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Health Care Providers' Perspectives on a Weekly Text-Messaging Intervention to Engage HIV-Positive Persons in Care (WelTel BC1)

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Abstract Though evidence shows that Mobile health (mHealth) interventions can improve adherence and viral load in HIV-positive persons, few have studied the health care providers' (HCP) perspective. We conducted a prospective mixed methods pilot study using the WelTel intervention wherein HIV-positive participants (n = 25) received weekly interactive text messages for 6 months. Text message response rate and topic data were collected to illustrate the HCP experience. The aim of this study is to explore intervention acceptability and feasibility from the HCP perspective through a baseline focus group and end of study interviews with HCP impacted by the intervention. Interview data were thematically coded using the Technology Acceptance Model. HCPs identified that the WelTel intervention engaged patients in building relationships, while organizing and streamlining existing mHealth efforts and dealing with privacy issues. HCPs recognized that although workload would augment initially, intervention benefits were many, and went beyond simply improving HIV viral load.

Keywords HIV · mHealth · Engagement · Health care providers · Adherence · Antiretrovirals

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Introduction

Since its introduction in 1996, combined active anti-retroviral therapy (cART) has led to enormous improvements in health and survival of HIV positive (HIV+) persons [1], and is now known to assist prevention efforts [2–4]. Effectiveness of cART is dependent on achieving high levels of medication adherence; however, ongoing adherence among key high-risk populations is low [5–7]. Indeed, due to a myriad of structural and psychosocial barriers that encompass the social determinants of health, HIV+ patients are lost from care at points all along the cascade of care continuum [8]. Engaging patients on multiple levels, while addressing the social determinants of health that influence both patients and health care providers (HCP) alike is vital for achieving optimal medication adherence, increasing virologic suppression and affording favorable population health outcomes [9]; making successful patient engagement strategies vital for best health outcomes.

More recently, research has drawn attention to the impact of patient-provider interactions on patient engagement in care. Positive perceptions of patient-provider relationships and shared decision-making are associated with better cART adherence [10–14], improved retention in care [13–15], viral suppression [16], and overall health outcomes [17]. In Flickinger's study of 1300 HIV+

patients, the authors found that 'feeling known as a person' was the most significant predictor of appointment attendance [18]. A crucial theme emerging from this research is recognition that engagement must be more dynamically conceptualized to include active participation in decision-making and a strong sense of responsibility for one's health, rather than minimalist definitions focusing exclusively on retention [19]. Establishing trust and open communication is central to relationship building.

Mobile health (mHealth), the use of mobile phone technology to deliver health care, is an emerging field of disease management that can improve adherence to medications/treatments and monitoring of care [20–22] in HIV+ populations, and for a variety of chronic diseases [23–25]. Thus far, mHealth research in HIV has focused primarily on outcomes of prevention, adherence, viral suppression and appointment attendance. Engagement, taken in its broader conceptualization of increasing self-efficacy and enhancing patient-provider relationships, has not been widely emphasized as a primary intervention outcome in the HIV and mHealth literature. This is despite the suggestion that more personalized and interactive approaches are seemingly more successful [26]. The success of mHealth to develop and maintain patient-provider relationships, which in turn may improve patient engagement in care, has thus far received relatively little attention in the literature.

The WelTel mHealth model is a bi-directional short messaging service (SMS) intervention distinguished from other mHealth interventions by the fact that patients are given the opportunity to self-identify problems or ask questions related to their care through a weekly text message. The WelTel SMS intervention was piloted at the Oak Tree Women and Family HIV Centre, in Vancouver, Canada with 25 HIV+ patients and their HCP in 2012. The Oak Tree Clinic utilizes a patient-centered care model that places high value on establishing provider/patient relationships as a method to engage patients in care. The objectives of this study were first to contextualize HCP experiences in context of the patient-provider interactions over the course of the intervention, then to explore the experiences of HCPs as they pertain to acceptability and feasibility of the WelTel mHealth intervention within a patient-centered model of care: illuminating important, often overlooked considerations in the design and implementation of mHealth interventions in clinical settings.

Methods

Study Design

A prospective mixed methods pilot study of the WelTel SMS outpatient management service (adapted from the WelTel trial in Kenya) [22] was conducted between January and December 2012 at the Oak Tree Clinic in Vancouver, British Columbia (BC). The study was a cohort and thus had no control arm. Results of baseline qualitative interviews and questionnaires from both HCP and patient participants informed the intervention. Mixed methods methodology was used to capture data characterizing HCP and patient participant interactions. In addition, we sought patient and provider input on the acceptability and feasibility of the intervention prior to initiating the intervention and at study end.

Setting

The Oak Tree Clinic is the provincial referral center for HIV+ women and families located at BC Women's Hospital in Vancouver, Canada. This specialized clinic cares for almost 750 HIV+ persons coming from throughout BC. The population consists of all HIV+ children in the Province (46 children), approximately 560 HIV+ women and 140 HIV+ men (mainly partners of female patients and adult perinatally infected men). Many of the clinic's patients face multiple barriers to engagement in care and medication adherence, such as distance from HIV services, stigma, social marginalization, poverty, homelessness, depression and substance abuse. An interdisciplinary team provides for the holistic health needs of women and their families in a single setting, and cares for a population representing all HIV-acquisition risk factor groups.

WelTel Intervention

The WelTel SMS intervention is based on the intervention previously trialed and found to be effective at supporting patients on cART in Kenya [22]. After an initial informative study period at the Oak Tree Clinic, the SMS intervention was modified for language, and utilized an automated software platform to send, receive, triage, and display the weekly text-messages sent to participants. In this study, the text message "How are you?" was sent to patient participants every Monday at noon from an automated platform (and with a number not traceable to the clinic). Patient responses were checked and followed up by a clinic nurse as shown in Fig. 1. Participants were instructed to respond if they were "OK" or "Not OK" but open responses were accepted and the software captured all texting content. HCPs never texted information relating to HIV status or the clinic unless asked explicitly to do so by the participant. After the initial formative study period, weekly text messaging to participants began at the patient's next clinical visit. Participants were instructed on how to use text messaging if needed, and given a cell phone with

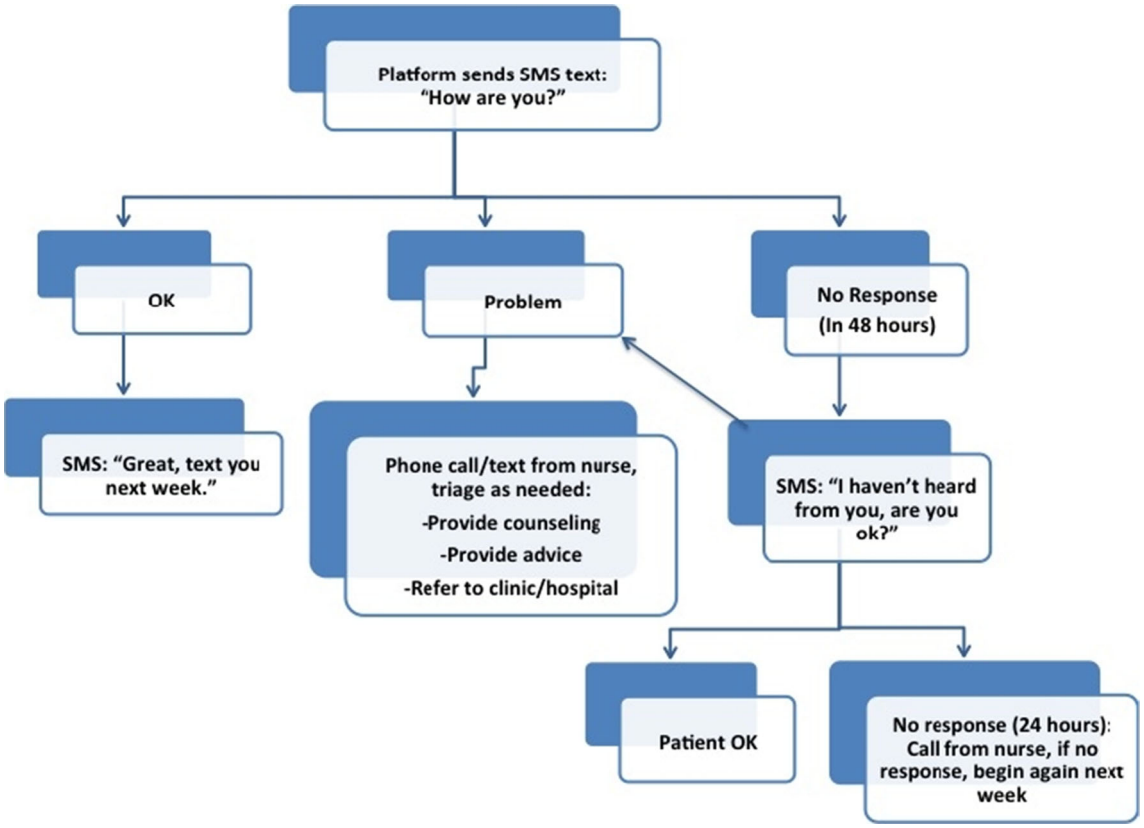


Fig. 1 Schematic of study intervention

unlimited text messaging if they did not have one. Automated WelTel text messaging to participants continued for 6 months. All communications related to the intervention were kept (coded by study ID) in an electronic study log maintained exclusively by the nurse involved with the study.

Patient Participants

Twenty-five HIV+ participants from a broad range of demographic and 'risk' categories were recruited through purposive sampling from the Oak Tree Clinic into five groups (five persons each) so as to obtain a broad and representative sampling of patients seen at the clinic, while targeting those groups felt by the study team to be most likely to benefit from the intervention. Inclusion criteria were: at least 14 years of age; HIV+; currently on or initiating cART; able to communicate in English or have access to an interpreter for the duration of the study; and qualified to be selected for one of the following five groups: youth (age $\leq$24), mature (age $\geq$50), English as a second language (ESL), remote (must travel 3 or more hours to get to clinic), and Low CD4 (CD4 <200 cells/mm^3, and an HIV VL >250 copies/mL on two separate occasions). A bias was permitted toward patients the HCPs perceived would most likely benefit due to an (a) lack of current phone ownership (and thus would gain provision of a cell phone through enrollment), and (b) prior demonstration of recurrent non-engagement in care. Details on inclusion/exclusion criteria, enrollment procedures and results of patient participant interviews are presented elsewhere [27].

HCP Participants

At baseline, the study was presented to all clinic staff during a clinic meeting, and those interested were asked to self-identify to the study coordinator on a first-come basis. We recruited five HCPs (of a pool of 11 potential HCPs) to participate in a focus group, one from each of the broadly targeted HCP groups of: physician, nurse/nurse practitioner, pharmacist, administrative/front line staff, and social worker/counselor. These groups were chosen in an effort to have representation in the focus group of all clinic professions; representing a broad array of priorities in providing care. We will refer to these participants as "HCP1", "HCP2", "HCP3", "HCP4" and "HCP5". At study end, four individuals were recruited for individual interviews who worked closely with the study including the project research assistant, the nurse managing the computer

platform and study responses/triage, an outreach worker and a physician. They will be referred as "HCP6", "HCP7", "HCP8" and "HCP9". This slightly different selection of HCPs was chosen for the exit interviews due to challenges encountered during the study with cellular phone services. The study coordinator was the main individual dealing with these issues and so was interviewed as one of the "HCP" at study end. In the clinical setting, these issues would fall to a HCP; thus, capturing information relating to the challenges of this facet of the intervention was deemed important enough to include this individual. The pharmacist and administrative HCP interviewed at baseline had little interaction with the intervention and consequently, though the study is limited by their exclusion, they were not interviewed at study end. All interviews and the focus group were conducted by an external qualitative researcher who was not a clinic member.

Data Collection: HCP Semi-structured Focus Group & Interviews

HCPs took part in a focus group discussion prior to intervention implementation (January 2012). The focus group was run by an external experienced qualitative researcher from outside of the clinic, recorded, and then transcribed verbatim. The focus group was designed to obtain consultative input, and occurred parallel to questionnaires, and semi-structured interviews with patient participants (patient participant data reported elsewhere) [27]. Following the intervention, individual semi-structured interviews were conducted with HCP participants (December 2012–February 2013) to assess their experiences with the WelTel intervention, explore benefits, and identify recommendations for improvement. All interviews were recorded and transcribed verbatim.

Data Analysis

SMS Data

Student's *t* test and Fisher's exact test were used to compare discreet and continuous variables between patient-participants and the general Oak Tree Clinic population. Participant text message response rates were collected throughout the study and classified as one of: "no response", "positive response" (the patient has no problems), "negative response" (the patient has a problem), or "no message sent" (for those with lost cell phones in that week). Mixed-effects logistic regression, which allows for unbalanced multiple measures from each participant, was used to examine changes in negative response rates throughout the intervention period (proportion of negative responses vs. positive, or no response). No message sent was treated as missing data. Patient-care provider interactions (excluding participant "ok" responses) were manually classified using consensus between the clinic research coordinator and the study co-primary investigator (Dr. Murray) based upon the major reason for each interaction and classified as "check-ins", medical, non-medical (primarily social), and study-related concerns. "Check-ins" were defined as any situation where either the HCP "checked in" with a participant on how they were doing with a specific aspect of care (e.g. "How are the meds going?", or where the participant shared something with the HCP about how they were doing (e.g. "I've been clean now for 2 months!").

Interview Data

Focus group and interview data were thematically coded as described below.

Conceptual Framework

The Oak Tree HIV Clinic utilizes a model of patient-centered care that acknowledges the relationship between health outcomes and the social determinants of health, such as income, education, housing, gender, and race. Much of the clientele served by the Oak Tree Clinic experiences multiple barriers to accessing care, and attention to the social determinants of health is central to providing care that is comprehensive. Analysis of HCP interview data related to engaging patients was done through a social determinants of health lens.

Analysis of interview data related to the acceptance of the SMS intervention was guided by the Technology Acceptance Model (TAM), The TAM was adapted from the theory of reasoned action (TRA) by Davis et al. [28] for the realm of user acceptance of information systems. Davis et al. identified two distinct attitudes that could predict the adoption of a new information system: perceived ease of use and usefulness. Usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" and ease of use as, "the degree to which an individual believes that using a particular system would be free of physical and mental effort" [28].

Results

SMS Responses

Overall, 650 outgoing text "How are you" messages were sent to the 25 patient participants during the six-month evaluation. The average proportion of participants

responding to the text messages each week was 56.9 %. On average, 15.2 % of participants indicated a problem each week, though the odds of negative response decreased weekly, from a predicted proportion of 12 % at week one to 5 % by week 26, or a 4 % reduction weekly (OR 0.96, 95 % CI 0.93–0.99, p = 0.02) (Fig. 2a). The proportion of participants not responding to the weekly text message increased over time (Fig. 2a). In addition, at study end (week 26), eight (33 %) participants were not receiving texts from the platform due to one withdrawal and seven participants who had lost their phones (Fig. 2a). Average weekly response rates and reporting of problems appeared highest in the "low CD4" group, who all had high rates of prior cART non-adherence, at 76.5 and 27.7 % respectively, while lowest response rates and problems reported were observed among "youth" at 47.8 and 4.3 % respectively. This was not statistically significant by logistic regression (p = 0.43) (Fig. 2b).

Patient-Care Provider Interactions

There were 177 mobile phone communication interactions outside of weekly responses stating that the participant was 'okay' (Fig. 3a). Forty-one (23 %) interactions included a participant or provider 'checking in' on the other, or reporting of positive news. Of 136 problems identified, 85 (62.5 %) were medical (Fig. 3b), 18 (13.2 %) requested non-medical allied health (primarily social) support

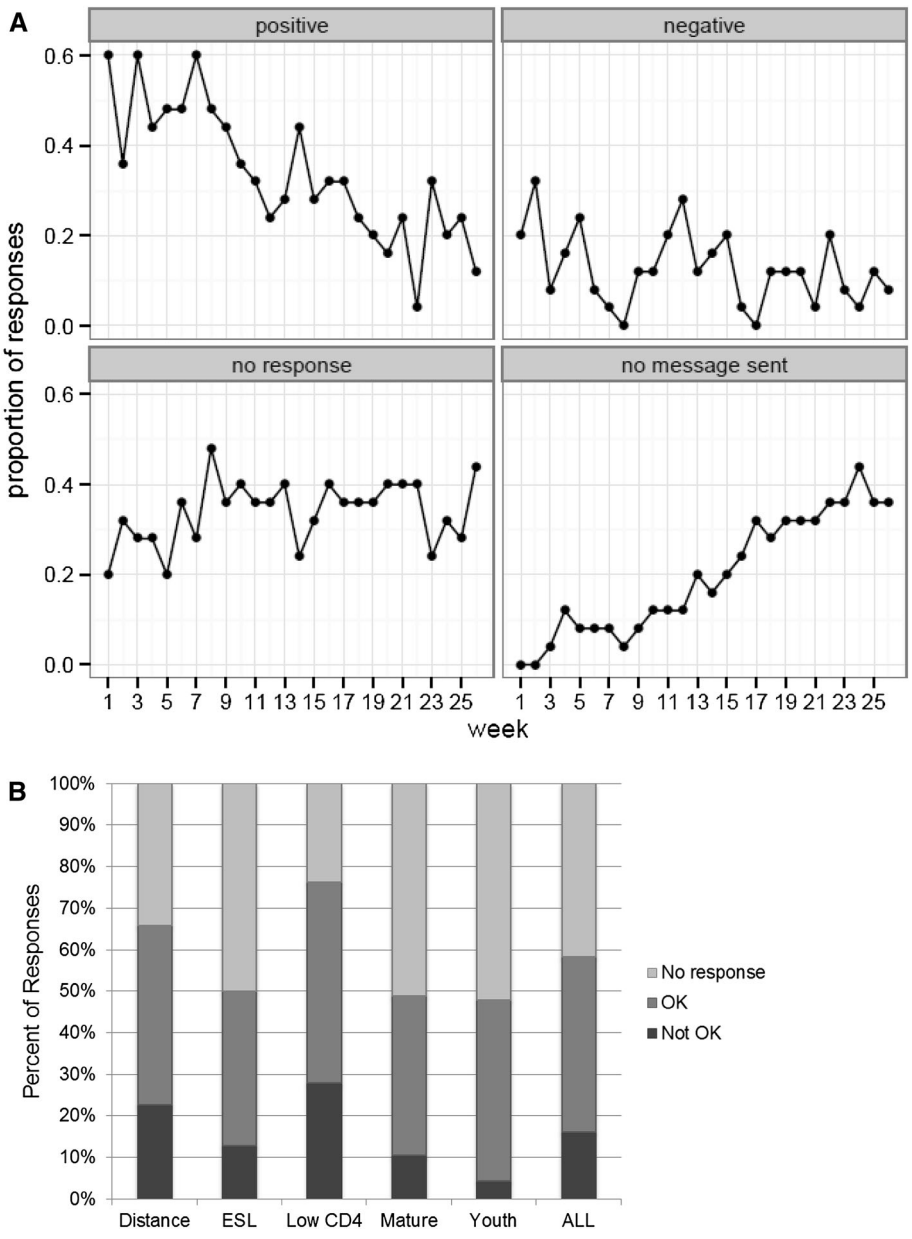
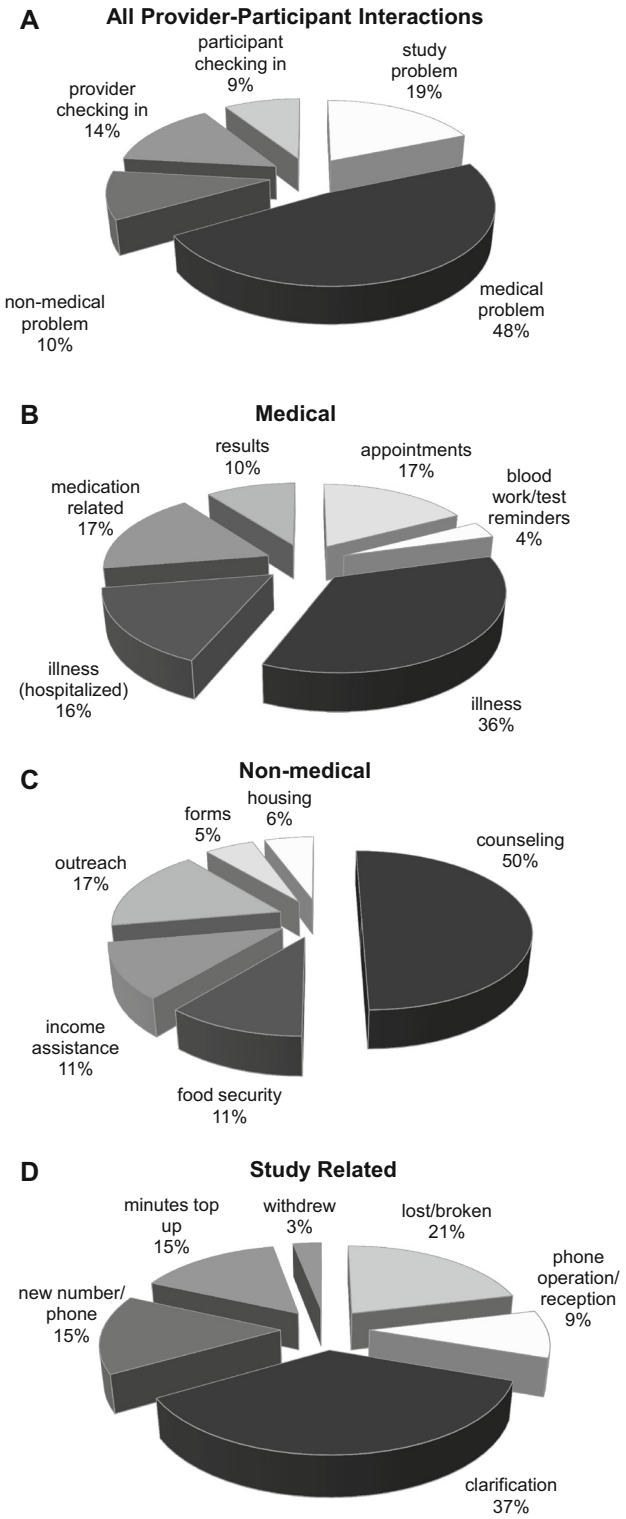


Fig. 2 SMS Responses by **a** study week and **b** 5 × 5 Group. **a** Average proportion of both positive and negative responses fell over the study period. "No message sent" refers to those with lost cell phones in that week. **b** Overall average weekly rates of all responses or only problem responses were 56.9 and 15.2 % respectively. Average weekly response rates and reporting of problems were highest in the "low CD4" group at 76.5 and 27.7 % respectively, and lowest among "youth" at 47.8 and 4.3 % respectively. *ESL* english as a second language



◀**Fig. 3** SMS breakdown of patient-health care provider interactions. There were 177 text-messaging interactions (outside of weekly positive responses) (**a**). Of 136 problem responses, 62.5 % were medical (**b**), 13.2 % requested non-medical allied health support (**c**), and 24.3 % were study related (**d**). Ninety-three contacts were initiated by participants, and 43 by providers; 81 were dealt with through texting, 48 through phone calls, and 5 in person (missing data = 2)

(Fig. 3c), and 33 (24.3 %) were study-related (Fig. 3d). Ninety-three interactions were initiated by participants, and 43 by providers; 81 were dealt with through texting, 48 through phone calls, and five in person (missing data = 2). This translates to roughly seven interactions between participants and the outreach nurse per week, with approximately four (58 %) of these occurring for medical or social issues and the remainder (42 %) for study-related issues or "check-ins".

Baseline Focus Group

The baseline focus group with HCPs, designed to elicit attitudes, beliefs and intentions for integrating the WelTel SMS intervention into clinical practice, highlighted three elements: (1) the importance of recognizing the Oak Tree clinic model of care, (2) anticipated benefits for patients, and (3) concerns for rollout.

Current Model of Care

In articulating their interest in the WelTel intervention, HCPs strongly emphasized the patient-centered care model practiced at Oak Tree Clinic and the high value placed on building relationships with patients as key markers of the Oak Tree clinic 'identity'. This model recognizes that multiple social barriers inhibit medication adherence, calling upon the need for HCPs to work collectively in strategizing engagement opportunities for each individual. Respect for adherence to this model of care was the most important concern for HCP participants.

As "HCP5" stated:

> "I think that part of our job is… to give the medication and make sure we tailor the best medications as per personality and personal barriers… views and values, etc. but I think the other part is really the multidisciplinary… support of the group because….it's HIV and not another chronic disease: they need a lot of support for their treatment because many of them have social barriers… we all know that if you don't have any housing that even if you are sick and your CD4 is 20, you will not be able to get your ARVs or take your ARVs or probably care."

Authentic relationships with patients, marked by respect, trust and familiarity, were notably a crucial element of providing comprehensive care to HIV positive women. However, maintaining this level of personalized

connection and commitment is challenging. As "HCP4" points out:

> "The comfort [that exists between patients and providers at Oak Tree] is around the relationship-building because with HIV it takes a while for people to feel comfortable. And once they've known a care provider for a long time, and somebody else comes in, it's just another step."

Interestingly, it emerged that many HCPs were already texting with patients, or communicating via other electronic means such as email, albeit in a non-systematic way; making this intervention one that was readily accepted among HCPs. Participant "HCP1" explains,

> "I think we use every method we can [to communicate with patients] within the confines of the clinic… I do for example, phone sessions and I will email people because sometimes people are more comfortable with that and they like to write and I mean I do like to see people [in person]… but I mean I think that even just a quick phone call can make a huge difference to someone, particularly those people who don't live in the city….. I find that texting is way more – I don't know – works way better, even than a phone call."

Perceived Benefits

Responding enthusiastically to the potential of texting to improve communication with hard-to-reach Oak Tree Clinic patients, HCPs identified three main areas of benefit to patient participants that included: (a) the organization and streamlining of outreach efforts to improve patient/provider interactions, (b) the use of non-conventional measures to connect with patients; and (c) the increase in agency provided to patients by both the provision of a cell phone and the opening of a channel of communication with care providers.

Organization/Streamlining WelTel's potential to streamline existing ad hoc communication systems with hard-to-reach Oak Tree Clinic patients via an automated platform, while ensuring provider confidentiality was noted. HCP personal privacy when engaging patients through texting or email was an ongoing concern prior to the intervention, with HCP preferring not to use these methods of communication or to wait until access to a work email or phone was available to connect with patients. "HCP1", who routinely communicates with patients via text, explains:

> "I mean I had some struggles with it because it means giving out my cell phone number and I had to think very carefully about that. But you know what? Its' worked really well, and I mean my cell is not my main phone by the way, it's like a spare – I only use it really for work and when I'm out, so it wasn't a personal number, but I didn't know who that would be and it's actually been – it's worked really well."

"HCP2" expressed more concern regarding personal privacy: "I have had a couple of patients ask if they can text me which I said no, because I—I won't give out my own phone number." Indeed, the focus group revealed a wide variety of practices with respect to texting (and other eHealth methods) participants. Not all HCPs communicated via text messaging, and only "HCP1" had access to a work-provisioned cell phone. The ability of the WelTel platform to obviate these concerns through an automated platform that also secures confidentiality of participants through a non-traceable contact number was well received. Indeed, it was felt that feasibility of text-messaging interactions would be improved with availability of the WelTel platform (which would act to organize communications), and that care providers would find it more acceptable to communicate in this fashion when their privacy was not impacted.

The appeal of WelTel to organize and improve patient/provider communication included both the texting aspect of the intervention, and the intention to provide cell phones to hard-to-reach patients with no phone. In this case, the provision of a cell phone could streamline outreach efforts by enabling HCP to interact readily with patients rather than having to seek them out in person each time communication was desired.

> "HCP1": "I could tell you right now that I have several clients that I think would really benefit who right now we have no way of communicating with, right, and who are less likely to come to the clinic… and who just maybe can't afford a phone… maybe they got in trouble financially and their phone, it's no longer in use, that kind of thing. So, I really think it could certainly make a huge improvement in certainly the quality of care and from a counseling perspective, just staying in touch. Um yeah, it doesn't always guarantee that they're going to come, but at least we know they're out there and that's a step and then maybe then by that we can get outreach or someone and you can start again and slowly kind of encourage them to come in."

The practicality of such an intervention in reaching out to patients through text messaging, particularly when the alternative is sometimes searching for them on foot further speaks to the acceptability of the intervention in this population.

Non-conventional Communications Health care providers identified some groups as being more difficult to engage than others. Meeting these individuals where they are by communicating with and engaging them in a fashion with which they feel comfortable was felt to be an acceptable and even desirable goal.

> "HCP1": "Yeah. It seems like [younger patients] can deal with that whereas if you're actually asking them to phone you back and have a conversation that might not be comfortable, and so, yeah, I had to learn how to text, and I'm the world's worst texter, but I was really surprised that people would actually respond. And sometimes they would respond spontaneously. You know I would just get sent a text, not because I'd reached out but because they were reaching out."

> "HCP5": with time, we will probably need to use more cell phone and email and this kind of communication… and at the end, sometimes it actually does save time. 'Cause it's easier to text "are you okay?" "I'm okay, no problem" than – 'cause then when you get to the phone you feel kind of you need to ask more, and sometime they're not interested."

With improved communication a desired outcome, a method that organized non-conventional forms of communication was felt to improve feasibility of communicating with and engaging patients that shy away from conventional provider/patient interactions.

Increased Agency The group felt that existing text message communication offers patients increased agency in initiating contact with HCPs and directing the encounter. This willingness to engage patients through new media reflects the patient-centered model of care, and promotes multi-directional relationships; increasing the agency of patients to become active participants in their own care. As "HCP 3" states:

> "I think it could be a lifeline for some. And some of our patients tend to be, um, they'll be really sick, and they really won't want care, and I think if we sort of kept connected to them there might be more women who come in and receive the care, if we stay in touch with them."

HCPs also remarked on the role of cell phones as status symbols among patients at Oak Tree Clinic, and the potential for the WelTel intervention to improve self-esteem. As "HCP5" states, "it may actually increase their self-esteem, as if 'I'm important enough to get a cell phone'. Because there is in our society kind of the notion that cell phone is status." Indeed, the participants in this focus group felt that providing cell-phones for hard-to-reach patients could be a 'lifeline' for many, not just for communicating with the clinic, but also with family and friends providing a crucial layer of social support needed for optimal medication adherence and health.

Concerns

In spite of the perceived benefits of the WelTel intervention, HCPs had two predominant concerns: (1) the potential for texting to replace traditional clinical care, and (2) the creation of additional demands on HCP's time.

The immediacy of text messaging was regarded as a double-edged sword. The potential that increased texting with patients, whether via existing systems or the WelTel intervention, would create an expectation of immediacy regarding care or even replace traditional clinical care was raised. As "HCP2" states,

> "I have a bit of concern…that it might lead to more and more texting and then I would worry that that's how they would see their care being done, because it's so convenient for them, and we'd be able to respond quickly and everything like that. I would hate to see it as though this is how your care is now, is via texting, or phone, or whatever, versus in person."

"HCP5" further elaborates:

> "I think one thing is to get hold of them, and the other thing is actually to provide care. And sometimes even if you actually get hold of them, that doesn't necessarily mean that you actually provide care…. So when we get hold of them there is the extra step that we need to do, that they need to do."

Interestingly, the potential for WelTel to result in time savings was regarded with ambivalence. Initial reactions suggested that "a text message usually prompts other work… consulting team members, or pulling lab results," ("HCP4"), and that staff "might not be able to keep up with the [workload], depending on how many people choose to text" ("HCP2"). A consensus emerged later in the discussion, however, that "if this is really successful and people do… start to adhere [to their HIV medication]… [the workload] would even out over time." The primary reason for this being that patients "that aren't adherent are more work," ("HCP2"). These observations speak to the feasibility of the intervention, which was linked more specifically to sustainability based upon the current amount of staffing available in the clinic. Overall it was agreed that if the intervention was successful in improving adherence (and as an extension of this, improving the health of those receiving the intervention), then it would be both feasible and sustainable in the long term. The overarching concern regarding use of WelTel

among HCPs was that the intervention would not replace the in-person patient-centered care offered at the Oak Tree Clinic, but rather fit within it.

Post-intervention Interviews

Results of study-end interviews with HCPs involved with the study revealed two main themes believed important to clinical practice: (1) the workload required to integrate WelTel into the Oak Tree model of care, and (2) the usefulness of the intervention to engage, empower, and interact with patient participants.

Workload for Integration into Oak Tree Model of Care

Managing Text Message Responses HCP reports of workload and time demands of the intervention were consistent with predictions in the preliminary focus group. From "HCP9" perspective, WelTel did steadily increase time demands on staff:

> "When somebody texts you something they're asking you to do often, and they're asking you to do something, so either make a referral to someone, or you know get meds reordered, or look up blood work, so all of those things are, none of them are like hugely time consuming in that moment, but it's extra work."

Simultaneously, WelTel served as a tool for supporting more regular care and preventing emergent problems from becoming crises, suggesting time demand increases were the result of an evened out workload, rather than an actual increase:

> "HCP9": "We had someone's text a couple of weeks ago, saying they thought they had a concussion and so we facilitated an outreach worker going to pick her up and bring her to the emergency to be seen. So again, you know that created work for the person but had she not been seen and had, you know all of the work up for that, what in terms of our clinic and management follow-up to that, I don't know."

The primacy given to building relationships and trust with patients at Oak Tree Clinic also impacted WelTel's time-associated demands, as staff prioritized immediate responses to the texts:

> "HCP9": "I think we were able to meet people's need, um by responding pretty much right away. I don't know how sustainable that is, in a larger program…. But I think that's also what contributed then to people feeling like they had a connection with the clinic, like they had a connection with myself, or the research team, that they felt like their kind of voice was heard, because it wasn't this kind of system that was getting back to them, it was a person who could interact with them back and forth a few times generally within, for sure within the day, if not within the hour of them sending their message."

These quotes all highlight the staff resources needed to prioritize the needs of patients texting the platform which would need to be taken into consideration when implementing the WelTel intervention in a clinical context. Indeed, available staff time would impact the feasibility and sustainability of the intervention and may well limit the number of individuals the clinic could offer the intervention to at any given time.

Managing Phones/Phone Plans From the perspective of HCPs, providing and maintaining cellular phones for patient participants was challenging. Lost phones, monthly cell phone plan management, and maintenance were managed by a research coordinator, and thus did not impinge on HCPs time, but would increase time demands in a non-research context. There was also concern that cell phone management by the Oak Tree Clinic could create "dependency", particularly when problems arise with phones. As "HCP6" explained, participants would call the clinic to address problems with phone functioning rather than the cellular service provider:

> "I think the patients should go to [the cellular service provider] directly, not through me, 'cause I was just kind of an extra unnecessary step… we had created this dependency… maybe that role could be given to outreach or a social-worker or something… Have it transition to a more sustainable self-management thing."

HCP asserted that in order to be feasible for long term clinical use, the management of phones and cell-phone plans subsidized by the clinic must either be managed by the patients themselves, or would need to be factored into staffing decisions surrounding intervention support.

Usefulness of the Intervention in Providing Care

HCP remarked on the usefulness of the intervention to: (a) empower patient participants to take an active role in their own care, (b) to strengthen patient-provider relationships, (c) to provide customized patient-centered care to individual patients based upon their individual needs, and (d) to improve uptake of HIV related and community services. In light of the patient-centered care model, which acts as a central tenet of patient-provider interactions at the Oak Tree Clinic, HCP found the intervention to be a very acceptable means through which care could be provided.

Patient Empowerment A widely noted benefit perceived by HCPs was the potential for the WelTel intervention to

increase the sense of empowerment among patient participants. The bi-directional nature of the texting intervention provided participants with a channel for actively engaging in their health care rather than passively waiting for their next appointment to address pertinent health issues:

> "HCP9": "I think it is a tool for empowerment, because they could ask us for their blood work in a text, as opposed to waiting, um, you know weeks or even sometimes months, till their next appointment, to hear that their viral load is now undetectable, or their CD4 is increasing, or like positive outcomes, and so to be able to text that back, and – and really encourage, and you know, celebrate some of those successes with someone was really neat."

Relationship Building The WelTel intervention provided opportunity for HCPs to develop more personalized relationships with patients. In particular, HCPs believed that directly connecting patients with the needed caregiver encouraged patients to prioritize complex health needs that might otherwise be ignored:

> "HCP9": "for someone to text back and say, I'm really low this week, and we can say, can we connect you with our counselor, and have her give you a call, and just stuff like that, that might of just kind of sat on the back-burner, to have it addressed right away, um I think definitely improved their health."

Offering Patient-Centered Care HCPs also emphasized the need to customize the intervention for patients, based upon their individual needs.

> "HCP9": "I think it's best to let them direct the response and… we got things back from just people. Just having like a cheery thanks for asking, or you know like—you know kind of that emotion, I feel cared for type response, to people wanting specific, "can you send me my latest blood work?", to "Can you check my next appointment?" to "Not great, my thrush is back," like you got, you know it—it allowed our patients … to direct where they wanted to go with it…. In a group in general who are more marginalized or are more vulnerable, I think it's really important to allow to- to have that platform, that they can then direct where they want to take it, or not respond."

Interestingly, HCPs also noted increased enjoyment in their work from connecting with patients more directly. As "HCP9" stated:

> "Not just me, but our clinic in general [had more interaction via texting during the study] which I liked. I enjoy linking other people and I could see that some of the other clinicians as well enjoyed like, hearing from people through texting and would come to me, you know to ask to follow-up on something through a text back to the person."

Increasing Patient Access to Services While the instantaneous and direct nature of text message communication was a key feature of empowerment, it was noted in some instances that these benefits were believed to result from the provisioning of cell phones to certain participants, rather than the texting itself. In these cases, the possession of a cell phone resulted in increased uptake of community and HIV-related services, as well as better connectedness to personal support systems. This was felt to be very acceptable by HCPs involved with the study.

> "HCP7": One of the women that has the lowest self-esteem of the patients, she couldn't believe she gets the cell phone, and then she really learned how to use it and to text message, and then one day she even said she text messages to all her friends… way beyond the medical part. And her self-esteem really significantly improved."

Though 52 % of participants were provided a study phone, benefits of receiving a phone and of receiving weekly texts are difficult to decouple within the scope of the study. Engagement literature suggests that increasing social capital—the network of social relationships and resources that individuals can draw on for social support—can have a positive effect on engagement in care for HIV+ women [29]. As "HCP8" suggested:

> "I noticed fairly profound change in being able to access [the participants] and therefore their better connection to community services as a result, I believe, that the [resulted from] having access to the cell phone…. In my role as an outreach worker, I'm constantly trying to find people who are not really engaging in their care, who might be open to me kind of pursuing them, so, when [one patient] got the cell phone, probably over the period of three weeks, I started seeing how easy it was to connect with her, versus just looking for her on the streets or talking to community agencies, saying 'if she shows up, can you call me?'".

Discussion

This mixed-method formative stage investigation of a bi-directional mHealth intervention for improving engagement in HIV care explored the perspectives and experiences of HCPs. Results suggest that the WelTel intervention can

have a positive impact on individualized dimensions of engagement, such as medication adherence, appointment attendance, and addressing social-structural barriers. In addition, the intervention facilitated a more coordinated approach to outreach efforts in order to address challenges related to housing, food security and social determinants of health, and enhanced communication between patients and care-providers, which contributed to enhanced trust and improved provider-patient relationships.

When considering factors related to system adoption, the TAM indicates that a system must be both easy to use and useful for an individual to adopt it. HCPs reported no significant challenges with learning to use the system. More importantly, the automated platform alleviated many of their concerns around privacy and availability that were related to use of their personal phones when texting with patients.

While the HCPs did express concerns around the time demands of the intervention, our analysis illustrates a reconfiguration of clinical duties across providers involved in the intervention, rather than an increase in total staff time. Indeed, as a direct result of the intervention, an average of seven interactions were handled each week by HCPs (for 25 participants); with the majority of triage and problem solving being handled by our study nurse. This did, however, decrease over time. Qualitative interviews, revealed that crisis prevention was a significant benefit of the intervention, and that interactions often required involvement from members of the entire inter-disciplinary health team at Oak Tree Clinic, beyond those adopting a more traditional case manager role. Counseling services, for instance, accounted for 50 % of non-medical patient-provider interactions. The qualitative data suggests that outreach efforts were noticeably streamlined by the intervention, and that the tangible benefits of this intervention greatly exceeded the time demands of the interactions wherein only 17 % of non-medical interactions were directed to outreach practitioners, thus potentially saving them time and proving to be both useful and easy to use. Of note, a potential limitation of this study is the bias towards reporting a high proportion of quotes by HCP9 (our outreach nurse), who had the greatest interaction with patients in the study.

It is also particularly important to note the number of SMS interactions related to the study itself. These interactions, which included issues such as malfunctioning phones, minutes top up and clarification questions, accounted for 19 % of all interactions (1–2 per week), which were addressed by the research coordinator. While the growing pains associated with initiating and maintaining mHealth interventions are likely to decrease over time, the additional time demand associated with these issues must be factored into design of any sustainable mHealth intervention program if the technology is to be accepted and implemented as a program.

The openness of the 'How are you?' text message, which allowed participants to direct the nature of interactions, was welcomed by the HCPs. Indeed, our study underscores the need for mHealth interventions to create a more humanized and individually tailored connection, despite the automated nature of SMS texting. While medical-based issues accounted for the majority (62.5 %) of all SMS interactions, a substantial number concerned non-medical issues and simple check-ins. Though the small sample size of both patient and health care worker participants limit the generalizability of this pilot study, the response data collected throughout the intervention demonstrates the usefulness of WelTel as a tool for better categorizing and tracking the needs of various patient populations.

For instance, though not statistically significant in this small population, participants from the "distance" and "low CD4" groups had the most "problem" responses. Indeed, patients living at distance come less frequently to clinic; suggesting that with standard care, problems may go unanswered for weeks or months at a time. Similarly, those with low CD4 counts risk increased morbidity if engagement or medication adherence is suboptimal, and if problems are not dealt with in a timely fashion. This knowledge draws attention to those groups who perhaps are most likely to benefit from such an intervention, and has served to inform a larger study powered to examine effectiveness of the WelTel intervention on health outcomes in these individuals. Of note, the provision of cell phones to patient participants was viewed as an important aspect of the intervention to reach patient participants 'where they are at, and will be continued in the larger study.

Recent literature has suggested that a broader conceptualization of engagement in care can have beneficial impacts on health outcomes for people living with HIV [30]. A recent systematic review by Saberi et al. [31] of technology-based self-care methods for improving adherence to ARVs found that individually tailored technologies that facilitated communication with providers were significantly more successful than uni-directional interventions [32]. The Oak Tree Clinic's patient-centered model of care recognizes social barriers inhibiting medication adherence, and values interventions that benefit patient engagement. Indeed, the openness of the 'How are you?' text message, which allowed participants to direct the nature of interactions, was welcomed by the HCPs. Our study underscored the need for mHealth interventions to create a more humanized and individually tailored connection, despite the automated nature of SMS texting.

Conclusion

Results from this study demonstrated the critical importance of designing interventions to fit within distinctive clinical cultures and models of care. Overall, HCPs felt the mHealth intervention was a positive experience for both HCP and patients alike; proving to be an acceptable addition to the Oak Tree Clinic's interdisciplinary, patient-centered care model by providing an alternative tool for engaging vulnerable HIV+ patients in care, while promoting patient agency and empowerment. The intervention also served to build on HCP relationships with patients and appeared to improve service uptake, while organizing and streamlining existing mHealth efforts and dealing with privacy issues. The intervention was well received among HCP as it was felt to be both feasible and sustainable from a workload standpoint, provided that concerns around management of phones and phone plans, and the provision of time to triage and manage patient responses was accounted for. HCPs believed that although workload may augment initially, intervention benefits would be greater than the HCP-desired outcome of improving HIV viral loads, and would address more of what patients need—support with the social determinants of health underpinning engagement and adherence to HIV care. With the focus of HIV care strategies shifting more and more to towards improving engagement in care and adherence to HIV medication, this study provides important considerations for the adoption of bi-directional mHealth interventions aimed at improving engagement and adherence to cART for HIV+ persons.

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