

A peer-reviewed version of this preprint was published in PeerJ on 30 July 2015.

[View the peer-reviewed version](https://doi.org/10.7717/peerj.1096) (peerj.com/articles/1096), which is the preferred citable publication unless you specifically need to cite this preprint.

McInnes DK, Fix GM, Solomon JL, Petrakis BA, Sawh L, Smelson DA. 2015. Preliminary needs assessment of mobile technology use for healthcare among homeless veterans. PeerJ 3:e1096
<https://doi.org/10.7717/peerj.1096>

Preliminary needs assessment of mobile technology use for healthcare among homeless veterans

D Keith McInnes, Gemmae M Fix, Jeffrey L Solomon, Beth Ann Petrakis, Leon Sawh, David A Smelson

BACKGROUND: Homeless veterans have complex healthcare needs, but experience many barriers to treatment engagement. While information technologies (IT), especially mobile phones, are used to engage patients in care, little is known about homeless veterans' IT use. This study examines homeless veterans' access to and use of IT, attitudes toward health-related IT use, and barriers to IT in the context of homelessness.

METHODS: Qualitative interviews were conducted with 30 homeless veterans in different housing programs in Boston, MA. Inductive thematic analysis was used.

RESULTS: Most participants (90%) had a mobile phone and were receptive to IT use for health-related communications. A common difficulty communicating with providers was the lack of a stable mailing address. Some participants were using mobile phones to stay in touch with providers. Participants felt mobile-phone calls or text messages could be used to remind patients of appointments, prescription refills, medication taking, and returning for laboratory results. Mobile phone text messaging was seen as convenient, helped participants stay organized because necessary information was saved in text messages. Some reported concerns about the costs associated with mobile phone use (calls and texting), the potential to be annoyed by too many text messages, and not knowing how to use text messaging.

CONCLUSION: Homeless veterans use IT and welcome its use for health-related purposes. Technology-assisted outreach among this population may lead to improved engagement in care.

Authors:

D. Keith McInnes^{1,2}

Gemmae M. Fix^{1,2}

Jeffrey L. Solomon¹

Beth Ann Petrakis¹

Leon Sawh^{3,4,5}

David A. Smelson^{1,3,4}

¹Department of Veterans Affairs, Edith Nourse Rogers VA Hospital, Bedford, MA

²Department of Health Care Policy, Boston University School of Public Health, Boston, MA

³VA National Center on Homelessness among Veterans, Philadelphia, Bedford, MA

⁴Department of Psychiatry, University of Massachusetts Medical School, Worcester, MA

⁵School of Criminology and Justice Studies, University of Massachusetts, Lowell MA

Acknowledgements. Supported by the National Center for Homelessness Among Veterans, the HIV/Hepatitis Quality Enhancement Research Initiative (HHQ 12-001) and the eHealth Quality Enhancement Research Initiative (EHQ 52-009). In addition DK McInnes was supported by a VA Career Development Award (CDA 09-016). We thank Kathryn O'Connor for help conducting interviews.

Key Words: homeless persons, access to care, veterans, cellular phone, informatics,

INTRODUCTION

The health of homeless veterans is among the worst of any vulnerable group, which is concerning given that there are approximately 67,000 homeless veterans on the street¹ and homeless veterans comprise 11.1% of US homeless population.² Homeless veterans have high rates of chronic conditions. A study of urban homeless veterans receiving care in a Department of Veterans Affairs (VA) medical center found 53% suffering from degenerative joint disease or arthritis, 45% with hypertension, 35% with hyperlipidemia, and 28% with hepatitis.³ The study also reported that mental health related conditions were highly prevalent, with 71% suffering from alcohol abuse, 67% with depression, 43% cocaine use, 37% anxiety, 17% heroin use, and 11% bipolar disorder.

Information technologies (IT) are increasingly being used to improve access to health care, make utilization of services more efficient, and improve health outcomes.^{4,5} IT such as mobile phone tools including texting and apps contribute to improved medication adherence,⁶ increased clinic attendance rates,⁷ increased vaccination rates,⁸ and behavior changes such as reduction in smoking in non-homeless populations.⁹ While some of this research examines use of information technologies with people with low incomes in low resource settings, such as in developing countries, there have been few interventions aimed at assisting homeless persons in their use of technologies for health-related purposes. Data from primarily non-veteran populations indicate that about half or more of homeless persons have mobile phones.¹⁰⁻¹² Therefore, we sought to understand homeless veteran's access to and use of information technologies, and whether using these technologies to communicate with health care providers would be acceptable to them.

METHODS

The current qualitative study was one component of a larger survey project that examined rates of technology ownership among 106 homeless veterans living in an urban area of the Northeast US.¹³ In the current study in-depth interviews were conducted with 30 homeless veterans to explore, access to, and perceptions of, information technologies; and, attitudes toward using information technologies for health related purposes.

Participants. We sought to represent a variety of homeless veterans by recruiting from different geographic locations and housing programs around the greater Boston metropolitan area. The 30 veterans recruited came from five locations representing four different types of housing programs – domiciliary, transitional housing, grant-per-diem (GPD), and emergency shelter (we recruited from two shelters that were in adjoining towns, but run by the same organization). Two housing programs (domiciliary and transitional housing) were run by the US Department of Veterans Affairs (VA) and two by a single local non-profit organization (GPD and the two emergency shelters). The VA Domiciliary program has a maximum 100 day stay with a focus on veterans with substance use disorders, while the VA transitional housing program allows residence for up to two years. GPD refers to housing owned by a non-profit, with maintenance and program costs partially subsidized by federal funding. Residents in the GPD program described in this study can stay for up to two years and they receive supportive services including case management and vocational training.

Researchers met with staff at the four programs to describe the study objectives and to enlist staff assistance in notifying residents about the study. In addition, at the domiciliary and the

transitional housing facilities, investigators described the study directly to residents at the weekly resident meetings and posted flyers about the research study. Interviews were conducted between January and September 2012 at the program facilities. Prior to the interviews, a qualitative team investigator (GF) conducted training for interviewers (BAP, KO, DKM) on semi-structured interviewing techniques and taking field notes.

Written informed consent was obtained from all participants prior to the interviews. Participants received \$25 for study participation. The study was approved by the Institutional Review Board of the Edith Nourse Rogers Memorial Veterans Hospital, Bedford, Massachusetts (Approval #0008).

Data collection. We conducted semi-structured qualitative interviews. In addition to collecting demographic information, interview topics covered two broad areas, first, access to IT, including ownership of a mobile phone, use of mobile phones, uses of other information technologies (e.g. computer, Internet), and information technology use related to health care; and secondly, perceptions of potential health-related interventions based on mobile phone calls or texting, such as reminders (e.g. for appointments, medication-taking and refills, reminders, availability of lab results). Interviewers recorded descriptive field notes immediately following interviews. They consisted of a systematic summarization of participants' responses to interview questions.¹⁴ More detailed notes were added to the field notes when investigators (JS, BAP, KM) listened to the audio-recordings. In addition verbatim interview transcripts were created and used by the research team to extract participant quotes.

Analysis. An analysis team (BAP, JS, KM) led by a qualitative research expert (JS) conducted an inductive thematic analysis to identify broad themes and subthemes from the field notes.¹⁵ Investigators used an iterative process to develop a preliminary list of themes and to develop inter-coder reliability. Each member conducted a close reading of seven field notes and coded them for preliminary themes. Through in-person meetings the team developed consensus on the list of themes. Then, using a set of 5 field notes, team members did coding and discussed results in order to achieve good inter-rater reliability. Meetings were used to discuss those themes, determine whether they indicated the emergence of additional themes, and make a revised list of themes. Through subsequent meetings some themes were collapsed and new themes were added. The remaining 18 field notes were divided among the analysis team for coding, with investigators meeting regularly to discuss the coding process and any potential new themes. Throughout these discussions, investigators maintained a strong degree of consensus regarding the themes. Themes and corresponding examples from field notes were documented and tracked in a shared folder accessible to the analysis team.

Once all field notes had been coded in the shared coding document, each member of the analysis team developed a written summary of the most salient themes. Salience was defined both by frequency of codes supporting that theme and/or the degree that it addressed study goals. We met to discuss the written summaries and come to consensus on the most important findings. In a final phase, after developing preliminary interpretations, we searched the data for alternative interpretations and rival conclusions.

RESULTS

Description of participants. The 30 participants ranged in age from 33 to 65 years. Most (87%) were male and white (77%). Other race/ethnicities were black (17%) and Native American (7%). Over half (60%) had some college education (but not 4-year degrees), 37% had completed high school or equivalent, and 3% had not completed high school. Almost all (90%) had a mobile phone at the time of the interview, 70% used the Internet, and 72% had an email address. See Table 1. When asked about current health, commonly mentioned conditions were depression, PTSD, substance and alcohol use disorders, anxiety, and hepatitis C.

Respondents received healthcare from a variety of sources. The VA-run homeless facilities linked veterans to VA medical care – for those in the domiciliary it was on the same physical campus, and thus relatively easy to access. For those in the VA transitional housing, there was VA shuttle bus transportation to and from a VA medical center. One of the emergency shelters had a nurse on site. Some participants relied on hospital clinics that specifically targeted homeless patients.

Overview of findings. We have organized our findings into four main areas: 1) Barriers to communication with health care providers; 2) Access and barriers to, and current use of, information technologies, in general; 3) Current uses of information technologies for health-related purposes; and, 4) Attitudes toward information technology use for new types of health-related communications. Related to the fourth theme (attitudes toward information technology), our interview questions covered specific uses of IT for appointment reminders, medication refill reminders, medication adherence support, and laboratory result notification – all of which have

been tried in the general population, but not with homeless persons. Findings from each of the four main areas are described below.

Barriers to communication with health care providers.

Becoming homeless creates substantial disruption in a person's life that can be long lasting. Communication with health care providers and systems becomes complicated. Some reported that they no longer had a reliable mailing address, or the health system had an old address on file and letters were going to that address. Thus they sometimes missed important letters containing medical appointment reminders or changes, or laboratory results. Similarly, most no longer had a landline phone as a result of their homelessness, causing them to miss telephone appointment reminders from their healthcare providers. Cell phones replace landlines, but participants staying in shelters reported that guests must hand in their mobile phones to staff in the late afternoon or evening for safekeeping overnight.

Access and barriers to, and current use of, information technologies, in general.

Mobile phones and/or computers were used by almost all study participants. They used these devices for many of the same reasons that non-homeless persons do, such as staying in touch with family and friends, taking care of personal business (e.g. making appointments, checking bank accounts, connecting with health care providers), entertainment, and gathering information, including, to some extent, health-related information.

Mobile phones. Ninety percent of participants had mobile phones. Participants paid for the devices and service in a number of ways. Some got their phones through government programs

that provide a free device and 250 free minutes per month, with some respondents noting they had 2 such free phones in order to boost the number of monthly available minutes. Others had inexpensive devices and bought pre-paid cards (e.g. \$10 or \$20) for phone and/or texting services and reloaded cards as needed. Others were on contracts. Typically this was through a relative, friend, spouse, or ex-spouse. Mobile phones were used for things like keeping in touch with family and friends, tracking appointments on the calendar feature, and searching for work. A number reported they used texting, while others did not, but indicated they would like to learn how.

Computers and internet. Use of computers, the internet, and email were common. A few had laptops, while others reported using computers at libraries and other locations that provided free computer and internet access. Common uses were for reading the news, searching for jobs, and entertainment, such as listening to music and playing games. Some used the Internet to find places to stay. A few reported not knowing how to use the internet and similarly not having an email account. However, there was interest among these respondents in learning how to use the internet.

Current uses of information technologies for health-related purposes.

General uses. Many participants were using computers, Internet, and mobile phones for health-related purposes. Table 2 summarizes our findings related to perceptions and use of IT for health-related purposes. Some seemed to regularly use their mobile phones to keep in touch with primary care and other health care providers, including psychiatrists, social workers, and case managers.

184
185 *“I’d be lost [without my cell phone]...I keep in close communication with my social*
186 *worker, for my doctors, and everything. They always check on me...”*
187

188 A few used mobile phone text messaging to contact health care providers, including to find out
189 about upcoming appointments. Many respondents used the internet to look up information about
190 medical conditions, medications, side effects, and medication interactions. Some used email to
191 check upcoming appointments with health care providers. Few respondents reported ever having
192 used an electronic personal health record such as the VA’s My HealtheVet system. One reported
193 using My HealtheVet to order medication refills and to check laboratory results, and several
194 others knew about My HealtheVet but had not used it. Quite a few had never heard of it.
195

196 *Appointment reminders, medication refill reminders, medication adherence, and laboratory.*

197 Respondents were asked about whether they currently received reminders via mobile phone or
198 Internet, about appointments, medication refills or medication taking, or if they received
199 notification that laboratory results were ready. Some respondents currently received phone call
200 reminders and liked them. There was variation in what kind of phone calls the respondents liked.
201 Several liked live (e.g. speaking directly to receptionist or nurse) reminders because they were
202 seen as more personal and allowed patients to ask questions. Several respondents received
203 automated calls, or “robo-calls”, but they generally were not satisfied with them. They reported
204 they could be confusing, for example it would not be clear to which clinic or doctor the
205 appointment was for, and there was often no phone number given to call back. None were
206 currently receiving regular text message reminders for health related purposes.

No respondents reported receiving systematic reminders to refill a prescription or to take a dose of a current medication. Laboratory results, respondents reported, were generally given to them in-person when they came for health care visits. Respondents did not report receiving mobile phone calls or text messages to let them know their laboratory results were ready.

Attitudes toward information technology use for new types of health-related communications.

We explored with participants a variety of ways that healthcare providers might use mobile phones to communicate with patients. We asked respondents about their interest in receiving 1) appointment reminders, 2) medication-related reminders, 3) notifications that laboratory results were ready, and 4) “checking-in” type outreach (either daily phone calls or texts to ask “how are you”, or phone calls or text messages to patients who had not been seen in the clinic in a long time to encourage them to come for a visit). There was considerable support for healthcare providers using mobile phone technology to communicate with veterans for these kinds of purposes.

Appointment reminders. There was strong interest in receiving appointment reminders from healthcare providers. Many respondents cited poor memory as one of the reasons that reminders were appealing.

228 *“A lot of us vets our memories aren’t that great and to receive something on a cell phone*
229 *like a text message letting me know two days from now I have an appointment, that way I*
230 *wouldn’t forget about it. Yeah, that would be very helpful.”*

231
232 Perhaps because of the familiarity with this mode (some used to receive phone call reminders on
233 landlines), there was considerable openness to greater use of mobile phone call reminders. As
234 mentioned above, several preferred live phone calls which were viewed as more personal and
235 allowed greater interactivity, even if they cost more than a text message or an automated call,
236 *“It’s just more personal and you can ask questions”*. Automated calls, while acceptable to
237 some, were viewed more ambiguously by many others. Some referred to them disparagingly as
238 “robo-calls”.

239
240 *When you answer it you can’t shut it off and you’re stuck with it and it eats up all your*
241 *time and you don’t know who it is.*

242
243 Also, others noted automated calls can be confusing because they often do not indicate who is
244 calling, which doctor’s office it is coming from, or which clinic to go to, and they often do not
245 provide a phone number to call if one has questions.

246
247 Mobile phone text message reminders were seen as practical and efficient. Respondents liked
248 the fact that they provide a written record that one can review as many times as needed. If
249 English is not the recipient’s first language, noted one respondent, the recipient can show the text
250 message to a friend for help in understanding the message content.

251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272

Well you have something solid in front of you. You don't have to write it down.
You can save it and it's there. I mean you have all your information right there.

Conversely, a provider or receptionist may have an accent that is hard to understand, as noted one respondent, and a text message would be preferable to voice communication that the patient has a hard time understanding.

Participants liked the asynchronous nature of texting. One reported that he was not supposed to receive phone calls during work, but with text messages he could read and respond to them during breaks or after work. Other respondents suggested that text message reminders should have the option for the recipient to respond, for example to confirm they will attend the appointment, or to request rescheduling or cancellation.

Some in our sample were not sure of the value of text message appointment reminders. Some did not want to receive any reminders (phone or text) on their mobile phone because of the cost. Others were concerned about the potential annoyance of receiving too many text reminders, while others reported they did not view their text in-box frequently enough for it to be valuable as a reminder system for appointments coming in the next one to two days. Some respondents, who lacked skills or confidence in texting, felt they would need to learn to use it because it was a technology that, as one respondent said, is “here to stay”.

273 *Medication related reminders.* Participants were asked about two kinds of medication-related
274 reminders – for prescription refills and for medication adherence. Medication refill reminders
275 were generally positively seen, whether it was a live person making the reminder call, an
276 automated call, or a text message. Several participants expressed interest in reminders to assist
277 with medication adherence.

278

279 Participants were generally in favor of receiving mobile phone calls – live or automated – to
280 remind patients that it was time to refill a prescription. Here a respondent describes his
281 preference for live calls for appointment reminders, *“It’s just more personal and you can ask*
282 *questions. It’s more informative, just better to talk to a live person.”*

283

284 There was also widespread support for text message reminders for medication refills.
285 Respondents proposed other ideas as well. One suggestion concerned hospital pharmacies.
286 When patients were on-site at the hospital or medical center waiting for their medication, the
287 pharmacy could text the patient that their prescription was ready to be picked up at the pharmacy
288 window. This would allow patients to leave the pharmacy waiting room to go to other parts of
289 the medical center, e.g. to cafeteria or store. Several respondents were supportive of text
290 messages used for medication taking, for example the sending of text messages each morning at
291 a specific time to remind a patient to take their pills.

292

293 Some respondents expressed concern about potentially receiving too many medication-related
294 reminders. Some said it would be annoying to receive reminders daily or more often, for
295 example before each dose of medication.

296

297 *If they do [text messages] more than once I would get annoyed. You know, ... if they do it*
298 *like four, five times ... I'll probably throw the phone up against the wall!*

299

300 *Laboratory results.* Participants felt it would be valuable to be notified via their mobile phone
301 that laboratory results were ready to be discussed with a healthcare provider, though this support
302 was not as strong as for appointment reminders. While several liked this idea, some were not
303 interested because the current system of receiving lab results from their clinician during office
304 visits worked fine for them, while others felt a text message saying their lab results were ready
305 would just make them feel nervous that the results were going to be bad. Similar to appointment
306 reminders, there was support, however, for text message reminders to have lab work done:

307

308 *[Text messages to remind you to have lab work done] would be very helpful because they*
309 *usually schedule [lab work] like months in advance. And if you don't write it down on the*
310 *calendar and you try to remember something like that, it's impossible. So that would be a*
311 *very good idea.*

312

313 *Caring Outreach.* We explored the idea of a check-in or caring outreach, by phone call (live or
314 automated) or text message. One type of message would target patients who had not been seen
315 by their healthcare team in a long time, for example one or two years. The content of such a
316 phone or text outreach was described as, “We were wondering how you are doing because we
317 haven’t seen you in a while? It would be great to see you. Please call xxx-xxx-xxxx to set up an
318 appointment”. Respondents supported this idea.

Interviewers also asked about daily outreach efforts delivered via mobile phone, such as “Are you doing alright today?” This was also seen positively. Respondents indicated this would be especially valuable for people who were having psychological difficulties.

That would be a huge help and then if you say, "no," [I'm not doing well] well okay then they transfer you and then either you're texting or phoning with somebody to try to help get you immediate help. Um, yeah that would be huge.

DISCUSSION

Through qualitative interviews with 30 homeless veterans living in a large Northeastern US metropolitan area, we found that the majority had access to, and used, mobile phones and other information technologies regularly, and also reported positive attitudes about health providers using these technologies to connect with homeless veterans related to their healthcare needs. Respondents viewed reminders especially favorably whether for upcoming health appointments, medication refills, medication taking, or to receive laboratory results. There was also support for mobile phone calls or text messages to reach out to individuals whose health was considered at especially high risk.

Life is disrupted when one does not have a stable home and this interrupts health seeking behavior.^{16, 17} While some homeless shelters have clinics on site, or facilitate transportation to health care services, in general the US health care system, including the VA health care system, is designed for people who have stable housing, a dependable mailing address, a landline phone,

and easy access to the Internet. Homeless veterans lack many of these resources. However, despite the economic, societal, situational and psychological barriers that affect homeless veterans accessing healthcare, our results suggest that IT such as mobile phones can contribute to improving access to outpatient health care services, which in turn may lead to improved health outcomes. While these technologies may not directly address these serious underlying challenges, IT does make it easier to connect with health care providers (e.g. text messages, mobile phone calls, emails and secure messages), remember appointment times (e.g. using calendar and reminder functions on one's phone, or receiving text message reminders from health care team), and know when it is time to refill a medication (interactive voice response, text messages or email refill reminders).

Treatment engagement is an area that can be addressed through mobile technologies as missed visits and being lost to follow up present a significant problem for managing chronic conditions, including homeless persons trying to manage high-risk health care needs such as HIV, substance abuse, chronic pain, and depression.¹⁸⁻²⁵ Fortunately, there is evidence that even modest interventions can help improve visit attendance for vulnerable populations, including brochures and posters in exam and waiting rooms reminding patients about the importance of coming to all clinic visits,²⁶ and text message appointment reminders which have been shown to increase appointment attendance in a variety of health care settings with diverse populations.^{7, 27} Our finding that many homeless persons use mobile phones suggests this may be a worthwhile approach to reducing missed visits in that population.

Another area ripe for innovations is medication adherence. Poor medication adherence is a serious barrier to chronic disease management,²⁸ and low income populations are at especially high risk for non-adherence.²⁹ Studies of homeless populations' medication adherence indicate that both patients and providers recognize it is a major problem.²⁴ In a study of homeless and unstably housed tuberculosis patients, 36% reported they expected to have difficulty regularly taking their tuberculosis medications, and 30% said they had no one to help remind them to take medications.³⁰ This illustrates the lack of social support networks available to many homeless and unstably housed persons, and the potential role that IT, such as texting, emails, and social media, can play in creating an electronically enhanced social network or system that can support disease self-management. A number of studies in non-homeless populations, including randomized trials, have indicated that text message medication adherence reminders contribute to improved anti-retroviral medication adherence and reductions in viral load for persons with HIV.⁶ Other studies have shown that text messaging interventions can contribute to other behavior changes, such as smoking cessation,^{4, 9, 31, 32} blood glucose monitoring by diabetics,³³ and weight loss behaviors.³⁴ While our respondents reacted favorably to the idea of mobile phone medication-related reminders, they warned against over-utilization of such reminders. Once-a-day text-messages seemed to be the maximum acceptable number for medication adherence reminders and other health-related purposes.

It is important to underscore that the use of IT with vulnerable populations is not without challenges. With a low-income population such as the homeless, cost will inevitably be an issue – some of our study participants felt that things like appointment reminders would be a waste of their monthly allotment of talk and text. Other barriers for this population and include the

difficulty keeping phones charged,³⁵ loss and theft of phones,³⁶ and, for those in some emergency shelters, not having access to mobile phones in the evenings because shelters lock up the phones at night. A broader health system issue regarding mobile phone texting relates to privacy. Some health care settings, including the Department of Veterans Affairs, have not approved mobile phone texting because it is considered unsecure.³⁷ These systems hope to avoid inadvertent disclosure of sensitive information, for example a patient sending a text message to a provider asking when HIV test results would be ready would be exposing him/herself to loss of privacy.³⁸

There are several limitations to this study. As a small study, using a convenience sample of homeless veterans from a single metropolitan area, the findings may not be generalizable to other populations of homeless veterans in other parts of the country, or in rural areas. Additionally, we did not interview any homeless veterans living on the streets, living doubled-up with friends or relatives, or using single-room occupancy hotels. In addition, most participants were males, so the findings may not apply to women. All data collected was via self-report, so the various uses of IT were not verified in an objective manner. Social desirability bias may have caused respondents to speak more favorably of proposed uses of technologies than they actually felt.

Conclusion: Many homeless veterans have mobile phones and regularly access the internet. Mobile phones may represent an effective tool for communicating with homeless persons and increasing their engagement in care and adherence to treatment. When asked about a variety of kinds of communication, there was support for mobile phone calls and text messages, for purposes such as appointment reminders, medication refill reminders, and reminders to take medications. There was also support for outreach to bring back into care homeless patients who

410 had not been seen by their providers in a long time; and as a means of keeping regular contact
411 with individuals who may be susceptible to suicidality. Additional research is needed to evaluate
412 implementation of mobile phone communication systems for homeless persons in clinical
413 settings and to assess their impact on engaging homeless persons in health care services.

Table 1. Characteristics of study participants

	VA Domiciliary (n=9)		VA Transitional Housing (n=6)		Emergency Shelters (n=9)		Grant Per Diem (n=6)		Total (n=30)	
	%	(n)	%	(n)	%	(n)	%	(n)	%	(n)
Male	78	(7)	83	(5)	100	(9)	83	(5)	87	(26)
Ethnicity										
Hispanic	0	(0)	0	(0)	11	(1)	17	(1)	0	(0)
Native Am	11	(1)	0	(0)	0	(0)	0	(0)	7	(2)
Black	0	(0)	50	(3)	11	(1)	17	(1)	17	(5)
White	89	(9)	50	(3)	78	(7)	67	(4)	77	(23)
Education				(0)						
Some HS	0	(0)	17	(1)	0	(0)	0	(0)	3	(1)
HS/GED	22	(2)	50	(3)	33	(3)	50	(3)	37	(11)
Some college	78	(7)	33	(2)	67	(6)	50	(3)	60	(18)
Have cell phone	78	(7)	100	(6)	89	(8)	100	(6)	90	(27)
Go online	78	(7)	67	(4)	56	(5)	83	(5)	70	(21)
Have email	67	(6)	67	(4)	56	(5)	100	(6)	70	(21)
Age, Mean (SD)	50.7 (10.16)		54.8 (5.12)		58.0 (4.64)		50.0 (10.49)		53.6 (8.34)	

VA=Department of Veterans Affairs; SD=standard deviation; HS=high school; GED=high school equivalency exam

Table 2. Perceptions and uses of IT for health-related purposes, summary of findings.

Topic	Perceptions and Uses
Current health-related uses of technology	<ul style="list-style-type: none">• Receive cell-phone reminder calls for appointments• Use of mobile phone to stay in touch with health professionals• Some reported dislike for automated appointment reminder calls which can be confusing and use up valuable cell phone minutes.
Openness to using mobile phones for health	<ul style="list-style-type: none">• Reminder text messages were seen positively (e.g. for appointments, medication refills, and medication taking)• Provider proactive checking on physical or emotional health was acceptable, e.g. receiving a text message: "How are you doing?"
Perceived benefits	<ul style="list-style-type: none">• Convenience: information is retrievable, there is less need to write appointment information down, and the asynchronous communication is less intrusive.• Organization: reduces worry about losing slips of paper with appointment information, and forgetting to go to appointments
Possible barriers	<ul style="list-style-type: none">• Cost: calls and texts cost the recipient money if they do not have an unlimited mobile phone plan• Annoyance: too many text messages become annoying instead of helpful• Lack of skills: some participants lacked text messaging skills

REFERENCES

1. US Department of Veterans Affairs. Facts About Veterans Homelessness. 2012. Available at: http://www.va.gov/HOMELESS/about_the_initiative.asp
2. Perl L. Veterans and Homelessness. Washington, DC: Congressional Research Service; 2011
3. O'Toole TP, Buckel L, Bourgault C, et al. Applying the chronic care model to homeless veterans: effect of a population approach to primary care on utilization and clinical outcomes. *American journal of public health*. 2010;100(12):2493-2499
4. Free C, Phillips G, Galli L, et al. The Effectiveness of Mobile-Health Technology-Based Health Behaviour Change or Disease Management Interventions for Health Care Consumers: A Systematic Review. *PLoS Med*. 2013;10(1)
5. Cole-Lewis H, Kershaw T. Text messaging as a tool for behavior change in disease prevention and management. *Epidemiol Rev*. 2010;32(1):56-69
6. Lester RT, Ritvo P, Mills EJ, et al. Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya (WelTel Kenya1): a randomised trial. *Lancet*. 2010;376(9755):1838-1845
7. Guy R, Hocking J, Wand H, Stott S, Ali H, Kaldor J. How effective are short message service reminders at increasing clinic attendance? A meta-analysis and systematic review. *Health services research*. 2012;47(2):614-632
8. Stockwell MS, Kharbanda EO, Martinez RA, Vargas CY, Vawdrey DK, Camargo S. Effect of a text messaging intervention on influenza vaccination in an urban, low-income pediatric and adolescent population: a randomized controlled trial. *JAMA : the journal of the American Medical Association*. 2012;307(16):1702-1708
9. Free C, Knight R, Robertson S, et al. Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomised trial. *Lancet*. 2011;378(9785):49-55
10. Eyrych-Garg KM. Mobile phone technology: a new paradigm for the prevention, treatment, and research of the non-sheltered "street" homeless? *J Urban Health*. 2010;87(3):365-380
11. Stennett CR, Weissenborn MR, Fisher GD, Cook RL. Identifying an effective way to communicate with homeless populations. *Public Health*. 2012;126(1):54-56
12. McInnes DK, Li AE, Hogan TP. Opportunities for engaging low-income, vulnerable populations in health care: a systematic review of homeless persons' access to and use of information technologies. *American Journal of Public Health*. 2013;103 Suppl 2:e11-24
13. McInnes DK, Sawh L, Petrakis BA, et al. The potential for health-related uses of mobile phones and internet with homeless veterans: Results from a multi-site survey. *Telemed J E Health*. 2014;(in press)
14. Bernard HR. Research Methods in Anthropology: Qualitative and Quantitative Approaches. Walnut Creek, CA: Alta Mira; 2002
15. Patton M. Qualitative Research and Evaluation Methods, 3rd ed. Thousand Oaks, CA: Sage Publications, Inc.; 2002
16. Gelberg L, Gallagher TC, Andersen RM, Koegel P. Competing priorities as a barrier to medical care among homeless adults in Los Angeles. *American journal of public health*. 1997;87(2):217-220
17. O'Toole TP, Conde-Martel A, Gibbon JL, Hanusa BH, Freyder PJ, Fine MJ. Where do people go when they first become homeless? A survey of homeless adults in the USA. *Health & social care in the community*. 2007;15(5):446-453
18. Giordano TP, Visnegarwala F, White AC, Jr., et al. Patients referred to an urban HIV clinic frequently fail to establish care: factors predicting failure. *AIDS Care*. 2005;17(6):773-783
19. Schluger N, Ciotoli C, Cohen D, Johnson H, Rom WN. Comprehensive tuberculosis control for patients at high risk for noncompliance. *American journal of respiratory and critical care medicine*. 1995;151(5):1486-1490

20. Karter AJ, Parker MM, Moffet HH, et al. Missed appointments and poor glycemic control: an opportunity to identify high-risk diabetic patients. *Medical care*. 2004;42(2):110-115
21. Macharia WM, Leon G, Rowe BH, Stephenson BJ, Haynes RB. An overview of interventions to improve compliance with appointment keeping for medical services. *JAMA : the journal of the American Medical Association*. 1992;267(13):1813-1817
22. Haynes RB, McDonald HP, Garg AX. Helping patients follow prescribed treatment: clinical applications. *JAMA : the journal of the American Medical Association*. 2002;288(22):2880-2883
23. Mugavero MJ, Westfall AO, Zinski A, et al. Measuring retention in HIV care: the elusive gold standard. *Journal of acquired immune deficiency syndromes*. 2012;61(5):574-580
24. Hwang SW, Wilkins E, Chambers C, Estrabillo E, Berends J, MacDonald A. Chronic pain among homeless persons: characteristics, treatment, and barriers to management. *BMC Fam Pract*. 2011;12:73
25. Weiser SD, Riley ED, Ragland K, Hammer G, Clark R, Bangsberg DR. Brief report: Factors associated with depression among homeless and marginally housed HIV-infected men in San Francisco. *J Gen Intern Med*. 2006;21(1):61-64
26. Gardner LI, Marks G, Craw JA, et al. A low-effort, clinic-wide intervention improves attendance for HIV primary care. *Clin Infect Dis*. 2012;55(8):1124-1134
27. McInnes DK, Petrakis BA, Gifford AL, et al. Retaining homeless veterans in outpatient care: a pilot study of mobile phone text message appointment reminders. *American Journal of Public Health*. 2014;104 Suppl 4:S588-594
28. Viswanathan M, Golin CE, Jones CD, et al. Interventions to Improve Adherence to Self-administered Medications for Chronic Diseases in the United States: A Systematic Review. *Ann Intern Med*. 2012
29. Mojtabai R, Olfson M. Medication costs, adherence, and health outcomes among Medicare beneficiaries. *Health Aff (Millwood)*. 2003;22(4):220-229
30. Craig GM, Booth H, Story A, et al. The impact of social factors on tuberculosis management. *Journal of advanced nursing*. 2007;58(5):418-424
31. Free C, Whittaker R, Knight R, Abramsky T, Rodgers A, Roberts IG. Txt2stop: a pilot randomised controlled trial of mobile phone-based smoking cessation support. *Tob Control*. 2009;18(2):88-91
32. Rodgers A, Corbett T, Bramley D, et al. Do u smoke after txt? Results of a randomised trial of smoking cessation using mobile phone text messaging. *Tob Control*. 2005;14(4):255-261
33. Hanauer DA, Wentzell K, Laffel N, Laffel LM. Computerized Automated Reminder Diabetes System (CARDS): e-mail and SMS cell phone text messaging reminders to support diabetes management. *Diabetes Technol Ther*. 2009;11(2):99-106
34. Patrick K, Raab F, Adams MA, et al. A text message-based intervention for weight loss: randomized controlled trial. *J Med Internet Res*. 2009;11(1):e1
35. Le Dantec CA, Edwards WK. Designs on dignity: perceptions of technology among the homeless. *CHI '08: Proceedings of the SIGCHI conference on human factors in computing systems*. 2008:627-636
36. Bure C. Digital inclusion without social inclusion: The consumption of information and communication technologies (ICTs) within homeless subculture in Scotland. *The Journal of Community Informatics*. 2006;2(2):116-133
37. Hassinen M, Laitinen P. End-to-end Encryption for SMS Messages in the Health Care Domain. Connecting Medical Informatics and Bio-Informatics: Proceedings of MIE2005 - The XIXth International Congress of the European Federation for Medical Informatics Amsterdam: IOS Press; 2005:316-321
38. Lim MS, Hocking JS, Hellard ME, Aitken CK. SMS STI: a review of the uses of mobile phone text messaging in sexual health. *Int J STD AIDS*. 2008;19(5):287-290