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Perceptions, Attitudes, and Experience Regarding mHealth Among Homeless Persons in New York City Shelters

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Mobile health may be an effective means of providing access and education to the millions of homeless Americans. We conducted semi-structured interviews with 50 homeless people from different shelters in New York City to evaluate their perceptions, attitudes, and experiences regarding mobile health. Participants' average age was 51.66 ($SD = 11.34$) years; duration of homelessness was 2.0 ($SD = 3.10$) years. The majority had a mobile phone with the ability to receive and send text messages. Most participants attempted to maintain the same phone number over time. The homeless were welcoming and supportive of text messaging regarding health care issues, including appointment reminders, health education, or management of diseases considering their barriers and mobility, and believed it would help them access necessary health care. Overwhelmingly they preferred text reminders that were short, positively framed, and directive in nature compared to lengthy or motivational texts. The majority believed that free cell phone plans would improve their engagement with, help them navigate, and ultimately improve their access to care. These positive attitudes and experience could be effectively used to improve health care for the homeless. Policies to improve access to mobile health and adapted text messaging strategies regarding the health care needs of this mobile population should be considered.

The homeless population of the United States is estimated to be approximately 3.5 million annually (Link et al., 1994; National Coalition for the Homeless, 2013). The homeless are more likely to be of a racial and ethnic minority background, and men in early to middle age are at greater risk for being homeless (Culhane, Metraux, Byrne, Stino, & Bainbridge, 2013; Fargo et al., 2012). Close to a quarter of the homeless population are chronically homeless, and a significant number stay in the shelter system for more than 1 year or are frequently homeless.

Most homeless individuals in the United States were born during the latter part of the baby boom era and are in their early 50 s; thus, they are more at risk for developing chronic diseases and need more preventive care (Culhane et al., 2013; Kushel, Vittinghoff, & Haas, 2001). Hypertension is one of the most common conditions among the homeless (Gelberg & Linn, 1989; Kim et al., 2008; Kleinman, Freeman, Perlman, & Gelberg, 1996; Moczygemba, Kennedy, Marks, Goode, & Matzke, 2013; Savage et al., 2006; Szerlip & Szerlip, 2002), and rates of smoking and substance abuse are high among the homeless (Kim et al., 2008; Lee et al., 2005; Szerlip & Szerlip, 2002). Compared to the general population, the homeless die from cancer twice as often, but their rate of cancer screening is lower (Asgary, Garland, Jakubowski, et al., 2014; Asgary, Garland, & Sckell, 2014; New York City Departments of Health and Mental Hygiene and Homeless Services, 2005). In general, chronic diseases among the homeless are often not well controlled (Lee et al., 2005; Szerlip & Szerlip, 2002), and the homeless face barriers to therapeutic lifestyle changes (Moczygemba et al., 2013). They suffer disproportionately from mental illness, which complicates the management of their medical conditions.

The homeless encounter multilevel barriers to accessing health care, including lack of a primary care physician or consistent primary health care, inadequate preventive counseling, lack of insurance, fatalistic views regarding health issues, and a history of discrimination in the health system (Asgary, Garland, Jakubowski, et al., 2014; Asgary, Garland, & Sckell, 2014; Chau et al., 2002; Khandor et al., 2011; Lebrun-Harris et al., 2013; Wen, Hudak, & Hwang, 2007; Zlotnick & Zerger, 2008). There are biases against the health needs and priorities of the homeless among providers who often lack training to address social issues that affect the health care of these individuals (Wen et al., 2007). The current health system at best focuses on addressing acute health issues of the homeless and neglects their chronic disease management, health education, or preventive care. Homeless populations are mobile, often lack an

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established relationship with health care providers, and are more likely to miss their medical appointments and follow-ups because of multiple social conditions, including unemployment, a lower level of education, lack of social support, and substance abuse (Khandor et al., 2011; Zlotnick & Zerger, 2008).

Little information exists regarding strategies that use mHealth (i.e., mobile technology for providing health information or services) to mitigate barriers to health care access among the homeless. Exploring perceptions, attitudes, and experiences of the homeless regarding potential mHealth methods may help to design programs to mitigate some of these barriers and address health disparities among homeless individuals. Qualitative research is useful in eliciting the perspective of recipients of health care (Marshall & Rossman, 1989), and semi-structured interviews provide the opportunity to explore factors that affect health-seeking behavior (Krueger, 1994; Sim, 1998). We explored these perspectives and attitudes among homeless persons in New York City shelters.

Methods

This study was performed at six shelters and/or shelter-based clinics supported by the Community Medicine Program of Lutheran Family Health Centers, New York, during 2014. We used both random and criteria sampling to enroll 50 non-domicile adult participants. We used criteria sampling to include women, age ranges below and above 50 years, and both chronic and recently homeless individuals. One research assistant approached patients in waiting rooms of the shelters or shelter-based clinics, discussed the study, assessed eligibility, obtained consents, and performed interviews. Days of enrollment were selected randomly for each site. Criteria sampling was applied on an ongoing basis. Semi-structured interviews in English or Spanish (if needed) were performed in a private room in the shelters or shelter-based clinics. We also held formal discussions with key informants who possessed knowledge of particular relevance to the research themes, including staff and case managers at shelters, allied health workers, and medical providers at shelter-based clinics. These discussions informed our interview tool and areas to explore further but were not included in the analysis. This study received institutional review board approval from Lutheran Family Health Centers, New York.

Semi-structured individual interviews were performed rather than focus group discussions to ensure a private and candid environment in which participants could freely discuss their experience. We asked a series of open-ended questions, with directing probes or follow-up clarifications if needed. Questions regarded possession of cell phones, attitudes toward and acceptance of mHealth strategies such as text messaging on access to health care, and ideas on the content of text messages and the perceived effect of free-of-charge mobile services to improve preventive care and chronic disease management. We obtained oral consent. The interviews were recorded and documented verbatim and translated into English if needed. We then coded transcripts and analyzed them for major themes.

A qualitative descriptive approach was used for analysis by two authors (Ramin Asgary and Analena Alcabes). Content analysis was performed to identify core themes regarding knowledge, understanding, and perceptions of mobile technology and health care. We developed the preliminary coding based on priority codes derived from the theoretical framework and conceptual model guiding the study. Our theoretical framework was built around the following concepts: (a) There are misconceptions and negative experiences regarding the health care system among the homeless, largely due to barriers to accessing health care and lack of health education and proper counseling for preventive care by providers; (b) the homeless are mobile and are often hard to reach; and (c) the homeless have good experiences with mobile phones and technology and have positive attitudes toward using mobile technology to improve their health care access. We performed critical deliberation about initial coding and reviewed the coding for similarities and variations to achieve a high level of agreement. Two authors reviewed all codes independently, reviewed and discussed all codes, discussed the specific categories, and characterized and agreed on major important themes. Coding was open and selective. Codes fell into distinct but overarching categories. Codes were referenced back to the subject characterizations to evaluate responses based on age and gender. Emerging themes were compared across cases to explain commonality and variability of themes.

Results

Fifty homeless men and women participated in the study. Demographic data on the participants are presented in Table 1.

Ownership of Cell Phones and Use of Text Messaging

The majority of women (F; $n = 25$) and men (M; $n = 14$) had a working cell phone with the ability to send and receive text messages: ''I can get text messages? And voice messages?'' [M53]. Most participants had had their phones for at least some years: ''[I have had it] for 4–5 years'' [M52], ''Two years'' [F52], ''Two or 3 years, I have other backup

Table 1. Demographic data on the participants

Indicator	Value
Average age (*SD*), range	51.66 (11.34), 25–79
Female, *n* (%)	29 (58)
Age above 50, *n* (%)	33 (66)
Average years of homelessness (*SD*), max	2.03 (3.10), 14
History of chronic diseases, *n* (%)[a]	30 (60)
Active mental illness, *n* (%)	10 (20)

[a]History of chronic diseases included hypercholesterolemia, hypertension, diabetes, asthma/chronic obstructive pulmonary disease, or seizure disorder.

phones . . . '' [F25], ''This has been my number for 4 or 5 years'' [F54], ''One year'' [F52], ''Since 2009 I have not, but [then] I just got a new phone'' [F53]. Others indicated a relatively shorter time period of ownership, including within months: ''Not long'' [F49], ''Four months'' [F27]. Most participants knew how to send or receive text messages. However, some older men had difficulty sending text messages because the phones were so small: ''But I am not using text much, can't see well'' [M79].

Most of the participants who did not have cell phones had had them before: ''No [I don't have now], it was stolen'' [M52], ''No I don't have cell phone, [I] use landline'' [M58], ''Not now but I had until weeks ago'' [M60]. Additional quotes are presented in Table 2.

Experience Using Mobile Technology

Participants usually kept the same phone numbers; however, men were more likely than women to change phone numbers over time. Older women changed their phone numbers less often than younger women: ''Try not to, [I] used to change it often'' [F53], ''Every 3 years [I] change it'' [F42], ''I change it once a year. Change it frequently'' [F43], ''[I have had] it for long time, got it from Google software, had smartphone and there were problem with them but I kept this Internet Google phone'' [M53], ''Two years same number, different phone. Don't change the number'' [F52], ''[I have it for] 3 years'' [M61], ''[I have it for] almost 4 years'' [M62], ''[I have it for] 3 months'' [F42], ''I've had it for about 10 months . . . I keep them all the time so family members can contact me''

Table 2. Mobile phone ownership and experience among the homeless, New York City, 2014

Question	Sample quotes
How long have you had a cell phone?	''I've had it for about 10 months,'' ''I keep them all the time so family members can contact me'' [M59]
	''Four years'' [M55]
	''Three years, not often I have the same one for a while'' [M53]
	''Don't know number, my wife uses it, I don't like cell phones. I prefer landlines'' [M55]
	''One month, first number'' [F59]
	''One year'' [F43]
How often do you change your phone/number?	''I don't'' [M53]
	''Same number it was given to me from Safe Link, I could text as well, they pay 250 minutes a month and rest is on you if you go over, if you forget to recertify (based on low income) then you will get new number, I had same number for some years'' [M60]
	''Three times in 2 years'' [F57]
	''I change it once a year. Change it frequently'' [F43]
	''I try not to [change it]'' [F27]
	''Three times in 2 years [I have changed it]'' [F57]
	''I have it for several years, it's a 212 number I will never change it'' [F42] ''One year'' [F33]
How much credit/many minutes do you have? Do you have enough?	''It's a free phone, they call it an Obamaphone,'' ''I only make calls when I need to more than when I want to'' [M59]
	''Usually yeah'' [M52]
	''Yeah, but I turned it off this time because I didn't'' [M58]
	''I make sure my phone gets paid'' [M53]
	''No'' [M75]
	''Have free Obamaphone, but I add minutes'' [F46]
	''Always, that was a part of a deal'' [F59]
	''I keep the bill paid, that's important for me to keep in touch with my family. Health care appointments'' [F52]
	''Obamaphone is basic phone you can get if you're on public assistance. Sixty minutes a month, rolls over. Don't check e-mail, it's hard to text. Have to be conservative with it'' [F42]
	''Yeah I've never struggled on that'' [F54]
	''Yeah'' [F42]
	''We'll see,'' ''It's very important'' [F59]
	''Sometime'' [F28]
	''Yeah unlimited plan'' [F33]

Note. M = male; F = female.

[M59]. A minority stated that their current phone was their first mobile number/phone: ''Four months, I never had before in my life, this is the first time, Medicaid sent it in'' [M55], ''First time I did get a cell'' [F49].

Around a third of both men and women had an ''Obamaphone'' (provided and paid for by insurance) and elaborated on being able to manage to keep enough phone plan minutes: ''It's a free phone, they call it an Obamaphone. I only make calls when I need to more than when I want to'' [M59], ''Mine was paid, yes I could afford pay extra minutes'' [M60], ''I do [afford it]'' [F27], ''I try to keep at least 5 minutes on the phone'' [F43], ''Yes, it's only $50 a month'' [F45], ''This is from insurance'' [F56]. Very few had unlimited minutes. Close to half stated they usually had money to pay for their phone and minutes: ''Yes, I can pay the bill'' [M53], ''Yeah, usually'' [F67], ''Well, I have to save it, many pennies'' [F57]. And a minority got help from family for their plan: ''No, I get 250 minutes, sometimes my friend will help me get the $30 unlimited, most of my calls are to my doctors'' [F53], ''No, my daughters are the ones helping me to pay'' [F47], ''I never pay the bill for the phone, my family helps with that. They have to, it's a must if they want to keep in touch'' [F25]. Please see Table 2 for additional quotes.

Perceptions of and Attitudes Toward Text Messaging to Improve Medical Care

The majority of women, across age groups and more than men, welcomed and preferred receiving texts regarding health messages and navigating health system: ''Hell yeah,

Table 3. Attitudes toward the use of text messaging and mobile technologies in regard to health care among the homeless in New York City, 2014

Question	Sample quotes
How do you feel if someone sends you text messages regarding your health care?	''They could call me for appointment reminders and I'll answer and tell them to call her [my wife] and she'll tell me'' [M55] ''It's a free phone, they call it an Obamaphone,'' ''I only make calls when I need to more than when I want to'' [M59] ''That's no problem, that's great'' [M52] ''Yes, that is good idea, I am not annoyed at all'' [M60] ''That's good, that would be a nice thing'' [F57] ''That would be okay with me. Rather they call me into the office and give me information'' (in person) [F52] ''Uh, yeah, as long as it wasn't monotonous,'' ''Wouldn't want to get three texts'' [F42] ''It would be helpful. It might slip my mind, might be going through something that day, might need a reminder'' [F49] ''Yeah that would be very helpful'' [F66] ''Yeah I think so, it's always good to get a reminder'' [F59]
What/how do you suggest/prefer text messages be like, the content of texts?	''Reminder'' [M75], ''A reminder, I would like the text message the day before'' [M59] ''Time for your test . . . whatever'' [M62] ''Just reminders'' [M58] ''Tell me what needs to be done, information'' [M53] ''Information or asking about my health'' [M53] ''Whatever works for you/doctor, as far as I get info it is all right'' [M60] ''The information'' [F46] ''A reminder of the appointment and what it is for'' [F52] ''Reminders when to get screenings,'' ''My memory isn't all that, the seizures make me forget sometimes'' [F66] ''Time for a checkup! And just say the appointment, GYN appt on this date. Very straightforward'' [F59]
What could be the advantages of free phones or plans for health-related issues?	''Yeah, I guess so, how free is it if you run out of minutes . . . so no, the plan I have now I pay $40 a month'' [M62] ''I have one that is free, if they take it back then sure, it would help a lot'' [M55] ''Yeah, definitely, that's one of the calls I don't ignore'' [M55] ''Yeah'' [F27] ''Oh yeah, definitely, I would love to have a free phone'' [F57] ''Yes,'' ''Could call that cell to remind about appointments'' [F40] ''It probably would. Extra incentive for others.'' [F49]

Note. M = male; F = female.

yes I always like to be reminded. I'd like them to do it a week in advance as well as the night before" [F59], "Yeah, that would be cool, that's fine" [F53], "That helps a lot because that's something I can save or store" [F43], "I think it is a good idea depending who sends it, if my doctor or for my health it is great, I love it" [M53], "If it is my doctor it is okay and if it is for health, texting is good for health related" [M58]. Very few preferred solely phone calls or in-person encounters because they were not familiar with texting: "Even to call. Calling is better. Sometimes I don't remember to check the phone . . . " [F56], "Not really, I don't know how to use it yet, calling is better" [F59]. Additional quotes are presented in Table 3.

Overwhelmingly both men and women preferred a simple text message reminder that provides necessary information rather than lengthier texts and motivational messages: "To remind me and also to inform me if there's been something wrong I can come in and take care of it immediately" [M52], "Reminder with information of my appointment and location and time" [F49], "I think it would be just a general reminder . . . [because] with questions I may not have enough minutes left" [F53], "Little reminder not that much info" [F49], "Don't forget, a reminder" [M61], "Just say you have an appointment, date, time, address, and a number to call back to confirm. Something simple, nothing too elaborate. Less information, all the extra shit distracts me. Text message is easier for me because it's something visual" [F43]. Very few participants requested other health tips/recommendations, and others suggested more interesting messages: "Pink [colored message]" [F43], "Not repeating the same information verbatim. If there is new information, new machine . . . little tips. Things that would take the stress off of it. Not the same stuff you could get from a book" [F42], "Information, good news, what I need to do" [M55].

The majority of women and men stated that they would be more open to text messaging, more empowered to keep medical appointments, and better able to follow health recommendations if they were given free phones or phone plans: "I never thought of that, I think everyone would want that, if that's possible I'd be 100% behind it" [F53], "I would imagine it helps a lot for people who can't afford it" [M53], "That would be great!" [M53], "That would help a lot of people. Communication means everything. In the shelter you should be able to contact your counselor and they give you the message. But it doesn't happen" [F43], "Yeah because I need to call my psychiatrist and I didn't call" [F56], "Hell yeah, who doesn't want that?" [F59]. A few men did not think free phones and plans would help them much regarding access to health information as they faced other difficulties or distrusted the government and system: "I wouldn't take one of those, I'd rather buy myself a plan. The government never did anything for me before, why do they wanna give me a free phone?" [M55].

Discussion

The majority of homeless in New York City own mobile phones. Although some homeless in this study had difficulty maintaining their phone plans consistently, others either got free limited insurance phone plans or were supported by family or friends. Most homeless are familiar with and know how to use text messaging; however, older men may have more difficulty using text messaging because of lack of practice or poor eyesight. The homeless usually make every attempt to keep the same phone number over time to maintain connections and communication, as they are mobile and lack access to landlines. Limited previous research indicates that 70% of the homeless owned cell phones and had no significant differences in new media use, modality, or frequency compared to domicile populations (Post et al., 2013). The homeless, however, have significantly lower rates of contract plans with unlimited minutes (Post et al., 2013). The homeless appreciate receiving text messages from providers or clinics regarding their health care and better management of their medical concerns. Many believe that free cell phone plans will give them better control over managing their health problems and navigating the convoluted health care system. Prior studies have shown that patients experiencing homelessness welcome health information regarding substance abuse, smoking cessation, pregnancy, domestic violence, and mental health (Eyrich-Garg, 2010; Post et al., 2013).

There are millions of homeless Americans who need and want to have better access to care but face multilevel barriers that are not addressed systematically (Asgary, Garland, Jakubowski, et al., 2014; Asgary, Garland, & Sckell, 2014; Chau et al., 2002; Khandor et al., 2011; Lebrun-Harris et al., 2013; Wen et al., 2007; Zlotnick & Zerger, 2008). The current complex health system poses difficulties to the homeless in terms of navigating it effectively for preventive care and chronic disease management. The homeless also face discrimination in the health care system, which dissuades them from seeking care (Cooper et al., 2012; Hausmann et al., 2011; Wen et al., 2007). Providers may have prejudice and biases against the medical needs and priorities of minorities and may focus largely on addressing their acute care needs rather than chronic disease management, risk reduction and risky behaviors, and preventive care (Hausmann et al., 2011; Teal et al., 2010). Strategies to address biases among providers have been proposed (Devine, Forscher, Austin, & Cox, 2012; Peek et al., 2012), and mHealth strategies may help reduce missed opportunities for health education and counseling by providing a more consistent approach and improved connectivity (Post et al., 2013). The homeless in our sample acknowledged their barriers and social conditions and recommended and welcomed using mHealth technology to get reminders for their preventive care and medical appointments to improve adherence and receive health education.

Mobile technologies are ubiquitous and provide a potentially excellent platform for providing targeted health services especially for mobile populations or those who are out of reach and socially marginalized without direct access to usual health care facilities or health education. The homeless have poor access to primary care and use emergency departments largely because of their difficulty effectively

communicating and connecting with health providers or the health system and maintaining follow-up visits (Post et al., 2013). mHealth strategies have been used for the management of chronic diseases such as hypertension and diabetes with excellent results in terms of improving uptake, adherence, and clinical outcomes of treatment modalities (Car, Gurol-Urganci, de Jongh, Vodopivec-Jamsek, & Atun, 2012; Chen, Fang, Chen, & Dai, 2008; Dick et al., 2011; Guy et al., 2012; Leong et al., 2006; Márquez Contreras et al., 2004; McGillicuddy et al., 2013) and could be adapted to address the medical needs of the homeless (Eyrich-Garg, 2010).

The homeless in this sample overwhelmingly preferred simple reminders or short, straightforward text messages regarding health issues and disliked long or motivational texts. Contrary to general assumptions, they are enthusiastic about getting health education that targets their specifics risks and conditions and improves their preventive care, which has been largely ignored. Studies have shown that the content and format of text messages are important and need to be adjusted specifically to populations and their needs (Car et al., 2012; Dick et al., 2011; Márquez Contreras et al., 2004). The type and content of such mHealth communications and their frequency could be tailored to recipients' age range, gender, and cultural background. The homeless in our study were largely open to receiving straightforward health messages from their providers or people they recognize.

Existing opportunities in the shelter system with case workers and social services could be coupled with mHealth text messaging to more effectively help the homeless connect with the health system, reinforce peer education, facilitate the making of medical services referrals, and bring the homeless and medical providers together and improve communication. They can provide an opportunity for reciprocal communication as messages and recommendations are recorded and stored for follow-up and support during counseling for changing unhealthy behaviors and addressing misconceptions. mHealth modalities could serve as patient navigators to counterbalance multilevel barriers to accessing health care, as they have shown sustained improvement in chronic disease management in the general population.

Our study is among the very few qualitative studies of mHealth strategies among the homeless with direct input from patients and without preconceived notions from providers or health systems, and it helps better explain the priorities and underpinning of homeless people's decision making regarding health care. We collected data from multiple shelters in different neighborhoods and boroughs of New York City, a city with one of the largest homeless populations in the country, and we included a good-size sample of different age ranges and genders, which makes our data more generalizable.

Our study is not without limitations. We primarily enrolled participants from shelters and may have missed homeless individuals living exclusively on the street. These individuals, however, constitute less than 10% of the total homeless population in New York City. Because of difficulty gathering all participants in one location, and considering their social conditions and constraints, we preferred semi-structured interviews to focus group discussions. Focus groups may have allowed for more synergy and potentially improved sharing of experience and perception. We did not collect data on history of substance abuse, educational background, or race/ethnicity and were unable to compare responses across those spectra. However, previous data from our population indicate that the majority of our population were Black and Hispanic, and more than half had a high school education or less (Asgary, Garland, Jakubowski, et al., 2014; Asgary, Garland, & Sckell, 2014). We have collected data on mental health problems, which did not differ in regard to response themes among the homeless.

Despite adequate attitudes and perceptions regarding mobile technologies and text messaging for health care issues, these strategies have not been generally evaluated or used with the homeless. Because of multiple system-level barriers, the current health system fails to provide effective support for the homeless to have access to the same standards of care that average Americans have. mHealth platforms could be very effective in improving knowledge and access to care for largely mobile populations of homeless who face discrimination and prejudice within the health system; generally avoid the health care system (Wen et al., 2007); and therefore miss common opportunities for health education, regular care, or checkups. Health education and strategies to improve and promote healthy behaviors are particularly important among this unusually marginalized population. The attitude of the health system needs to change significantly from providing only basic care to more equal opportunities for accessing preventive care and management of chronic diseases, which may be achieved through the effective use of mobile technology in the health system. Aside from health system changes, there need to be societal strategies to address and prevent homelessness.

Conclusions

The homeless regularly use mobile technologies and welcome text messaging modalities to improve their health care. This significant positive attitude toward and experience with mobile technologies could be effectively used to improve homeless people's connection with the health care system and providers, health education, and preventive care and chronic disease management. Policies and plans to improve availability of and access to mobile technologies along with targeted and adapted mHealth strategies should be considered for highly vulnerable and mobile homeless populations.

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