

Adapting mHealth to Workflow – A Case Study in South Africa

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Abstract. Community Health Workers (CHW) perform important healthcare and health promotion in many low and middle income countries. They are increasingly supported in their work by the use of mHealth. This study aims to explore how mHealth services can support the everyday work for CHWs when delivering home care in rural areas in South Africa. A single case study was performed, mapping CHWs workflow and investigating where and when CHW can be supported by mHealth services. Despite the very positive feedback from the CHWs and the fact that the studied mHealth solutions appears to support the majority of the important activities in the CHWs work process, the application is no longer in use. Financial and strategic decisions are behind the discontinuation of the project, further stressing the importance of taking all socio-technical dimensions into account when evaluating success or failure of implementation projects.

Keywords. mHealth, Socio-Technical Systems, Community Health Workers

1. Introduction

Globally, healthcare systems are facing similar challenges and a pressure to perform alongside limited budgets and shortage of staff. eHealth has the potential to facilitate the work for healthcare professionals, however problems with low usability and poor interoperability continue to cause problems [1]. Low- and middle-income countries (LMICs) suffer from several health care challenges, one of the major ones being lack of workforce. This leads to understaffed hospitals, patients not having access to care, and a communication-gap between patients and physicians, especially in rural areas. South Africa is a middle-income country with a private and a public healthcare sector. Healthcare is funded by a mixture of taxes, private medical schemes and out-of-pocket payments [2]. The private healthcare sector has larger funding, since it comprises private out-of-pocket payments and medical schemes. This leads to an unequal distribution of healthcare, since most health care professionals decide to work within the private sector, which the poor cannot afford [2].

To bridge this gap, community health workers (CHWs) play a vital role [3]. CHWs are a group of health workers who have a formal but limited training for certain health-related tasks [4]. Their tasks include providing health education, referrals and follow ups,

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home visits to specific communities, and basic preventive health care. They support individuals and families to access the health and social services system [5]. CHWs work outside of health care facilities, visiting people in their homes, neighborhoods, communities or other nonclinical spaces [3]. The individuals and families they visit often do not have the means to go to the health care facility themselves, therefore the CHWs often work in rural areas. Mobile technology support community health workers in collecting health data, facilitate health education sessions, receive alerts and reminders, and to communicate [6]. The concept mHealth has emerged as a sub-category of eHealth and can be defined as medical and public health practice supported by mobile devices [7]. By using mHealth tools, CHWs might be able to improve the quality and range of the services they provide.

To improve design and implementation of mHealth to support home care in rural areas in the future, we need an in-depth understanding of the factors that impact the success or failure of mHealth interventions. Today, there is a lack of empirical evidence of effectiveness when implementing mHealth services in rural home care [8]. mHealth interventions can be classified as complex socio-technical systems [9], and therefore it is important to address more than only technical aspects when studying success and failures of mHealth implementations.

This study aims to explore how mHealth services can support the everyday work for CHWs when delivering home care in rural areas in South Africa.

2. Methods

A single case study was performed, focusing on how mHealth services can support CHWs in South Africa when delivering home care to patients in rural areas. The focus is on mapping their workflow and investigating where and when they can be supported by mHealth services.

2.1. Setting and participants

Data collection was done in two different sub-districts in the North-West province, South Africa. The municipality has a population of around 82 000 people. It is a farming community where the main economic sector is agriculture. There are eight clinics in the area. The clinics are either primary health care clinics or community health centers. Mobenzi is a mobile application for smartphones that had been used in the studied context. It was specifically developed for CHWs in South Africa. Mobenzi allows the CHWs to register patients, collect data and keep records of them. The mHealth solution also allows screening different diseases, sending referrals and intervention-specific functionality according to program guidelines and requirements [10]. Real-time notifications and screening provide real-time decision support. The automatic report makes it possible for management, the outreach team leaders (OTLs), to monitor key indicators. The mHealth application can be used offline, meaning data synchronization will happen automatically in the background, which makes it possible to use in remote areas without network connection [10]. It is possible for the users to communicate with each other through the application.

Since the study is limited to the pilot of a specific mobile health application, the number of users is small. Due to the small group of participants, convenience sampling was chosen as sampling technique [11]. Three focus group interviews were conducted,

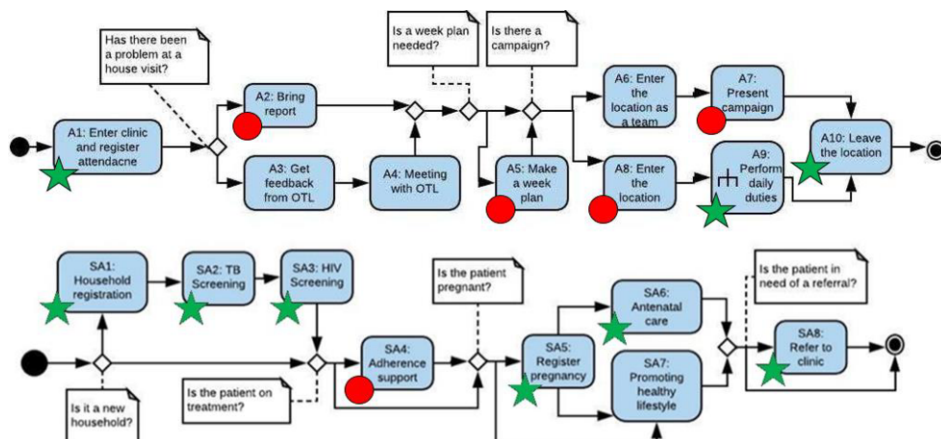


Figure 1. CHWs workflow in the South African context.

one with OTLs and two with CHWs. A total of four OTLs and 23 CHWs participated in the focus group interviews.

2.2. Data collection and analysis

The focus group interviews were mainly held in English, but with support of local researchers indigenous languages were also used when necessary. Interview guides focused on understanding the workflow and activities undertaken by OTLs and CHWs and how the mHealth application supported them in their work. The interviews were transcribed and where necessary translated to English. Activity diagrams were used for visualizing the CHW's workflow (Figure 1). Based on the analysis of the focus group interviews, activities that could be supported through mHealth was identified, and a mapping with the functionality of Mobenzi was performed to further understand how well it supports the current workflow. Qualitative content analysis was used for analyzing the interviews [12]. In this study, we took our starting point in the socio-technical framework proposed by Sittig & Singh [13] focusing on two of the eight dimensions; workflow and clinical content.

3. Results

The analysis of the case study is presented in the form of activity diagrams (Figure 1) with accompanying descriptions of activities that could be supported through mHealth (marked by a symbol in the diagrams). A green star indicates that the studied mHealth solution provides support for this activity, whereas a red circle indicates that it does not. A further description of the marked activities is presented in Table 1.

The activity diagram for CHWs in South Africa was broken down into two parts, where A9 is broken down into sub-activities SA1-SA8.

3.1. Qualitative analysis of the focus group interviews

The South African CHWs were very positive towards the Mobenzi application and said it was very useful to them. They experienced an increase in efficiency, data collection

and entry was faster, and they could do more patient visits when they used it. The application had reminders of which patient to visit and when, which also supported them. According to the CHWs, the application also made their work more tangible and possible to track. They thought Mobenzi helped them feel motivated to do a better job, because they could see their improvements, *“it motivates you to do better and to do more, go an extra mile”*. Mobenzi would also help organizing and structuring the data; *“clients are being categorized in Mobenzi. For the pregnant woman, you found that there is a category for that one with this code, because of Mobenzi, if the woman has already delivered, it will automatically change, there was no need to scroll on the phone and change it”*.

Table 1. Description of CHW's workflow with potential for mHealth support.

Activity	Description	Possible mHealth support	Supported?
A1	The CHW is entering the clinic and registers their attendance	The attendance could be registered in the application which in turn could be integrated with the OTLs' application	Yes
A2	Brings report from previous workday	The report could have been written in the application	
A5	Sometime the OTL and CHW are planning for the CHW to follow during the upcoming week	The week plan could be integrated in the application for the CHW to follow	
A7	Presents campaign for the household. The campaign can have themes such as the usage of condom, encourage to be tested and other health promotions	Instructions for the campaign could be integrated in the application before the presentation	
A8	If there is no campaign, the CHW enters the household on their own	In order for the CHW to be prepared for the visit he/she could read about the household in the application	
A10	Depending if it's a campaign the OTL and CHW leave the household as a team, if not the CHW leaves the household. The CHW can either end their day or enter a new household	Instead of documenting on paper on site or back at the clinic, changes could be edited in the application on site	Yes
SA1	If the household is not registered, the CHW registers it, who lives there, their work, age and other demographic details	This activity is possible to do in the application instead of writing on paper	Yes
SA2	If the household is registered the daily duties is followed by TB screening	The screening could be registered in the application	Yes
SA3	TB screening is followed by HIV screening if there is a new patient	The screening could be registered in the application	Yes
SA4	If the patient has an ongoing treatment adherence support is given. The CHW instructs on how to take treatment and dosage	If the treatment was registered in the application, the CHW could check it and make sure the patient is following the instructions	
SA5	If there is a pregnant patient in the household, she will be registered and educated about healthy eating and the importance of booking visits at the clinic	The pregnancy could be registered in the application and book appointments at the clinic for the patient	Yes
SA6	Antenatal care is encouraged, and post-natal care is provided after the child is born.	The changes in pregnancy and check-ups could be registered in the application	Yes
SA8	If the patient is in need of a referral, the CHW can refer the patient to the right clinic and department	When entering patient data in the application, it will provide a form with yes/no questions	Yes

The CHWs also appreciated the improved confidentiality when using mHealth rather than paper-based documentation; *“sometimes when you let the patient fill out a form, it will be as if the other household members see what this patient is saying in the form. So, if it was captured in the phone, it was much easier to keep the confidentiality”* because, *“each one of us was having a code to get into Mobenzi. I was not able to touch anyone else’s Mobenzi. That’s how it was confidential”*.

In table 2 below, findings from the focus group with the South African participants regarding the clinical content and human computer interface are presented. Three categories could be identified in this theme; missing functions, user satisfaction, and usability.

Table 2. Findings of clinical content of Mobenzi.

Category	Description	Quote
Missing functions	Referrals to other departments is not supported	<i>“More icons for the paper referrals, more icons that would include other departments, because we are delivering an integrated service, so we need to have this integration in the Mobenzi as well”</i> .
User satisfaction	The participants are satisfied with the application.	<i>“Mobenzi was making our work easy because it was faster than the papers”</i>
Usability	The participants think the application is making their work more efficient.	<i>“Mobenzi can you show you your performance” and “for me, Mobenzi was like my additional colleague. In the sense that, it kept me on track with my visit plan. I just follow the guidance. So, it was like my guide, like my adviser, it led me in performing”</i> .

When the participants were asked about what specific functions they miss, they only mentioned one; that they would like to be able to send electronic referrals of patients to not only health clinics, but also other departments, e.g. social services.

4. Discussion and Conclusion

According to the CHWs, they felt their work was more efficient when using Mobenzi. A systematic review about CHWs and mobile technology shows similar results [6]. The CHWs said that they were able to collect data faster, and that they could visit more households during a day when they had Mobenzi. They would also be more effective since Mobenzi reminded them who to visit and when. According to the systematic review [6], there would be less data loss when using mHealth. In this study however, we found that data loss could be one of the issues with Mobenzi. The collected data would sometimes disappear for no reason. We were not able to investigate why this happened, but it is a challenge for the developers to solve. An advantage with mHealth, that the review does not mention but was discussed during the focus group, was that the integrity of patients improved as data was not as easily accessed by non-authorized users in the mHealth tool as it was on paper. Although our results come from one case study, the workflow analysis and suggestions for functions to support the workflow are likely relevant in similar settings. The method of visualizing the workflow and mapping it to functions of the mHealth tool may also be useful to others.

Despite the very positive feedback from the CHWs and the fact that the studied mHealth solution appears to support the majority of the important activities in the CHWs work process, the pilot project was terminated and the mHealth is no longer in use. In the larger research project, further information regarding the implementation and use of the application has been gathered, indicating that financial and strategic decisions led to

the discontinuation of the project. This is a common problem for mHealth and eHealth projects globally, and further stresses the importance of taking all socio-technical dimensions into account when evaluating success or failure of implementation projects.

Acknowledgement

The study was funded through the MobEVAL project (2016-00623) supported by FORTE – the Swedish Research Council for Health, Working Life and Welfare and SAMRC – the South Africa Medical Research Council. This research was also supported by Uppsala MedTech Science & Innovation (www.medtech.uu.se), a joint strategic initiative between Uppsala University and Uppsala University Hospital.

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