Remote "Hovering" with Individuals with Psychotic Disorders and Substance Use: Feasibility, Engagement, and Therapeutic Alliance with a Text-Messaging Mobile Interventionist

Dror Ben-Zeev, Ph.D.[1], **Susan M. Kaiser, M.P.H.**[2], and **Izabela Krzos, B.A.**[3]

Dror Ben-Zeev: dror.ben-zeev@dartmouth.edu; Susan M. Kaiser: susan.kaiser@northwestern.edu; Izabela Krzos: izabela.krzos@thresholds.org

[1]Dartmouth Psychiatric Research Center, Department of Psychiatry, Geisel School of Medicine at Dartmouth, Lebanon, NH

[2]Center for Behavioral Intervention Technologies, Department of Preventive Medicine, Northwestern University, Chicago, IL

[3]Thresholds, Chicago, IL

Abstract

Objective—People with serious mental illnesses and substance abuse problems (i.e., dual diagnosis) constitute a particularly challenging and costly clinical group. This study evaluated the feasibility and acceptability of a novel model of care in which a mobile interventionist used mobile phone text messaging to remotely monitor and provide daily support to individuals with psychotic disorders and substance use.

Methods—Seventeen participants with dual diagnosis were enrolled in a twelve-week single-arm trial. A clinical social worker served as the mobile interventionist and sent daily text-messages to participants' privately-owned mobile phones to assess their medication adherence and clinical status. The mobile interventionist provided text-message feedback and support, and suggested various coping strategies flexibly, in response to participants' replies to prompts. At the end of the trial, participants completed a usability and satisfaction measure and two self-rated measures of therapeutic alliance with their clinicians. In one version, participants rated their relationship with their mobile interventionist; in the second version, they rated their relationship with their community-based treatment team.

Results—Participants received an average of 139 text messages (*SD* = 37.5) each from the mobile interventionist over the twelve-week trial. On average, participants responded to 87% of the mobile interventionist's messages that required a reply. Over 90% of participants thought the intervention was useful and rewarding, and that it helped them be more effective and productive in their lives. Participants' assessments of their relationship with the mobile interventionist were positive. Paired sample *t*-test found the therapeutic alliance ratings participants provided for their

mobile interventionist were significantly higher than those provided for their community-based treatment team clinicians who they met with regularly.

Conclusions—Our findings suggest that text-message "hovering" can be conducted successfully with individuals with psychotic disorders and substance abuse. Developing a cadre of mobile interventionists who are specifically trained on how to engage patients via mobile devices while adhering to ethical guidelines and regulatory standards may be an effective way to strengthen service delivery models, improve patient outcomes, and reduce costs.

Keywords

mobile health (mHealth); dual diagnosis; mobile phones; SMS; schizophrenia

People with serious mental illnesses and substance abuse problems (i.e., dual diagnosis) constitute a particularly challenging clinical group. The reciprocal relationship between psychiatric symptoms and substance use increases their level of impairment, makes it more difficult for them to seek and maintain care, and increases illness exacerbation rates and relapse frequencies (Drake, Alterman, & Rosenberg, 1993; Carey, Carey & Meisler, 1991). Consequently, people with dual diagnosis often require more costly services (e.g., hospitalization), and have poor long-term outcomes (Drake, Mercer-McFadden, Mueser, McHugo, & Bond, 1998; Linszen, Dingemans, & Lenior, 1994). Several intervention models have evolved to help keep this higher-risk group out of the hospital with intensive community-based care (e.g., assertive community treatment teams, integrated dual diagnosis treatment, supportive housing), but results remain suboptimal (Drake et. al., 2001 & Tsai, Salyers, Rollins, McKasson, & Litmer, 2009).

Mobile phones can be useful instruments to enhance clinical care (Agyapong, Farren, & McLoughlin, 2011; Ben-Zeev, 2012; Proudfoot, 2013). Recent research has shown that between 72% and 97% of adults with psychiatric conditions in the U.S. own mobile phones (Ben-Zeev et. al., 2013; Carras, Mojtabai, Furr-Holden, Eaton, & Cullen, 2014; Torous, Friedman & Keshvan, 2014). Similar mobile phone adoption rates have been shown in people with mental health problems in Australia (Proudfoot et. al., 2010) and the U.K. (Ennis, Rose, Denis, Pandit, & Wykes, 2012). While the penetration of mobile phones among people with dual diagnosis specifically is unknown, given the high rates of substance use among people with mental illnesses (Cuffel, 1996; Drake et. al., 1989; Regier et. al., 1990), it is likely that a substantial portion of the individuals in these studies would have met criteria for dual diagnosis. Many individuals with mental illnesses (Ben-Zeev et. al., 2013; Proudfoot et. al., 2010), as well as substance use disorders (Muench, Weiss, Kuerbis, & Morgenstern, 2013), are interested in receiving mobile phone-supported services. Mobile Health (mHealth) interventions that leverage mobile phones are already being used to treat challenging conditions including schizophrenia (e.g., Ben-Zeev et. al., 2014; Granholm, Ben-Zeev, Link, Bradshaw, & Holden, 2012; Spaniel et. al., 2012), alcoholism (e.g., Gustafson et. al., 2014), and dual diagnosis (Agyapong, Milnes, McLoughlin, & Farren, 2013), with promising results.

One way to enhance the care of higher-risk patients is to leverage mobile technology to support clinical monitoring and delivery of services outside of the conventional face-to-face

clinical encounter, in other words, a form of "hovering" over people in their daily lives, in the context of their own environment (Asch, Muller, & Volpp, 2012). Frequent yet brief mobile phone-assisted contact with a clinician could potentially help identify and dismantle patient challenges (i.e., poor medication adherence, symptom exacerbation, missed appointments) in a time-sensitive manner, before they cascade into more difficult and costly problems down the line. In the current paper we report on a pilot study in which a clinically-trained mobile interventionist used daily text messaging to "hover" over patients with dual diagnosis over a twelve-week period. Specifically, we examined intervention feasibility and usability, patient engagement and satisfaction, and patient-rated therapeutic alliance with the mobile interventionist in this novel model of care.

METHODS

Participants

This study was conducted in collaboration with an urban psychiatric rehabilitation agency. There was a complete discussion of the study with potential participants. Written informed consent was obtained from all participants after this discussion. The study was conducted in accordance with the Declaration of Helsinki and was approved and monitored by the Committee for Protection of Human Subjects at Dartmouth. Seventeen individuals with schizophrenia or schizoaffective disorder and past or present substance abuse participated in the study. Participants were recruited from three community treatment teams. Clinicians referred patients who were diagnosed with schizophrenia or schizoaffective disorder, were taking oral anti-psychotic medications, and owned a mobile phone.

Measures

Participants' reading level was evaluated with the Wide Range Achievement Test—Fourth Edition (WRAT-4; Wilkinson & Robertson, 2006). Participant diagnosis was determined using the relevant sections of the Structured Clinical Interview for DSM-IV Axis I Disorders-Patient Edition (SCID-I/P; First, Spitzer, Gibbons, & Williams, 1995). Symptoms of schizophrenia were assessed by a trained interviewer using the 30-item Positive and Negative Syndrome Scale (PANSS; Kay, Fiszbein, & Opler, 1987). Symptoms of depression were measured with the widely-used 21-item self-report Beck Depression Inventory- Second Edition (BDI-2; Beck, Steer, & Brown, 1996). Participants' beliefs about the necessity to take medications as well as medication-related concerns were assessed using the Brief Medication Questionnaire (BMQ; Svarstad, Chewning, Sleath, & Claesson, 1999). Cognitive functioning was measured using the Brief Assessment of Cognition in Schizophrenia (BACS; Keefe et. al., 2004) assessment battery, administered by a trained rater. At the end of the trial, participants completed an intervention usability and satisfaction measure comprised of adapted items from the USE questionnaire, which was designed to measure satisfaction, usefulness, ease of use, and ease of learning (Lund, 2001). Participants also completed two adapted versions of the Working Alliance Inventory (Tracey & Kokotowitz, 1989), a self-rated measure of the quality of the therapeutic relationship with one's clinician. Participants rated their agreement with twelve statements about their working alliance (e.g., "I believe the way we are working on my problem is right", "I believe my clinician likes me", "my clinician and I trust each other") using a 7-point bipolar

rating scale (1-"Never" to 7-"Always"). In the first version, participants were asked to rate their relationship with their mobile interventionist. In the second version, they were asked to rate their relationship with their community-based treatment team whose clinical staff they met with in-person regularly.

Procedures

Participant screening—Clinical staff identified 38 individuals who were appropriate candidates and who agreed to being contacted for research. Research staff contacted these individuals, and 29 expressed interest in participating. Reasons for refusal included disinterest in participating in the study, concerns about spending call/text minutes, and lack of mobile phone texting skill (with disinterest in learning). After receiving a comprehensive explanation about the study, all potential participants were administered a structured diagnostic interview to verify diagnosis of schizophrenia or schizoaffective disorder. Potential participants were enrolled if they were 18 years of age or older, owned a mobile device, and were prescribed psychotropic medications. Candidates were excluded if they had hearing, vision, or motor impairments that made it impossible for them to use a mobile phone, if their reading level was below 4th grade, or if they were enrolled in another intervention study. Three individuals were excluded from the study because of diagnosis, three were ineligible due to reading level, and one was excluded due to enrollment in another study. One participant dropped out after providing consent because he reported losing his phone and a replacement phone before commencing texting. Another individual was administratively dropped after displaying inappropriate behavior with the mobile interventionist in a pre-trial rapport building session.

Pre-trial—Once enrolled, participants completed self-report and interview measures that included demographic information, measures of symptoms of schizophrenia, symptoms of depression, and beliefs about medications. Within a week of completing baseline measures a research assistant met with participants to review limits to confidentiality associated with text messaging using mobile phone networks, and to clarify their responsibility in maintaining privacy (e.g., not giving the phone to others, using device lock features, erasing text messages from the device). The research assistant also trained participants on how to use their mobile device prior to meeting with the mobile interventionist. Training included selecting a loud text message tone, increasing font size and screen brightness when necessary, and creating a shortcut to the text messaging icon on the phone home screen. Participants learned how to lock their mobile device and were briefed on what information may be available if they shared the mobile device with others. Participants engaged in mock text messaging with the research assistant to demonstrate mastery of opening and reading a text message, drafting a text message, and deleting messages from the text message inbox. The research assistant observed participants sending and receiving a message and addressed any observed problems. Written instructions were prepared for participants who did not use text messaging regularly and had difficulty remembering the steps. The research assistant reviewed the participant's phone plan provider to determine their monthly reimbursement. Participants received a flat rate of $30 per month or a prepaid $35 refill card for three consecutive months. Following the training session, the research assistant provided the mobile interventionist with a detailed summary of the phone training, highlighting areas of

text messaging that the participant struggled to master. Finally, the mobile interventionist met with each participant in-person to establish rapport and to review mastery of text messaging skills (i.e., sending, receiving, and deleting text messages). Every participant was assigned medication adherence as a treatment target because we wanted to have at least one element that was consistent across all participants (daily follow-up texts varied depending on individual needs). The mobile interventionist and participant would review a "typical day" and decided when it would make most sense to receive daily text messages from the mobile interventionist.

Mobile interventionist trial—The mobile interventionist "hovering" model was designed to enhance illness monitoring capacity and to provide brief daily support to individuals via mobile phones. Participants in the twelve-week trial received text messages on weekdays from a clinical social worker (i.e., the mobile interventionist) who was supervised by a clinical psychologist. Participants were informed that the mobile interventionist could respond to messages between 9 AM and 5 PM on weekdays, and that it may take participants several hours to receive a reply if they initiated the text exchange (as opposed to responding to a message sent from the mobile interventionist). Participants received a maximum of three messages a day. If a text exchange was cut short due to reaching the day's texting limit, the mobile interventionist would pick up where the thread ended on the following day, creating an asynchronous yet content-continuous thread.

Unless the participant initiated contact, the daily text exchange typically started with the mobile interventionist sending the first message inquiring about their medication adherence. The mobile interventionist did not send messages on days she knew that participants could not respond (e.g., hospitalization, out of call/text minutes for the month). Participants who responded to the initial daily text received up to two follow-up messages on the same day. Depending on the participant's response to the initial text, the mobile interventionist would either follow up with assessment of problems that might have prevented the participant from taking their medications, offer concrete troubleshooting strategies (e.g., "One way you can remember is to put the pill box next to your toothbrush. Would that help?"), or provide other illness management and wellness suggestions. If the participant mentioned an acute problem or crisis (e.g., "I'm getting evicted"; "I'm going to the hospital"), the mobile interventionist would offer suggestions, and inform their community treatment team leader. If a participant did not respond to any text messages over three sequential days, the mobile interventionist would attempt to call their mobile phone and inquire about their status. At the end of every week, the mobile interventionist sent a brief status report to participants' community-based treatment team leader using secure intra-agency email. Two weeks before the end of the trial period the mobile interventionist reminded participants that the intervention would conclude soon, and started focusing their text exchanges on post-trial self-management (e.g., "You're doing a great job. It's important to keep that up after we finish in 2 weeks"). All text-messages were recorded and time/date stamped by the mobile interventionist on a message log.

Post-trial—At the end of the trial, participants completed intervention usability and satisfaction ratings and therapeutic alliance ratings (one focused on the mobile interventionist, the other focused on their community-based treatment team).

Overview of Analyses

Descriptive statistics were derived from the text-message log to describe feasibility and participant engagement in the intervention. Participants' responses to the usability and satisfaction questions are reported in Table 1. Paired samples *t*-tests were used to compare scores on the adapted WAIs (mobile interventionist vs. clinical team clinicians).

RESULTS

Participant Characteristics

Participants had a mean age of 40.47 years (*SD*=11.56). The sample was 59% male, 53% African-American, 35% White, 6% Asian, and 6% more than one race. Twelve percent identified as Hispanic. Participants reported an average of 12.3 years of education (*SD*=1.21), but their average reading level was at the 9th grade level. Fifty-nine percent were living independently, 29% were living with family members, and 6% resided in a supervised living facility. The majority were unemployed (94.1%), and all owned a mobile phone of some kind. Eight participants (47%) reported using mobile phone text messaging before the study. The majority (80%) reported 6 or more lifetime psychiatric hospitalizations. At baseline, the sample experienced moderate symptoms of schizophrenia (PANSS total, *M*=75.12, *SD*=13.54; PANSS positive score, *M*=19.06, *SD*=5.59; PANSS negative score, *M*=19.47, *SD*=6.63), and moderate depressive symptoms (BDI-2 *M*=19.82., *SD*=13.75). Participants' beliefs that it was necessary for them to take medications were stronger than their medication related concerns (BMQ necessity-concern differential, *M*=8.12, *SD*=4.93). On average, participants had moderate cognitive impairment (BACS *t*-score, *M*= 26.76, *SD*=12.94).

Feasibility and Engagement

Participants received an average of 139 text messages (*SD* = 37.5) each from the mobile interventionist over the twelve-week trial (60 maximum days of texting excluding weekends and holidays). On average, participants responded to 87% of the mobile interventionist's messages. Five participants (29%) sent more text messages to the mobile interventionist than they received. One participant (6% of the sample) responded to only 32% of the mobile interventionist's text messages. All other participants responded to at least 67% of text messages.

Three participants were hospitalized during the study (one participant texted a notification to the mobile interventionist from the hospital emergency room). Mobile phone use was not permissible on psychiatric inpatient units so individuals who were hospitalized halted their texting, resuming shortly after discharge. There were several incidents in which the mobile interventionist contacted participants' clinical team to trigger immediate action. One participant texted that she had no medications, had been up all night, and was not eating. The mobile interventionist informed the clinical team and the participant's case manager

expedited the prescription refills and visited her at home several times to check on her status. Two participants sent text messages that indicated suicidal ideation. The mobile interventionist informed their clinical teams who followed up with home visits and phone calls until they were stabilized.

Usability and Satisfaction

Over 90% of participants ($n = 15$) thought the intervention was easy to use, and that they could engage successfully every time (see Table 1). Eighty-seven percent ($n = 14$) thought the intervention worked the way they wanted, and approximately 80% ($n = 13$) reported learning to use the intervention quickly and having no difficulty remembering how to do it. All participants indicated that they would recommend the intervention to a friend. Over 90% of participants ($n = 15$) thought the intervention was useful and fun, and that it helped them be more effective and productive in their lives. Eighty-seven percent ($n = 14$) reported being satisfied with the intervention, stating that it helped them have more control over the activities in their life, and that they felt they needed to have it.

Therapeutic Alliance

Average participant ratings of their therapeutic alliance with the mobile interventionist suggested a positive clinical relationship. Paired sample *t*-test found the therapeutic alliance ratings participants provided for their mobile interventionist (*M*=56.7, *SD*=9.4) were significantly higher than those provided for their community-based treatment team clinicians (*M*=50.4, *SD*=12.0); $t(11) = 3.28$, p < .01.

DISCUSSION

Our study demonstrated that daily hovering by a text messaging mobile interventionist is feasible with individuals with psychotic disorders and substance abuse. The majority of participants found the intervention engaging and easy to use, and reported high levels of satisfaction with the daily support. Participants responded to the majority of text messages they received from the mobile interventionist over a twelve-week period. Several participants sent the mobile interventionist more messages than they received, or took the initiative in daily text exchanges, suggesting they were not just responding to mobile interventionist prompts. These individuals were capable (and perhaps interested) in engaging more than the intervention offered.

Many interventions are developed in academic settings but then do not transfer well into real-word conditions (Teachman, et. al., 2012; Kazdin, 2008). In an effort to avoid an excessively artificial intervention that would likely not be feasible outside of research, the mobile interventionist hovering model was designed with the characteristics of real-world settings in mind; the intervention was delivered by a clinical social worker who had previously worked as a case manager at the study site. Thus, beyond the training and supervision she received in the new model, her experience and skill sets were not atypical for community-based settings. The mobile interventionist sent individual participants no more than three text messages a day, resulting in a time-efficient interaction. We did not provide participants with mobile phones for the study. Rather, individuals who agreed to

participate authorized us to deliver the intervention directly to the mobile phones they already owned. We reimbursed participants for text messages and compensated them for the time they spent completing study measures. However, we did not pay individuals for their participation in the intervention, or link incentives to their response rate beyond the encouragement they received from the mobile interventionist as part of the treatment model. The end result was a relatively low cost/low burden intervention that made use of many accessible resources.

The fact that hovering was conducted via text messaging did not negatively impact participants' engagement or rapport with the clinician. Less than half of our participants used text messaging before the study, but all were able to learn how to text proficiently in a single training session without difficulty. Participants' assessments of their relationship with the mobile interventionist (who they only met in-person once at the beginning of the trial) were positive. The therapeutic alliance they established with the mobile interventionist was rated superior to that which they had with their community-based treatment team clinicians who they met with regularly. The study was limited in that we did not collect data from a matched control group, the sample size was too small to examine pre/post changes within individuals who participated in the research, and we did not monitor participant service use or face-to-face provider time outside of the mobile interventionist effort. Future research will need to systemically examine whether such an approach can produce clinically meaningful outcomes (i.e., fewer hospitalizations, improved functioning), or accomplish the same outcomes existing models of care produce with significant reduction in time, effort, and resources spent on face-to-face interactions with clinical staff.

Text messaging as a method of supporting clinical care may not be suitable for everyone. Several individuals elected not to participate in the study after we explained the model to them. Individuals with physical disabilities that make it difficult to type and send text messages or individuals who have low literacy levels would not do well with such an approach. Individuals who cannot charge the phone regularly (e.g., due to major cognitive impairments or homelessness) would be difficult to monitor as the mobile interventionist would not know whether their unresponsiveness was an indication of their clinical status, disinterest in the intervention, or logistical barriers. People who share a mobile phone with others may also not be appropriate for such an intervention.

Text messaging and additional technology-facilitated treatment approaches are emerging alongside mobile platforms that can support other methods of remote patient/provider contact (e.g., smartphone enabled two-way video, web-based instant messaging). Integrating these approaches into the services offered by healthcare providers will require some effort and creativity (Muench, in press). Providers will need to adapt their assessment models (i.e., close to real-time/real-place rather than clinic-based retrospective reports) and broaden their therapeutic repertoire so that they can deliver interventions that capitalize on new telecommunication resources. Patients will need to be trained on how to use technology-based tools and how to engage in mobile interventions in a way that that enables them to improve their health while maintaining an acceptable level of confidentiality. National bodies will be faced with the challenge of developing broad regulatory guidelines for health information technology that can stay relevant even in the context of a perpetually evolving

technological landscape (e.g., the FDA/ FCC/ ONC Health IT Report and Proposed Strategy and Recommendations for a Risk-Based Framework: http://www.fda.gov/downloads/ AboutFDA/CentersOffices/OfficeofMedicalProductsandTobacco/CDRH/CDRHReports/ UCM391521.pdf). Despite these challenges, the advantages of leveraging contemporary technology to enhance the care of individuals with chronic or complex conditions are great (Ben-Zeev, 2012). Developing a cadre of mobile interventionists who are specifically trained on how to engage patients via mobile devices while adhering to ethical guidelines and regulatory standards may be an effective way to strengthen service delivery models and improve patient outcomes.

Finally, when healthcare information is relayed outside of the physical clinic to mobile devices it creates new patient privacy and data security challenges (Luxton, McCann, Bush, Mishkind, & Reger, 2011). Potential risks include loss, theft, or inadequate disposal of a mobile phone that contains protected health information, unauthorized access to information while it is stored on the device (intentionally or inadvertently), and threats associated with transmission of data over unsecure networks. Healthcare providers can take concrete steps to increase data security and privacy, and should make every effort to fully inform patients about the risks associated with various technology-based approaches (Muench, in press; Luxton, Kayl, & Mishkind, 2012). But even the most comprehensive measures will never be foolproof (Muench, in press), and healthcare organizations should evaluate whether to permit texting and other mHealth interventions as part of a thorough risk analysis (Hardiman & Edwards, 2013). While thoughtful consideration of the potential risks associated with text messaging is necessary, we must also consider the disservice we might be doing patients who could benefit from additional support, by not texting (Zur Institute, 2014).

Acknowledgments

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Table 1

Participant Usability and Satisfaction Ratings (*n*=16[*])

Statement	Number of Participants Selecting Each Response						
	Strongly Disagree	Disagree	Disagree Somewhat	Neutral	Agree Somewhat	Agree	Strongly Agree
Usability							
The mobile intervention is easy to use.	0	0	0	1 (6.3%)	4 (25.0%)	5 (31.3%)	6 (37.5%)
I can use the mobile intervention successfully every time.	0	1 (6.3%)	0	0	6 (37.5%)	4 (25.0%)	5 (31.3%)
I learned to use the mobile intervention quickly.	0	0	1 (6.3%)	2 (12.5%)	4 (25.0%)	6 (37.5%)	3 (18.8%)
I easily remember how to use the mobile intervention.	0	0	2 (12.5%)	1 (6.3%)	4 (25.0%)	5 (31.3%)	4 (25.0%)
The mobile intervention is easy to learn to use.	0	0	0	3 (18.8%)	3 (18.8%)	6 (37.5%)	4 (25.0%)
The mobile intervention does everything I would expect it to do.	0	0	0	3 (18.8%)	5 (31.3%)	1 (6.3%)	7 (43.8%)
The mobile intervention works the way I want it to work.	0	0	0	2 (12.5%)	5 (31.3%)	3 (18.8%)	6 (37.5%)
Satisfaction							
The mobile intervention is useful.	1 (6.3%)	0	0	0	2 (12.5%)	7 (43.8%)	6 (37.5%)
The mobile intervention gives me more control over the activities in my life.	0	0	0	2 (12.5%)	2 (12.5%)	6 (37.5%)	6 (37.5%)
The mobile intervention meets my needs.	0	0	0	3 (18.8%)	1 (6.3%)	8 (50.0%)	4 (25.0%)
I am satisfied with the mobile intervention.	0	0	0	2 (12.5%)	1 (6.3%)	4 (25.0%)	9 (56.3%)
I would recommend the mobile intervention to a friend.	0	0	0	0	3 (18.8%)	3 (18.8%)	10 (62.5%)
The mobile intervention is fun to use.	0	0	0	1 (6.3%)	4 (25.0%)	2 (12.5%)	9 (56.3%)
The mobile intervention helps me to be more effective.	0	0	1 (6.3%)	0	3 (18.8%)	4 (25.0%)	8 (50.0%)
The mobile intervention helps me to be more productive.	0	0	0	1 (6.3%)	3 (18.8%)	5 (31.3%)	7 (43.8%)
I feel I need to have the mobile intervention.	0	0	0	2 (12.5%)	4 (25.0%)	4 (25.0%)	6 (37.5%)

[*] One participant moved out of state at the end of the trial, and was not available for post-trial assessments.