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Mobiles For Quality Improvement Pilot In Uganda

BRIEF

SHOPS
Strengthening Health Outcomes
through the Private Sector

Summary: This brief is a summary of *Mobiles for Quality Improvement Pilot in Uganda*, November 2011, the full report of a qualitative evaluation conducted by the SHOPS project. Pamela Riley and James Bon Tempo prepared this brief which presents the pilot's objectives, methods, findings, and lessons learned. The evaluation revealed that family planning providers who received daily text messages reported:

- Being motivated by reminders to adhere to hand washing rules
- Referring to training manuals when receiving a quiz question about treatment protocols
- Re-learning steps in instrument sterilization they had forgotten
- Using tips about pain management to more closely attend to clients

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Project Description: The Strengthening Health Outcomes through the Private Sector (SHOPS) project is USAID's flagship initiative in private sector health. SHOPS focuses on increasing availability, improving quality, and expanding coverage of essential health products and services in family planning and reproductive health, maternal and child health, HIV/AIDS and other health areas through the private sector. Abt Associates leads the SHOPS team, which includes five partners: Banyan Global, Jhpiego, Marie Stopes International, Monitor Group, and O'Hanlon Health Consulting.

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The FrontlineSMS:Learn software is available at http://learn.frontlinesms.com.

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Health workers in developing countries receive limited opportunities for refresher trainings to update their skills. Given the rapid growth in mobile phone ownership, even in remote areas, mobile technology provides a potentially complementary channel for education, support, and encouragement. A qualitative evaluation of a pilot in Uganda, detailed in the full report[1], revealed that family planning providers who received daily text messages reported:

- Being motivated by reminders to adhere to hand washing rules
- Referring to training manuals when receiving a quiz question about treatment protocols
- Re-learning steps in instrument sterilization they had forgotten
- Using tips about pain management to more closely attend to clients

These positive user experiences have important implications for health programmers. Text messages provide a novel and cost-efficient way to: raise awareness, promote behavior change, address common myths, identify performance gaps, incentivize new practices, refresh skills, and increase cohesion among co-workers and peers. This brief describes the pilot's objectives, methodology, findings and lessons learned, to inform future applications.

Background

The Strengthening Health Outcomes through the Private Sector (SHOPS) project, funded by the United States Agency for International Development, seeks to increase the role of the private sector in the sustainable provision and use of quality family planning and reproductive health, maternal and child health, HIV and other health products and services. One of the areas of technical focus of the SHOPS project is to identify, deploy, and scale promising uses of mobile technologies to improve health outcomes. The use of mobile technologies to achieve health outcomes, or mhealth, provides promising opportunities to engage new private sector resources for, and to strengthen private sector provision of, family planning and reproductive health services.

To address resource constraints affecting human resources for health, SHOPS partners Abt Associates, Jhpiego, and Marie Stopes International collaborated on a mobile learning and performance support pilot called Mobiles for Quality Improvement (m4QI) conducted in Uganda from September 2010 to August 2011. This pilot was designed to facilitate the transfer of clinical training into practice, and support quality improvement and quality assurance in the workplace. The goal of m4QI was to demonstrate the potential for positive behavioral change in service delivery by reinforcing face-to-face initial training provided to Marie Stopes Uganda (MSU) staff.

[1] Riley, Pamela and James BonTempo. November 2011. *Mobiles for Quality Improvement Pilot in Uganda*. Bethesda, MD: SHOPS Project, Abt Associates.

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Inspired by text messages about the importance of hand washing in service provision, staff at Hoima Center installed an additional hand washing station.

Due to resource constraints, health care providers in developing countries often lack access to the latest clinical protocols, and have limited options for in-service training. Within this context, mobile phones offer an innovative channel through which to provide cost-effective approaches for clinical training and support to improve the quality of care.

Research has demonstrated that spaced reinforcement, or "distributed practice" combined with testing can significantly improve long-term retention of knowledge and skills. A recent study in Kenya found a link between text message reminders and adherence to malaria treatment guidelines. Based on this growing body of research, the hypothesis for the pilot was that learning reinforcement and assessment via text message would lead to the successful transfer of family planning/reproductive health training into on-the-job performance and adherence to clinical protocols.

Pilot Objectives

The objectives of m4QI were to develop and test a technology-supported approach to performance improvement and facilitate the transfer of clinical training into practice. The pilot aimed to:

1. Design a process for identifying performance gaps in adherence to clinical protocols
2. Develop a software platform to manage and automate the delivery and receipt of text message reminders and quizzes to address the gaps
3. Produce actionable data to improve the effectiveness of supportive supervision and follow-up

METHODOLOGY

Uganda was identified as the pilot site due to its robust mobile ecosystem and strong interest from SHOPS local partner MSU. MSU owns and operates 14 health centers offering affordable primary health care and family planning services, and 16 outreach teams who perform free long-acting and permanent method family planning services, targeting poor rural women.

Sample population: The pilot was conducted with 34 family planning staff working in six geographically dispersed service delivery sites—both brick-and-mortar and mobile—owned and operated by MSU. All MSU staff members at the six sites participated in the pilot. Their job functions included receptionists, lab technicians, service providers, doctors, drivers, housekeepers, and managers.

Choice of target behaviors: Four target behaviors were selected for the pilot: hand washing, sharps disposal, instrument decontamination, and a pain-management technique called vocal local. Vocal local employs trained staff members using conversational techniques to distract clients from pain and reduce anxiety. Criteria for selection included behaviors that were required of all staff, observable on a daily basis, and identified through routine audits as ones with inconsistent adherence.

Message development: Messages were developed for each of the four target behaviors to strengthen performance using a process to identify barriers to regular adherence. For each behavior, the pilot team created a matrix to identify: why such behavior was important, what the benefits were to both the provider and client for adherence, and any relevant existing training content.

Message scheduling: For each target behavior, a total of four messages were developed: two reinforcing tips/reminders/encouragement and two assessment questions to trigger and test recall of knowledge. A schedule of one message per day, four days per week, for eight weeks was established, allowing for each message to be repeated twice over the eight-week period, and a mix of topics to be covered throughout a week.

Technology platform design: To support scalability and replicability, the pilot platform was designed for users of low-end phones, and for those without access to the Internet. FrontlineSMS was chosen as the underlying platform because it is free and open source, widely used by nongovernmental organizations with limited technical expertise to send and receive large number of text messages, and does not require Internet access.

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SMS training messages can be accessed in the workplace reducing the need for off-site refreshers.

Technology platform development: The pilot developed software code for a "plug-in" module to FrontlineSMS called FrontlineSMS:Learn. Appfrica, a Ugandan software development organization, was selected through a request for proposal process to write the code and support the platform during the pilot. The choice of Appfrica was guided in part by the "coded in country" philosophy, committed to supporting local economic development and capacity building, and ensuring ongoing local support. The code was developed over an eight-week period, with collaboration among Appfrica, FrontlineSMS, and the Jhpiego technology advisor.

Sample Message

Mixed chlorine solution must be kept in a closed container. True(T) or False(F). Reply 4T or 4F.

Sample automated reply to participant response:

Correct answer: (True). That is correct. The chlorine solution loses concentration when left in an open container so it must be kept in a closed one.

Incorrect answer: (False). That is not correct. The chlorine solution needs to be stored in a closed container because it loses concentration when left open.

FrontlineSMS:Learn

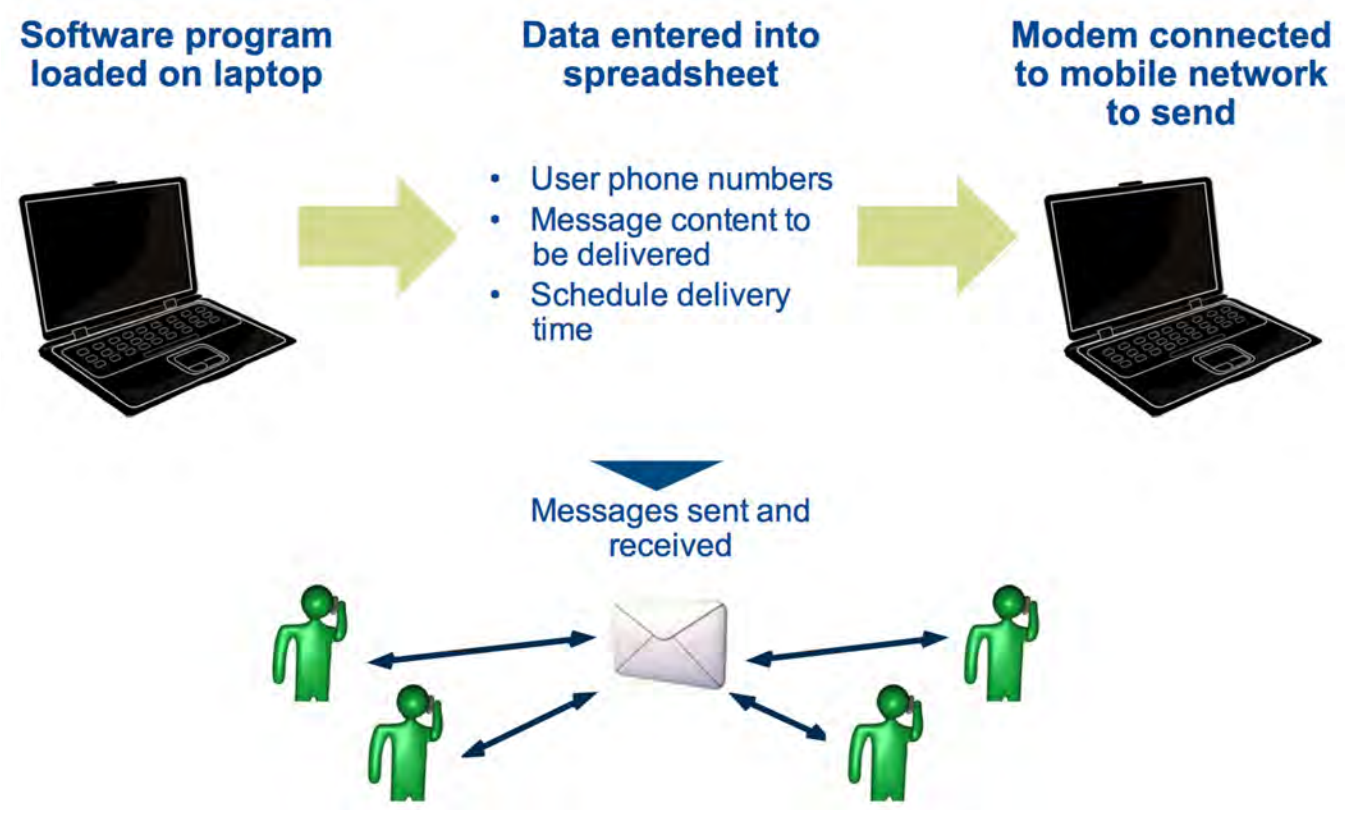
The software included new training-specific features:

- A databank of messages that can be stored by topic
- Quiz functionality with automated responses and remediation
- The ability to schedule in advance the delivery of messages
- Generation of grades based on assessment results
- Calculation of item difficulty to determine what specific questions were challenging for participants

Pretesting and orientation: Messages were tested with five staff members at the MSU Kavule Health Center in Kampala to identify possible software errors, and solicit feedback on message clarity, delivery, and process. A process was established to introduce the background, purpose, and mechanics of the intervention to participating sites, but due to time constraints and scheduling conflicts, the managers from the pilot sites were not briefed in person. Follow-up instruction was conducted through email and phone calls to the managers, but in a number of cases, managers had not been briefed prior to the start of message delivery, and others did not have time to communicate about the pilot to their staffs. As a result of these implementation gaps, some pilot participants reported having no idea why they were receiving work-related text messages, who they were from, or what they were expected to do.

Deployment: The m4QI platform was hosted and managed by MSU's research department, which was responsible for locating a computer dedicated for the project, acquiring a modem and SIM card to attach to the computer for sending and receiving text messages, downloading and installing the FrontlineSMS:Learn software, entering the participants' phone numbers, adding messages and scheduling their delivery, and monitoring the software operation.

Figure 1: m4QI Platform deployment



Monitoring and evaluation: A process evaluation was conducted to document project development and implementation processes aimed at generating lessons learned and recommendations to inform scale-up of the application and approach. Structured interviews were conducted with key local personnel involved in the implementation, including all staff at four of the pilot sites, followed by analysis of key themes and sub-themes.

FrontlineSMS:Learn, like other FrontlineSMS applications, is designed to provide real-time access to information in a dashboard format that shows message status, date, recipient's mobile number, and the content of the message. The MSU monitoring and evaluation manager was able to review data to ensure messages were being sent and received as scheduled. Monitoring activities for the pilot were largely focused on troubleshooting the operational and technical challenges experienced during deployment.

Feedback From Participants

"I gave a wrong response to one question and I received instant reply/feedback. The feedback was very clear." Transport Assistant

"People are more serious with hand washing. The project remained as a constant motivator of hand washing." Outreach Manager

"I now make sure that before I prepare the solution, I must ascertain concentration of the chlorine by reading on the manufacturer's label." Health Center Lab Technician

RESULTS

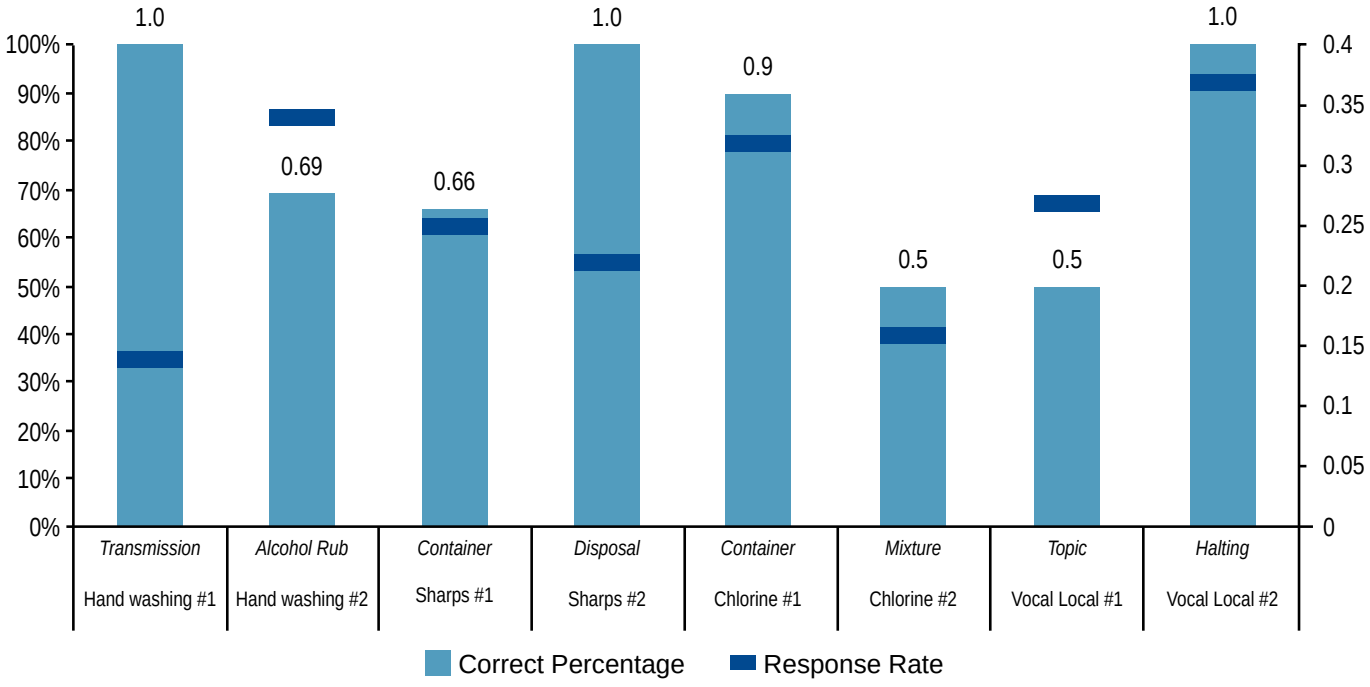
The pilot achieved its objectives with regard to successfully identifying performance gaps that could be addressed through text messages, and deploying a software application to automate the delivery and receipt of test messages to address the gaps.

1. A process was designed to identify performance gaps in adherence to clinical protocols.

In selecting the indicators to target in the pilot, the team used routine audit data collected by regional managers with input from clinical training staff on barriers that typically prevent consistent adherence to those indicators. This information was used to hone message development. Based upon participant responses, the messages did identify knowledge gaps, with incorrect responses submitted to four of the eight assessment questions. The software allows for an item difficulty analysis, showing the percentage of correct responses to a question (Figure 2).

Figure 2: Assessment Item Difficulty Analysis

The graph displays response rate and assessment item difficulty, as represented by the percentage of correct answers received.



Source: USAID SHOPS Project led by Abt Associates (2011)

All responses were correct for four of the questions, suggesting adequate knowledge of the topic addressed. Those questions on which all participants do well can either be removed or edited to target a different element of the indicator. The FrontlineSMS:Learn software also includes a "grade book" report that shows an individual learner's performance on sets of assessment items grouped by category, and allows one to pull up the details on the questions included in the category and the learner's specific responses to them.

2. A software platform was developed to manage and automate the delivery and receipt of text message reminders and quizzes.

The key result from the pilot is that the supporting software application largely performed as designed. Reinforcement tips and assessment questions were successfully sent to pilot participants, and automated replies sent to those who responded. The FrontlineSMS:Learn software will be available in the near future for free download from **learn.frontlinesms.com**.

The key result from the pilot is that the supporting software application largely performed as designed.

Although 86 percent of messages sent were successfully received, a number of technical issues resulted in intermittent periods of non-delivery or untimely delivery. These technical challenges included modem problems, failure to renew airtime on the SIM card, and software bugs that transmitted the same message multiple times. Some messages were also inadvertently scheduled for delivery in the middle of the night because of an error reversing AM and PM in message scheduling.

The pilot team conducted analyses of data generated and collected in the backend database for illustrative purposes. Given the small sample size of the dataset, these results do not allow for statistically significant conclusions to be drawn but they provide examples of the useful analyses made possible by the software.

Participant average response rate was 19 percent and was consistent throughout the pilot. Several factors contributed to this relatively low level of engagement, most importantly a software bug that sent repeated quiz questions on the same day. Given the importance of active participation to successful learning, it is significant that the common pattern of high initial involvement followed by a rapid decline was not observed. When controlling for days when message delivery was problematic, there was no significant difference between the average number of answers submitted per day between the first and second halves of the pilot period (4.7 and 4.8 messages per day, respectively).

Measurable responses were reduced by formatting errors. In order for the automated functions of FrontlineSMS:Learn to work properly (e.g., responses to correct or incorrect answers and generating reports), answers submitted by learners must be specially formatted using the number of the question and the letter corresponding to the answer (A, B, or C for a multiple choice question or T or F for a true/false one). Sixty-six

percent of all assessment responses were received in a correct format despite participants not having received any formal orientation or training. A number of steps were taken to reduce formatting errors including revising the code to accommodate more response variations (e.g., “6 True” or “6.T” in addition to the expected “6 T”), and sending out several mass messages calling attention to the need to type the question number first in the reply.

3. Actionable data were produced to improve the effectiveness of follow-up from supervisors.

For those assessment items that caused difficulties for providers, training coordinators could follow up with them directly (via phone or during a supportive supervision visit) to reinforce the correct knowledge and behaviors. This step was not incorporated into the pilot, which was focused on building and testing the tool. Based upon structured interviews, the participants reported changes in their knowledge, practice, and motivation related to the four indicators. These qualitative findings suggest that the messages offer a useful medium through which supervisors can gain insights into barriers to provider adherence to recommended practices.

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Participants reported that messages were generally considered to have been clear, understandable, informative, and relevant to them. Feedback also indicated areas for improvement, and instances where the content was confusing or dull. The quiz format with a need to recognize “true” and “false” statements was unfamiliar to some.

The evaluation produced specific examples of how clinical practices had changed for each of the four indicators as a result of the intervention, including practices not directly addressed in the messages. These practices included the distribution of more IEC (information, education, and communication) materials throughout one clinic to remind staff about proper hand washing, the placing of chlorine solution at more locations in treatment and procedure rooms, and a new ban on answering phone calls during procedures.

In addition to the self-reported behavior changes aligned with the four indicators, the project also recorded positive increases in information sharing on service standards. Pilot participants mentioned more staff consultation regarding the text topics, instilling a culture of inquisitiveness. The pilot was described as promoting team learning and research on questions related to the text questions, and increasing use of training reference manuals and clinical guideline documents. Participants also reported increased motivation on the job due to a stronger connection with the support office.

LESSONS LEARNED

The pilot demonstrated that FrontlineSMS:Learn facilitates training reinforcement and assessment of providers. Utilizing data generated from the software, managers can make programmatic decisions for supportive supervision and follow-up training, targeting specific gaps in knowledge and adherence. Among the most encouraging results were the provider comments on referring to training manuals and clinical guidelines when they did not know the answer to a quiz question. The use of text messages to trigger regular referencing of instructional materials and guideline documents is an important lever for improving clinical practices.

Given the limited scale of the m4QI pilot, the impact of these operational benefits were not measured, nor was evidence produced regarding sustained behavior change. Data on assessment responses were analyzed but there was no monitoring or follow-up intended to be provided by supervisors within the short pilot time period. Consistent with the purpose of a pilot, the m4QI project was designed as a proof-of-concept, and it exposed various operational and technical challenges to inform future deployments. Lessons learned are presented below.

The m4QI project was designed as a proof-of-concept, and it exposed various operational and technical challenges to inform future deployments.

1. **Technology-supported interventions require dedicated human resources to provide support and solve technical problems.**

The challenges included failure of messages to be delivered due to incompatibility of the software with a common operating system, purchase of an incompatible modem, software bugs that resulted in multiple deliveries of the same message, incorrect scheduling due to selection of AM instead of PM for message delivery, and message failures due to length beyond 160 characters.

The extensive troubleshooting required more resources than had been budgeted. Part-time MSU staff resources allocated to support the pilot, already stretched by heavy workloads, were further impacted by turnover of key positions, protracted illnesses by several key personnel, and lack of clarity regarding the local programmer's role in supporting the pilot. The lesson learned is to expect the unexpected when implementing mobile applications. The m4QI pilot introduced new behaviors on a new technical platform among new partners working across three continents. Local dedicated project management with some technology savvy would have expedited resolution of challenges and improved pilot operation.

2. **Planning and budgeting for mobile learning initiatives should include broad internal stakeholder input and a formal communications process.**

The m4QI pilot would have benefitted from more formal communications among a broader group of stakeholders within MSU, including wider circulation of project work plans, budgets, and pilot overview materials.

There was no formal internal communications plan for the team, based on an expectation that, given the small number of m4QI core team members, informal use of emails and calls would best serve the project aims. This was a weakness of the pilot, especially given turnover in key staff positions (changes in MSU operations director and research director). The project's orientation talking points could have been better shared and made more widely available to project stakeholders, and additional background materials socialized with project stakeholders.

The introduction of mobile learning initiatives should begin with an organization-wide orientation to the purpose and expectations. Efforts to mainstream new approaches to training and assessment require shared understanding and active participation from all levels of an organization. An inclusive process for content development and analysis of short message service (SMS)-supported training programs, particularly with quality assurance managers, will improve program acceptability and success.

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3. Adequate participant orientation is critical to ensure engagement in text message training interventions.

Plans to orient pilot participants—involving face-to-face orientation for center and outreach team managers from pilot sites who would then cascade the training to their staff—were not implemented as intended due to scheduling challenges. At this point, the pilot schedule should have been revised, to allow this crucial phase to occur. Instead, the pilot was launched, with many participants receiving messages before being briefed on their purpose and what was expected of them. Among the issues needing to be addressed prior to launching text training messages are 1) why it is important and beneficial to participants, 2) what is expected in terms of message frequency, timely responses, and formatting of replies, and 3) where to go for questions, concerns, or problems.

4. A process for prepayment of airtime subsidies is needed when relying on providers' use of personal phones for workplace purposes.

During pilot planning, it was assumed that due to the small scale of the pilot (requiring participants to reply to two SMS assessment questions per week for eight weeks), participants would use their own airtime for the 16 text messages, with the airtime to be reimbursed at the end of the pilot. Lack of prepaid airtime was in fact a barrier to participation and likely contributed to low response rates on the assessment texts. The lack of prepaid airtime was exacerbated by the gaps in participant orientation to the pilot, with some not aware that the project intended to reimburse them after the pilot. During a check-in call with random pilot participants, several commented that unless they were provided with airtime prior to receiving quiz questions, they were unlikely to respond, although this attitude was not entirely reflected in the quantitative response data.

The project explored the options of procuring reverse billing services for SMS received from the pilot participants but the service provider indicated that it was not available for the SMS service used by the project. The issue was solved by making individual cash transfers to the center and outreach team managers for weekly distribution to their staff for use in purchasing airtime to cover the costs of the SMS replies. Recommendations for future applications include prepayment in advance of use through remote "topping up" of airtime in conjunction with assessment texts.

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CONCLUSION

The promising results of the m4QI pilot have important implications for health programmers. The positive user feedback supports expanded applications with larger-scale populations, and across a range of provider training needs. SMS applications such as FrontlineSMS:Learn can span multiple countries, but because international texts are more costly than in-country texts, it is usually more cost effective to set up national services in each country. The platform is well-suited for use by organizations working in limited-resource environments to address any content area, with any size group of "learners."

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Because FrontlineSMS:Learn is an open source project, the code can be adapted to add functionality to suit education/training, performance improvement, and behavior change needs in other programs. Among the new features identified during the pilot for future enhancements to FrontlineSMS:Learn are creation of a peer-to-peer network that can facilitate sending and receiving of texts to specific cohorts within a larger population, additional and more robust reporting features, and the ability to create a course template with predefined message schedules that could be assigned to groups of users or that a user could register for via text message.

The mobile learning platform and process developed in this pilot is not designed for large data collection or data management needs better served by higher-end phones or SMS tools using structured forms. The platform is designed to build on existing training or educational programs, as the 160 character limitation of text messages is not suited to the presentation of comprehensive content such as would be available through Web-based e-learning tools.

The SHOPS project is currently identifying an appropriate market in which to scale up the mobile learning platform, to target loosely networked providers with limited access to clinical skills-development resources. This will address the additional challenges—and greater need—in maintaining quality standards when there is not an employer-employee relationship to motivate adherence to protocols. A key objective of the next iteration will be a more rigorous outcome evaluation to measure impact on provider performance. This phase will also examine the cost-effectiveness of the intervention to support sustainability.

Acknowledgments

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