

PRE-ECLAMPSIA INTEGRATED ESTIMATE OF RISK ON THE MOVE

Preventing the deadly complications of pre-eclampsia using a mobile phone

Pre-eclampsia is the second-leading cause of maternal death in childbirth globally, killing 76,000 pregnant women and 500,000 fetuses and infants each year. Over 99% of the women and babies who die or suffer complications related to pre-eclampsia live in middle and low income countries. Pre-eclampsia, a rapidly progressive condition characterized by high blood pressure and the presence of protein in the urine, arises during pregnancy and following delivery, and affects both the mother and the unborn baby. Deaths related to pre-eclampsia are often preventable and typically due to delays in diagnosis and treatment.

The Child & Family Research Institute (CFRI) at the University of British Columbia developed a groundbreaking solution to this global health challenge with Saving Lives at Birth seed funding in 2011. The technological solution integrates two separate previously successful innovations: the miniPIERS (Pre-eclampsia Integrated Estimate of Risk) predictive model and a Phone Oximeter. By combining these innovations in a mobile phone application, they can be made immediately available in rural, low-resource community settings. Together they produce a cutting-edge mHealth application that empowers community healthcare providers in rural, low-resource settings to rapidly and reliably assess risks to mothers and children, and to save lives by providing appropriate treatment and/or referral to higher level health centers.

Implementation date: September 2012 to October 2013

About PIERS on the Move

"PIERS on the Move" integrates the miniPIERS (Pre-eclampsia Integrated Estimate of RiSk) predictive model, which can accurately stratify women into risk categories up to one week before complications arise and without laboratory tests with a Phone Oximeter, a cellphone based pulse oximeter (a non-invasive device which can measure blood oxygen saturation levels). The mobile phone application assists community health workers in rural, low-resource settings to provide local, rapid and accurate risk assessment, referral, and treatment advice for pre-eclampsia, and transmits information to referral

centers for coordination of triage, transportation and treatment.

Development of the user interface for the PIERS on the Move application involved three phases of usability testing with target end-users in South Africa. Users were asked to complete clinical scenarios, speaking aloud to give feedback on the interface and then to complete a questionnaire to rate all aspects of the tool. A final stage in development included piloting the tool in Tygerberg Hospital, Cape Town, South Africa to confirm accuracy of the decision algorithm.

Evaluation and Results

Thirty-seven nurses and midwives (15: Tygerberg Hospital; 22: Frère Maternity) evaluated the user interface between November 2011 – January 2013. During the first round of usability testing, major issues in the functionality of the touch-screen keyboard and date scroll wheels were identified; during the second, major improvements in navigation of the application were suggested; and finally during the third round, the feedback was satisfactory and only minor improvements to navigation were required. Overall, users felt the application was pleasant and would improve their ability to care for hypertensive women.

Pilot clinical evaluation at Tygerberg Hospital occurred from September 2012 -October 2013. During this time, 165 inpatient women with a hypertensive disorder of pregnancy were evaluated. Among them, three had an adverse maternal pregnancy outcome, two of whom were correctly classified as high-risk by the PIERS on the Move tool.

The next step is a larger clinical evaluation when the developers will seek to leverage the existing research framework and collaborations in Mozambique and Pakistan to provide clear evidence of the innovation's impact and develop a sustainable economic model for its implementation through local demand, value and supply chain creation in Mozambique.



Geographic Coverage: South Africa; planned for Mozambique and Pakistan

Implementation Partners: Child & Family Research Institute (CFRI) at the University of British Columbia

Funder: Saving Lives at Birth Grand Challenge partners, including USAID, the Government of Norway, the Bill & Melinda Gates Foundation, Grand Challenges Canada, and the World Bank

Contact Information:
CFRI: Mark Ansermino, Senior Associate Clinician Scientist and Director of the Innovations in Acute Care & Technology (iACT), Research Cluster (+1-604-875-2000 x6669, part@cw.bc.ca), Peter von

Dadelszen, Senior Clinician Scientist, Reproduction & Healthy Pregnancy Cluster (+1-604-875-2424 x5545, pre-empt@cw.bc.ca)

Grand Challenges Canada: Kristen Yee, Associate Program Manager (+1-416-673-6536, Kristen.yee@grandchallenges.ca)

References:

1. <http://cfri.ca/news/news/2013/07/25/vote-for-piers-on-the-move-for-a-people-s-choice-award-at-saving-lives-at-birth>
2. <http://savinglivesatbirth.net/summaries/276>
3. <http://savinglivesatbirth.net/summaries/37>

Lessons Learned

- Usability evaluation with target end-users leads to a user friendly, intuitive application even for those who have little familiarity or training with smartphone technology
- Larger scale evaluation is required to determine the full scope and breadth of the possibility of global application
- By using ubiquitous smartphone technology, health care workers in low-resource settings are empowered to make decision that can save lives

Conclusion

In low-resource settings, referrals for pregnant and delivering women typically occur only when life-threatening events have occurred. By harnessing the processing and battery power of mobile phones, and leveraging the widespread availability of cellular services in Africa and South Asia, "PIERS on the Move" overcomes the barriers of skill, distance and resources.