

Design and Usability Testing of a Mobile Phone-Based Patient Management System for Women in Rural Kenya

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Overview

Introduction

- Maternal Mortality

- mHealth

Methods

- Setting

- Human-Centered Design

Results

- System Design

- Usage and Usability

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- Lessons Learned

- Future Research

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What we know...

Reducing maternal mortality is a major global health priority.

Most maternal deaths take place during a specific time period.

The burden of maternal mortality is greatest in poor and remote areas.

What we know...

Most maternal deaths are avoidable.

What we know...

Most maternal deaths are avoidable.

Three delay model for maternal mortality:

1. Seeking care
2. Accessing care
3. Receiving care

Mobile Phones and mHealth

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 - ▶ Mobile banking for everyone

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- ▶ Text message interventions
 - ▶ Patient education, health promotion
 - ▶ Provider training

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- ▶ Text message interventions
 - ▶ Patient education, health promotion
 - ▶ Provider training
- ▶ Interactive voice response (IVR)
 - ▶ Patient education
 - ▶ Emergency response

Baby Monitor

- ▶ Targets pregnant women directly with IVR
- ▶ Women answer screening questions by pressing numbers on their keypads
- ▶ Pilot study in Nairobi showed that screenings were reliable compared to in-person assessments with nurses
- ▶ Second study conducted in parallel to this project: assess reliability and validity in a rural, remote population

Research Objectives

- ▶ To understand the roles of CHVs, their responsibilities, needs, and environment
- ▶ To design a patient management system that addresses these characteristics
- ▶ To implement and evaluate the design solution based on feedback from the CHVs

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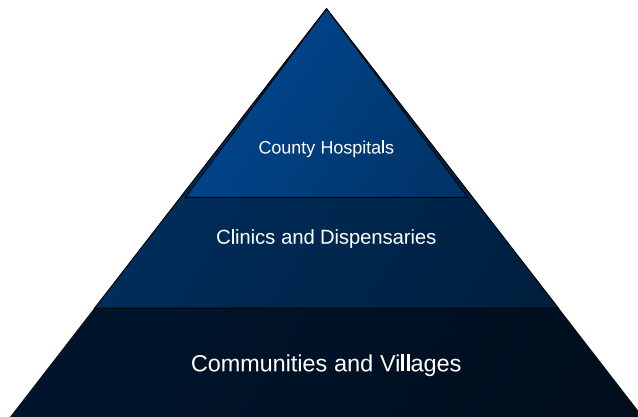
The Health System in Kenya



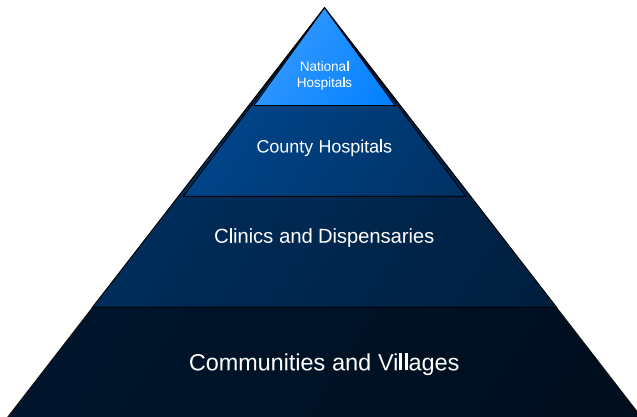
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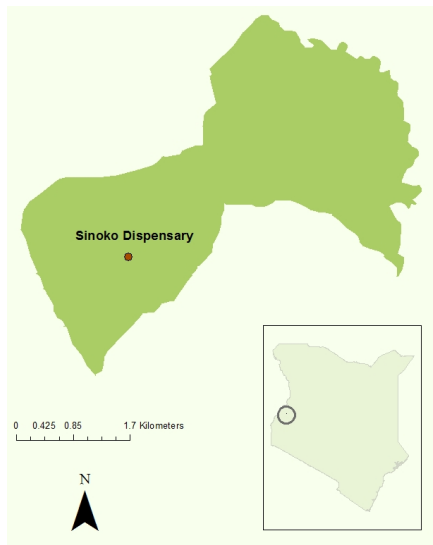


Maternal Health Care in Kenya

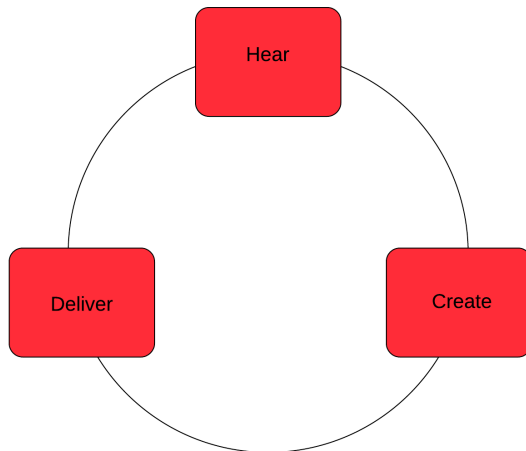
- ▶ Primary delivered at community level
- ▶ Free at all public health facilities as of June 1, 2013
- ▶ CHV responsibilities:
 - ▶ Pre- and post-natal home visits
 - ▶ Identify and monitor women throughout pregnancy
 - ▶ Family planning services
 - ▶ Maternal and child health services

Research Site

- ▶ Two community units
- ▶ Population: 10,744
- ▶ Clinic equipped for deliveries
- ▶ 55 CHVs
 - ▶ 195 individuals
 - ▶ 36 households



Human-Centered Design



Hear Phase

Objective: to understand the users, their responsibilities, needs, and environment.

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How does the current system of community-based maternal and child health care work?

- ▶ CHV focus group discussion
- ▶ CHV shadow days
- ▶ Clinic nurse focus group discussion

Create Phase

Objective: to develop a design solution based on what we've "heard".

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How can voice and text interfaces be integrated to address the users' stated needs and specifications?

- ▶ Verboice
- ▶ VoIP, Asterisk, telecommunications company
- ▶ SMS gateway provider
- ▶ Analysis engine in R
- ▶ CHV mock testing

Deliver Phase

Objective: to implement and evaluate the design solution.

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How well did the design solution address the users' stated needs and specifications?

- ▶ Usage: call data from July 2013 - March 2014
- ▶ Usability: evaluation survey administered through an automated Verboice call

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Reporting Data

- ▶ CHVs submit reports every two weeks to the clinic
- ▶ Approximately 5-6 months to visit each household in each village
- ▶ Home visit information is hand-written, paper based
- ▶ Collecting data on number of deliveries in the community is a key component of reports
- ▶ Nurses rarely used CHV reports; presents challenges for preparing for prenatal, postnatal care at the clinic

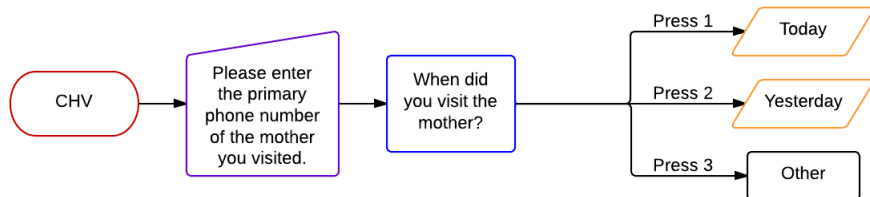
Reporting Data

Design Principle: Reporting home visits through IVR

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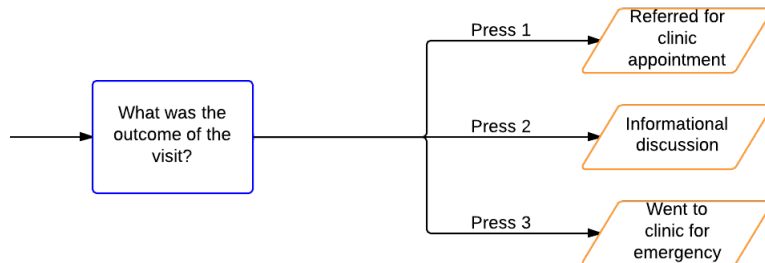
- ▶ CHV "flashes" the Baby Monitor number, receives free call back
- ▶ Identify themselves as CHVs with their national ID number (example)



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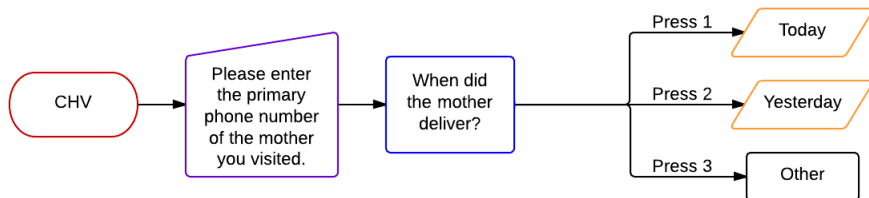
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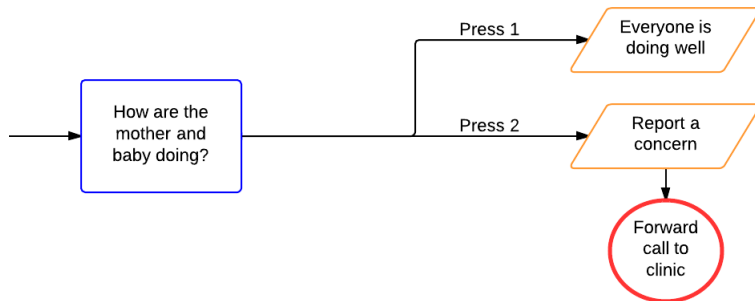
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Patient Referral

- ▶ CHVs carry "referral books" with sheets given to patients to take to clinic
- ▶ Nurses estimated that 50 patients per week referred by CHVs
- ▶ CHVs have no way of knowing whether patients followed up on their referrals
- ▶ CHVs have no way of hearing about deliveries if not contacted directly

Patient Referral

Design Principle: Referral notifications through text message

Patient Referral

Design Principle: Referral notifications through text message

- ▶ Visits from enrolled pregnant women logged by clinic nurses, data entered into Baby Monitor database
- ▶ R analysis script matched each woman who visited the clinic to the CHV assigned to her village of residence
- ▶ Automated text messages sent the following morning

Hi. Betty Odong visited the clinic yesterday! This was her ANC 2 month visit. Please encourage her to continue attending appointments.

Patient Referral

Design Principle: Delivery notifications through text message

Patient Referral

Design Principle: Delivery notifications through text message

- ▶ Family member "flashes" Baby Monitor number, receives free call back
- ▶ Identical to CHV reporting call flow
- ▶ R analysis script matches the woman reported to the CHV assigned to her village
- ▶ Automated text messages sent the following morning

Hi. Betty Odong delivered her baby on 08-04-2014!

Emergency Response

- ▶ CHVs are usually called during an emergency
- ▶ Recommend that the patient go to the clinic for immediate care
- ▶ Often, the clinic was unprepared to handle an emergency case
- ▶ Little to no direct communication between CHVs and clinic nurses about incoming emergencies

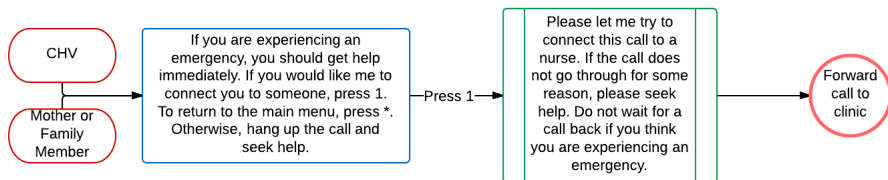
Emergency Response

Design Principle: Reporting emergencies through IVR

Emergency Response

Design Principle: Reporting emergencies through IVR

- ▶ CHV, mother, or family member "flashes" the Baby Monitor number, receives free call back
- ▶ Indicate that they would like to report an emergency



Call Volume

- ▶ 1,312 total calls registered from CHVs
- ▶ 401 valid calls registered from CHVs
- ▶ Call volume fluctuated over the eight month period
- ▶ CHVs reported 95 home visits and 71 deliveries during this period

Usability Results

The system helps me do my job as a CHV better.



The messages are easy to understand.



The messages help me keep track of my clients.



The messages are usually accurate.



The system saves me time.



It is easy to report an emergency.



It is easy to report a home visit.



It is easy to report a delivery.



I like receiving messages from Baby Monitor.



I find the system easy to use.



Response Disagree a lot Disagree a little Agree a little Agree a lot

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Lessons Learned

- ▶ Oral translation of messages
- ▶ Quality of voice messages
- ▶ Mobile network variability

Limitations

- ▶ Pilot study: small convenience sample
- ▶ Time constraints: one single iteration of HCD cycle

Future Research

- ▶ Impact on process outcomes: home visits, clinic visits for prenatal and postnatal care, deliveries
- ▶ Integration of screening service: decision-making support for CHVs
- ▶ Additional features suggested by focus group participants: reminders for upcoming events
- ▶ Considerations for scaling up:
 - ▶ Long-term cost of IVR
 - ▶ Patient enrollment strategies
 - ▶ CHV engagement strategies