Exploring Mobile Technology to Enhance Birth Outcomes in Rural Mozambique: Pilot Study Results

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ABSTRACT

Background: The global proliferation of mobile technology has generated a new tool to address public health challenges and shift the paradigm of health care access and delivery. The World Vision Organization currently has a Mobile Health Division that has developed *Mobile Technologies for Health* (mHealth). This platform bridges the practice of medicine with the practice of public health, through mobile technologies. This new field has emerged as a viable source to communicate health needs and collect community health data. It has been used to enhance healthcare information delivery to community health workers (CHW), researchers, physicians and patients, in real-time—and in the midst of rural, geographically-primitive areas.

Program Background: Improving the well-being of mothers, infants, and children is an important public health goal across the globe. Enhancing health behavior during pregnancy can determine the wellbeing of the next generation and can help predict future public health challenges for families, communities, and the health care system. World Vision's goal for this project was to examine the value of using mHealth in rural Mozambique to enhance pre-natal health promotion messaging/outreach to pregnant women.

Evaluation Methods and Results: Mobile phones were used to deliver a series of health education modules, in addition to data collection, CHW training, and a system to prompt emergency referrals. The pilot intervention design had 2 arms: with the mHealth intervention arm utilizing CHWs equipped with mobile phones and the comparison/control arm using CHWs without mobile phones. Surveys were administered at the end of the study to women in both groups to explore knowledge and awareness of danger signs during pregnancy the postpartum period among study participants. Odds ratios, confidence intervals and p-values for each indicator were calculated and compared between groups.

A total of 188 women were recruited into the study, with 93 in the intervention arm and 95 controls. Mothers in the intervention arm were less likely to have ever attended school (52%) compared to the controls (74%), as well as more likely to work outside the home (68% versus 59%, respectively). Results indicate that more mothers in the intervention arm could identify at least 2 danger signs during/after delivery when compared with mothers in the control group (11.8% versus 5.3%, respectively, *OR*=0.4, *p-value*=0.05). However, knowledge of danger signs in pregnancy was statistically higher in the control group versus the intervention group (68% compared to 52%, *OR*=0.4, *p*=0.009).

Conclusions: While these pilot intervention study findings are not conclusive in terms of program effectiveness, the feasibility of using mHealth in rural Mozambique was demonstrated. Group differences between the intervention and control arm were identified and the potential bias they presented on overall study results must be further explored.

Implications for Research/Practice:

The risk of maternal and infant mortality and pregnancy-related complications can be reduced by increasing access to quality prenatal care. World Vision's mHealth intervention shows promise as a feasible way to enhance knowledge among women of childbearing age in a rural, developing country. Further research and support to examine this platform is warranted.

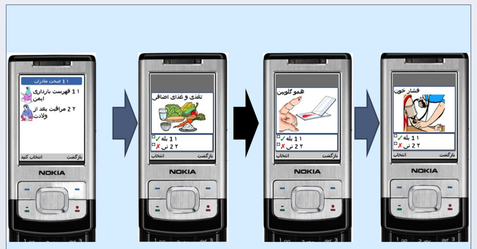
Methodology

The application used in this study was created by CommCare™, a mobile and web-based platform that creates software for healthcare-related information around the world, along with its technical partner, Dimagi. The mobile phones were used for health promotion plus data collection, CHW training and emergency referral.

Information Management

CommCare system organized and archived patient records while:

- Providing CHW training
- Reducing need for paper
- Serving as mechanism for emergency referrals



Human Resources

- CHWs (n-24) received 10 days of training on application and modules.
- CHW's initated home visits , recruited and enrolled participants from June 2011 through January, 2012—continuing visits until birth event
- CHW were selected from intervention/control communities to enhance rapport with participants

Training included:

- Pregnancy and postpartum modules
- Basic skills of mobile phone usage (power, text, data entry)
- Utilization of CommCare application
- Basic research enrollment

Module Content

Danger signs emphasized: bleeding, pain, fever, convulsions

Data Collection and Analysis

- Survey administered to gauge knowledge of mothers on pregnancy and postpartum danger signs at the end of study implementation phase
- Raw data collected in centralized database, STATA9 format
- Data cleaned and recoded for analysis.

RESULTS

The survey had a total sample of 188, with 93 from the intervention area and 95 from the control area. There were similar numbers of boys and girls amongst children under 12 months of age, in both areas. It was found that more mothers in the control area had ever attended school and more mothers in the intervention group worked outside the home. Table 1 presents background characteristics of the participants.

Background Characteristics	Results (%, 95% CL)	
	Intervention Area	Control Area
Sex of children of mothers interviewed:		
Boys	48.9 (38.2-59.7)	46.7(36.1-57.5)
Girls	51.1 (40.3-61.8)	53.3(42.5-63.9)
Mothers who have ever attended school	51.6 (41.0-62.1)	73.7 (63.6-82.2)
Mothers who work outside the home	67.7 (57.3-77.1)	58.9 (48.4-68.9)

Indicator	Intervention Area		Control Area		p value	OR
	%	N	%	N		
Mothers who know at least 2 danger signs in pregnancy	51.6	93	68.4	95	0.009*	0.4
Mothers who know at least 2 actions to be taken for bleeding in pregnancy	17.2	93	14.7	95	0.3	0.8
Mothers who know at least 2 actions to be taken for fever in pregnancy	3.2	93	9.5	95	0.04*	3.1
Mothers who know at least 1 action to be taken for fits during pregnancy	4.6	87	1.1	91	0.09	0.2
Mothers who know at least 2 danger signs during/after delivery	11.8	93	5.3	95	0.05*	0.4
Mothers who know at least 2 actions to be taken for excess bleeding during/after delivery	1.1	93	0	95	0.2	0
Mothers who know at least 2 actions to be taken for fever during/after delivery	1.1	93	1.1	95	0.4	0.9
Mothers who know at least 2 actions to be taken for fits during/ after delivery	1.1	93	0	95	0.2	0

The results above show, mothers who know at least 2 danger signs in pregnancy is significantly higher in the control area (68%, *OR*=0.4, *p-value*=0.009) than in the intervention group (51.6%). The higher proportion of school attendance history amongst mothers could have accounted for this difference.

The CHWs reported that they were able to use the mobile phone templates with ease and that the recorded algorithms help them make decisions for women who report complications. They reported successful facility referrals for such women and were pleased that their referrals were given priority attention, once at the facility.

SUMMARY OF FINDINGS

Only three of the comparisons of danger signs were found to be significant. Higher number of mothers who are educated in control group. CHWs reported ease use of mobile phone templates and successful and timely facility referrals. Pregnant women in the project's intervention group had a higher likelihood of accessing antenatal care, preparing for birth and have births assisted by a skilled provider

LIMITATIONS/CHALLENGES

- Self-selection bias
- Logistical Issues: Quality of Life; Sufficient bandwidth for large datasets
- Phone maintenance
- Quality of Life; confidentiality
- CHWs literacy and visual ability
- CHWs using phones for personal use

FUTURE DIRECTIONS/CONCLUSIONS

For future studies, taking more time to teach more basic phone operations uses could be effective for the CHWs to have a better working knowledge of the cellular phone. Also, finding more efficient and accessible power sources will be important when using electricity-required devices for future studies.

The technologies that are the basis of mobiles phones are becoming more powerful and cheaper; however, evidence surrounding the incredible value and potential mobile phones/technology offers areas of the developing work in terms of promotion of enhanced maternal and personal health. mHealth has the great potential to become a steady and viable resource in rural areas that lack the necessary health resources for their population.

REFERENCES

• Cherian, D. (n.d.). *Use of mobile phones for improvement of maternal, newborn, and child health care*. Retrieved from http://beta.wvi.org/health/mozambique-mhealth

• Kaplan, W. A. (2006). Can the ubiquitous power of mobile phones be used to improve health outcomes in developing countries?. *Globalization and Health*,*2*(9), 1-14.

• Patrick, K., Griswold, W. G., Raab, F., & Intille, S. S. (2008). Health and the mobile phone. *American Journal of Preventative Medicine*, *35*(2), 177-181.

• Chang, L. W., Kagaayi, J., Arem, H., & Nakigozi, G. (2011). Impact of a mhealth intervention for peer health workers on aids care in rural Uganda: A mixed methods evaluation of a cluster-randomized trial. *AIDS Behavior*, *15*, 1776-1784.

• Chang, L. W., Njie-Carr, V., Kalenge, S., Kelly, J. F., Bollinger, R. C., & Talisuna, S. A. (n.d.). Perceptions and acceptability of mhealth interventions for improving patient care at a community-based hiv/aids clinic in uganda: A mixed methods study. (2013). *AIDS Care*, 10, 1-7

• Iwaya, L. H., Gomes, M. A. L., Simplicio, M. A., Carvalho, T. C. M. B., & Dominicini, C. K. (n.d.). Mobile health in emerging countries: A survey of research initiatives in brazil. (2013). *International Journal of Medical Informatics* (Article in Press)

• Tamrat, T., & Kachnowski, S. (n.d.). Special delivery: An analysis of mhealth in maternal and newborn health programs and their outcomes around the world. (2011). *Maternal Child Health Journal*, *16*, 1092-1101.

• Martinez, F. (n.d.). Developing a full-cycle mhealth strategy.*Frontiers of Health Services Management*, *29*(2), 11-20.

• Leon, N., Schneider, H., & Daviaud, E. (n.d.). Applying a framework for assessing the health system challenges to scaling up mhealth in south africa. (2012). *Medical Informatics & Decision Making*,*12*(123), 1-12.

• Rajput, Z. A., Mbugua, S., Amadi, D., Chepnheno, V., Saleem, J. J., Anokwa, Y., Hartung, C., & Borriello, G. (n.d.). Evaluation of an android-based mhealth system for population surveillance in developing countries. (2012). *J Am Med Inform Assoc*, *19*, 655-659.

• _Gloyd, S., Floriano, F., Seunda, M., Chadreque, M. A., Nyangezi, J. M., & Platas, A. (2001). Impact of traditional health birth attendant training in mozambique: A controlled study. *Journal of Midwifery & Women's Health*, *46*(4), 210-216.

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