



This project aims to reduce perinatal transmission rates of HIV through the enhancement of information management, and to fortify the knowledge base and foster information acquisition and sharing among clinicians, patients, and the community.

## MOBILE APP for Management of HIV in Pregnancy

IMPLEMENTATION DATE: March 2015 - Present

### *Reducing perinatal transmission of HIV by improving information management*

Highly active antiretroviral therapy (HAART) taken by a woman during the peripartum period can virtually eliminate perinatal transmission of HIV.<sup>1</sup> Access and adherence to medication; a skilled, knowledgeable workforce; and patient retention, tracking, and monitoring are essential. However, much of the world suffers severe health care staffing and information deficits. Mobile, electronic health technologies can compensate for these deficits by providing access to patient records, access to up-to-date management guidelines, facilitating clinician and patient communication, retaining patients in care, and enabling extensive data mining and analysis.<sup>2</sup> A mobile technology-enhanced, combined electronic medical record and clinical decision support-system aimed at the co-management of HIV and pregnancy has been developed and will be studied for usability and effects on management processes.

### About Mobile App for Management of HIV in Pregnancy

This project seeks to reduce perinatal transmission rates of HIV by utilizing wireless broadband technology, mobile telecommunications technology, and electronic information systems to create a combined electronic medical record and clinical decision-support system (EMR/CDSS) to support the clinic, clinician, and patient in the delivery of care. This system is accessible via wireless broadband services on Chromebooks, which are low-cost, fast laptops. The wireless broadband accessibility and self-powered nature of the devices ensure that the system has utility in care environments that lack power and grounded Internet connections and when facilities lose power services.

The system utilizes the open source OpenMRS medical record software and the widely recognized CIEL-MVP dictionary, assuring interoperability with other OpenMRS-based systems and concept definition coherence with internationally recognized nomenclature systems. This system also provides the highest levels of security and standards for patient confidentiality.

The system provides access to individual patient electronic medical records. The record itself guides the clinician through both pregnancy and HIV management. Current, evidence-based management guidelines specific to pregnancy and HIV infection have been incorporated at relevant points

throughout the record and are accessible by clicking on an information icon. These guidelines address antepartum, intrapartum, postpartum, breastfeeding, and infant antiretroviral algorithms as well as opportunistic infection management, including malaria and tuberculosis, preventative services (immunization, malaria prophylaxis, deworming, and micronutrient supplementation), breastfeeding recommendations, contraceptive planning, and other pregnancy- and laboratory-related issues—at all points taking into consideration pregnancy and HIV status.

These guidelines are derived from the World Health Organization, Centers for Disease Control and Prevention, the National Institutes of Health, Kenya’s National AIDS and Sexually Transmitted Infection Control Program, and National Institute for Health and Care Excellence sources, and are updated in the EMR/CDSS when they are updated at the source. System-based, interactive graphics allow clinicians and patients to review danger signs during pregnancy as well as cover routine educational elements during visits. Patients may choose to be reminded of upcoming appointments and recalls to the clinic via SMS. Recall and clinic notification of missed appointments can be generated at the discretion of the clinic team. Clinical and administrative flags are generated on both patient-specific and clinic population-specific bases for missed appointments, concerning laboratory analysis values, and missing information. Flags appear both when an individual record is opened and reports are also generated daily for all flags in the clinic system.

As the EMR/CDSS is coded to concepts, reports may be generated at any interval requested, incorporating virtually any parameter that is part of the record. This function will assist with quality assurance and data reporting. Further, as the OpenMRS system is used in many locations worldwide and the concept dictionary is used widely, data from this project may be incorporated with data from other locations.<sup>3</sup> The potential applications of this level of data mining are limitless.

## Evaluation and Results

The research study associated with this project will take place at Kakamega County General Hospital in western Kenya. The EMR/CDSS will be used by clinicians at the point of care in the antenatal clinic for women living with HIV. A Chromebook loaded with the technology will be in the labor and birth suite and the medical director and HIV specialist physician will have a Chromebook loaded with the EMR/CDSS to consult when clinical staff in the antenatal or labor and delivery unit require consultation. The launch date was March 6, 2015.

The research design utilizes qualitative and quantitative approaches. The qualitative element will evaluate user experiences of the system and focuses on changes to

information access, workflow, patient interaction, management decision-making, consultation and referral capabilities, and ease of use.

Quantitative analysis will employ a post-interventional study group and a pre-interventional control group. Comparisons will be made between the two groups with respect to usage of continuous HAART versus no therapy or episodic therapy, treatment with HAART for longer than 12 weeks, and changes in the types of antiretroviral agents used. A sample size of 100 in each group will mean that a difference of 20 percent in treatment between the groups will be able to be detected with 80 percent power (using  $\alpha = 0.05$ ).

## Lessons Learned

- **Unfamiliarity** with using laptop computers and track pads required extra time for training of staff.
- **Extreme weather events** caused widespread power outages in Kakamega and caused extensive damage to the cell tower that the project is utilizing. Paper-based records have been printed to continue with data collection in case of these events in the future.
- **Programming and debugging the record** took longer than expected. This should be prepared for in future projects.
- **The Kakamega-based project coordinator** has been an essential element of the project.

## Conclusion

This project aims to reduce perinatal transmission rates of HIV through the enhancement of information management, and to fortify the knowledge base and foster information acquisition and sharing among clinicians, patients, and the community. It seeks to maximize the utility of clinicians and facilities, extend geographic access and patient volume capacities of clinicians, improve diagnosis and treatment, and enhance data management and analysis in both centralized and decentralized care environments. The study will add to the evidence base regarding the use of mHealth and eHealth systems. All stakeholders are looking forward to the data collection phase of the project. ■

**Geographic Coverage:** Kakamega County General Hospital, Kakamega Kenya

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