone Ownership	**(please circle your answer below)**				
Do you have a cell phone or a Blackberry or iPhone or other device that is also a cell phone?	Yes	No (if "NO", please skip to page 2)	Don't know		Prefer not to answer
Do you share your cell phone with someone else or is it just for your own use?	Yes	No	Don't know		Prefer not to answer
What kind of cell phone do you have? _____ (please write the name of your phone)	Smart phone (e.g., iPhone, android, blackberry)	"Regular" or "Feature" phone (not a smart phone)	Don't know		Prefer not to answer
What kind of cell phone **plan** do you have?	A prepaid or pay-as-you-go plan (e.g., a Go-phone or plan without a contract)	A family plan (where your phone is part of a contract that covers your family's cell phones)	A separate contract covering only your cell phone	Don't know what kind of plan	Prefer not to answer
What kind of voice calling do you have on your cell phone, if any?	A set number of minutes you can use a month	A set amount of money to use to buy minutes	An unlimited number of minutes per month	Don't know what kind of plan	Prefer not to answer
What kind of text messaging plan is on your cell phone, if any?	Unlimited texting plan	A limited texting plan	No plan – I pay per message	My phone cannot send text messages	Don't know what kind of plan
How often, if ever, do you use your cell phone to:	**several times a day**	**at least once a day**	**a few times a week**	**less than a few times a week**	**never**
Send or receive text messages					
Send or receive email					
Take a picture					
Send or receive pictures					
Play music					
Record a video					
Play a game					
Access the internet					
Use a social network site					
Download an "app"					

Whether or not you use a cell phone, please rate your agreement with the following statements:	Strongly Disagree						Strongly Agree
I am comfortable sending text messages on my cell phone.							
I would be comfortable sending a text message to my clinician.							
I would be interested in receiving a text message reminding me of an upcoming appointment from Centerstone staff.							
I would be interested in receiving a text message from my provider asking me how I'm doing.							
I would be interested in receiving a text message from my provider requesting a brief response.							
I would be interested in receiving text messages from Centerstone asking me to fill out a short survey.							

Please answer ONLY if you DO NOT have a cell phone:

1. What is the MAIN reason you don't have a cell phone? (choose one)
   a) Too expensive/Could not afford it
   b) Broke it/And could not replace it
   c) Don't need it
   d) Got tired of it
   e) Lost it/And could not replace it
   f) Stolen/And could not replace it
   g) Too intrusive/Too much trouble
   h) Other
   i) Don't know
   j) Prefer not to answer

1. Does anyone in your household have a working cell phone?
   a) Yes
   b) No
   c) Don't know
   d) Prefer not to answer

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