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Opinions and Attitudes of Participants in a RCT Examining the Efficacy of SMS Reminders to Enhance Antiretroviral Adherence: a cross sectional survey

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INTRODUCTION

Anti-retroviral therapy (ART) has significantly reduced morbidity and mortality for people living with HIV/AIDS in sub-Saharan Africa¹. However, incomplete treatment adherence, leading to treatment failure, development of drug resistance, and HIV disease progression remains a major concern^{2,3}. While initial concerns about poor adherence leading to widespread drug resistance have not been realized, evidence does suggest that adherence among individuals in sub-Saharan Africa declines over time^{4,5}. Given the prohibitive costs of second line therapy, successful adherence support interventions may be cost saving⁶.

Increasing mobile phone ownership across southern Africa has raised the possibility that text messages using the short message service (SMS) can be used to improve ART adherence. While there is extensive data from high income countries demonstrating that SMS technology is a feasible and cost effective means of improving adherence to HIV management^{6,7}, research from Africa has not conclusively demonstrated that SMS improves adherence to ART^{8,9}. Despite the fact that SMS adherence interventions are being

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implemented widely by HIV programs across sub-Saharan Africa¹⁰, it is also unclear if such interventions are acceptable to patients.

We sought to determine the acceptability of SMS interventions among participants in a randomized controlled trial (RCT) evaluating the efficacy of SMS reminders to improve visit adherence in Gaborone, Botswana¹¹. Our objective was to establish whether using SMS reminders was acceptable to patients on ART.

METHODS

We undertook a cross-sectional survey of the HIV-infected adults enrolled in an RCT evaluating the impact of SMS reminders on ART pharmacy collection and clinical outcomes. Participants were recruited from a single outpatient facility in Gaborone, Botswana. Those in the intervention arm of the trial received SMS reminder messages when medication refills were due, while the control group received no SMS reminders. At the end of the RCT, all participants were invited to participate in the survey to evaluate the acceptability of SMS reminders in HIV care.

The survey tool was based on similar questionnaires used in previous adherence research^{12,13}. All participants were invited to answer questions about (1) acceptability of SMS reminders as an adherence intervention, (2) perceived barriers to SMS reminders in HIV care, and (3) perspectives on the role of SMS interventions across the spectrum of HIV services. All interviews were conducted in English via telephone interview by the same investigator (SD). The survey tool was piloted with study site nurses before being used with study participants.

Chi-square and Fisher's exact tests were used to assess associations between responses to each component of the questionnaire in the control and intervention arms. Statistical analyses were performed using STATA software version 12. A 2-sided p-value of 0.05 was used to designate statistical significance. The Institutional Review Boards of Botswana's Ministry of Health and the University of Pennsylvania approved this study.

RESULTS

Eighty-three patients (SMS n=42, Control n=41) of the 128 originally randomized completed the full survey for a response rate of 65%. Of those who did not complete the survey, 39 could not be reached, three declined to answer, and three only partially completed the survey. Correcting for multiple tests, there was no significant difference in terms of age, gender, years of education, length of time on ART, or whether they had told someone about their HIV status between those that completed the survey and those that participated in the main RCT but did not participate in the survey¹¹. There were also no differences in these characteristics between the SMS and control groups.

Table 1 shows the survey responses by SMS group. Of those receiving the SMS reminders, 93% stated that SMS reminders were somewhat or very helpful, compared to 58% in the control group who felt that SMS reminders would be helpful ($p<0.001$). Only 10% of those that received SMS reminders compared to 56% of those in the control group expressed concern that receiving SMS reminders might lead to inadvertent HIV status disclosure ($p<0.001$).

For both groups, reminders to attend scheduled doctor's appointments were the primary information they would want from SMS messaging (46% of controls and 60% of SMS group). Only 20% of those that received SMS reminders and 5% of those in the control group stated that they would want to receive daily SMS pill reminders ($p=0.05$). Controls

felt that either morning (49%) or anytime (39%) would be the best time for receiving a message, while the SMS group preferred mornings (79%).

Of those that received SMS reminders, nearly all (95%) were satisfied with the appointment scheduling, and 90% would have liked to continue receiving SMS texts for future pill refills. Most (79%) would recommend this SMS service to others who have HIV. Over half (55%) felt their opinion of the SMS service improved over the course of the study. The primary reason reported for not collecting their pills were financial (36%), job obligations (17%), and not being able to get to the clinic (10%).

DISCUSSION

Our analysis is notable for three important findings that have significant implications for implementation of SMS-based adherence interventions across southern Africa. First, the study demonstrates that SMS reminders – used to remind patients to attend clinic visits and pick up HIV medications – are acceptable to patients, with minimal intrusion into their daily lives. Notably, the results also demonstrate that those that had experienced SMS reminders were more favorably inclined to them than those that had not received SMS reminders; and that in more than half of subjects that this favorable response improved during the duration of the study. While data demonstrating the impact of SMS reminders on clinical outcomes, such as virologic suppression and CD4 recovery are inconclusive^{9,14}, our research suggests that patient opposition to the intervention is unlikely to be a barrier to implementation. Given the high levels of enthusiasm among those in the intervention arm, our research also provides data to support using SMS-experienced peer educators to support any such scale up of this intervention in the same way in which such peer educators have been used to strengthen other areas of HIV service delivery^{15,16}.

Secondly, our data supports the hypothesis that inadvertent HIV status disclosure *is* an important perceived obstacle to use of SMS technology in southern Africa. A significant minority of participants that did not receive SMS reminders were concerned that SMS reminders might compromise their confidentiality. Despite high levels of phone ownership in Botswana the practice of phone-sharing is common⁸. Consequently it is not surprising that so many expressed concern about status disclosure. Several steps can be taken to mitigate the potential risk of disclosure (such as the use of general, non-HIV language). However, given that very few participants in the intervention arm expressed concern about accidental exposure, our data would also suggest SMS reminders rarely led to HIV status disclosure in practice.

Thirdly the study demonstrates that patients did not want to receive SMS reminders for all areas of their HIV care. While participants in both groups supported SMS reminders to attend clinic appointments (60% in the intervention arm vs. 46% in the control arm), it is notable that only 20% of controls and 5% of cases expressed enthusiasm for daily SMS reminders to improve HAART adherence. This is consistent with existing data showing that weekly SMS reminders improved pill adherence, whereas daily reminders did not^{8,17}. Habituation or the diminishing of a response to a frequently repeated stimulus may explain this finding. Daily messages may be perceived as intrusive. Further research is needed to distinguish the mechanisms as to why less frequent messages are most acceptable to participants.

There are several limitations to our study. While we believe that the results have considerable bearing to other settings in southern Africa, we acknowledge that since participants were recruited from a single site, sampling bias may have influenced the results. Furthermore, the study sample size was small (n = 83) and we were unable to determine the

impact of factors such as socioeconomic status, and employment history on survey response. In addition, although the survey tool had been piloted before initiation of the study, it had not been externally validated. Performing interviews in English may also have limited responses to questions for those participants for whom English was a second language. Furthermore, minor differences between survey content in intervention and control arms was inevitable as the groups had different experiences in the trial; although these differences were minimized, questions to each group were not identical. While we recognize that many individuals in the main RCT did not participate in the acceptability survey, the demographic profile of these individuals was no different from those that took the survey and thus we believe that our results are representative of the individuals in the intervention study.

CONCLUSION

This research demonstrates that mobile phone technology is an acceptable tool for improving adherence to ARV collection. Although HIV status disclosure is a potential obstacle to scale up of SMS adherence interventions as expressed by some participants, this was less of a concern in the intervention group. Consistent with existing data from Africa, our analysis demonstrates that SMS reminders are perceived far more favorably for intermittent ARV collection than for daily pill adherence.

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Table 1

Attitudes and opinions about SMS reminders among participants in the control and SMS intervention group

Question	No Intervention No. (%) N=41	Intervention—SMS adherence No. (%) N=42	P Value ¹
Receiving SMS texts (was/would be)			
• Very/Somewhat Helpful	24 (58.5)	39 (92.9)	<.001
• Neutral/Not helpful/Annoying	17 (41.5)	3 (7.1)	
Agreement with receiving medical SMS text messages has a risk to the privacy of my HIV status			
• Strongly Agree/Agree	23 (56.1)	4 (9.5)	<.001
• No opinion/Disagree/Strongly disagree	18 (43.9)	38 (90.5)	
Other information about HIV you would like texted to you			
a) Reminder to take pills everyday	8 (19.5)	2 (4.8)	.05
b) Reminder to attend scheduled doctor appointments	19 (46.3)	25 (59.5)	.27
c) Information about STDs	6 (14.6)	10 (23.8)	.41
d) Resources for counseling	6 (14.6)	9 (21.4)	.57
e) Sexually transmitted disease prevention techniques	5 (12.2)	3 (7.1)	.44
Best time to receive a reminder SMS			
• Morning	20 (48.8)	33 (78.6)	<.01
• Afternoon	6 (14.6)	2 (4.8)	.16
• Evening	2 (4.9)	2 (4.8)	.99
• Anytime	16 (39.0)	5 (11.9)	<.01

¹Fisher's Exact Test