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Nurses' Experience of Using an Electronic Medical Records -OpenMRS Module for the Management of Hypertension and Diabetes in Rwanda: A Qualitative Study

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Abstract. The management of NCDs require a secure and continuous collection and use of patient data to improve care and treatment. The OpenMRS NCDs module was developed and piloted in three districts to ascertain the possibility of using it in early detection and management of Hypertension and Diabetes in Rwanda. This paper explored the user experience NCDs module of OpenMRS, an open sources EMR used in health centers of Rwanda. We used two methods to explore the user experience of the system among the nurses: Key informant interviews and observations. We analysed the data using thematic content analysis and drawn upon the views and expectations of the users to experience effective use of the system. We collected the data using the developed and piloted tools. In this study we interviewed 10 nurses and observed how they complete tasks in the system. In general, the nurses found that the system was useful because it simplified patient care and reporting. Some barriers related to the use of the system were slowness of the system, and turnover of trained users. We concluded that during the first 12 months of the pilot of the OpenMRS in 5 hospitals located in three districts, nurses were able to use the system with limited and manageable challenges. However, some challenges related to system design and navigations should be addressed before wider implementation.

Keywords. Nurses, OpenMRS, Hypertension, Diabetes, user experience

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1. Introduction

The use of Electronic Medical Records (EMR) in low and income countries has increased over the past three decades. Rwanda started to use EMR in health centers since 2005 [1]. Large hospitals with resources adopted open source software's to support management of patients in hospitals [2,3]. In health centers of Rwanda, the use of OpenMRS started in HIV program with support of donor funding. Since 2005, HIV module in OpenMRS was developed and implemented in Kenya and Rwanda and later expanded in low- and middle-income countries [4–6].

Over the last 10 years, the use of OpenMRS was expanded in other district hospitals under the guidance of the Ministry of Health in Rwanda. Currently the system is in use in 40 district hospitals and over 500 Health centers in Rwanda [7]. In health centers EMR is mostly used in HIV care. From July 2022, Rwanda Biomedical Center in collaboration with Medtronic labs developed a web based openMRS module for the management of hypertension and diabetes from the community. The system synchronizes data from the Community health workers' mobile application where patients screened for hypertension and diabetes in the community are referred to the health center for further management.

The OpenMRS module for the management and care of patients with diabetes and hypertension has forms for diagnosing and confirming Hypertension and diabetes. The forms are filled by Nurses or other trained health care providers. Based on what the nurses found, the facility follow up is also done on monthly basis using Patient review form. A counter refer form is used to send a patient to the community health workers for Community follow up.

User experience studies focus on how the user interact with and experience use of the product, system, or services [8]. Users shares their perceptions of using the application or the system, how easy or difficult it is and how efficient the system is in achieving its intended function [9–11]. Findings from the user experience inform the system managers and developers on how they could adapt the system to improve user's experience. When the system is in pilot stage, user experience studies provide useful insights on how to improve and scale up the system in the same user groups and settings. This NCDs OpenMRs system was piloted in 5 hospitals and 53 health centers located in 3 districts from southern and Western provinces. The aim of this study was to explore the user experience of the NCD openMRS module for the management of hypertension and diabetes in Rwanda withing its 12 months of implementation.

2. Methods

We applied two methods: user observations and key informant interviews. In user observations, we walked through with the participant in the EMR and observed how the study participants performed the tasks. We used retrospective think aloud and concurrent think aloud [12] to ensure that we capture what the participant perform in the system and what he says about it. In the key informant interviews we asked participants to share their experience of using the system. We selected five hospitals that participated in the initial pilot and implementation of the EMR for NCDs in Rwanda. In each hospital, we selected two health center NCD Nurses, one with high performing and low performing level based on how they screen and enroll positive cases in NCD clinic with the target number of patients with hypertension and diabetes. We used an observation guide to observe the participants' experience of using the system. The guide covered most basic steps

performed by the nurse in confirming and enrolling positive cases in NCD clinic, for follow up visits and transferring a client and schedule the medical appointments. In addition, we used the interview guide to discuss with the participants on how they experienced the system in general. We focused on how they experienced usefulness, usability, ease of use, what they liked and disliked and what they suggest improving the system. Both guides were piloted before data collection. A team of 8 data collectors (co-authors) in pair of 4 visited health centers and conducted the interviews. Each group had a facilitator who led the discussions and a note taker who recorded the discussion and noted participant's views. The data collection happened in March 2024 after 12 Months of the implementation of the EMR at health center level. We analyzed the data using thematic content analysis. We began by reading the transcripts and coded the transcripts. We then reduced the findings and displayed the main findings under the themes and sub-themes. We interpreted what we found and cross checked them within participants and across health centers. We came up with the final themes and sub-themes as the main findings with corresponding quotations. Before engaging the participants in data collection, they signed a consent form. We conducted the interview or observation in a secure and private place to ascertain participants' confidentiality. The study sought ethical approval from University of Rwanda College of Medicine and Health Sciences Institutional Review Board (CMHS-IRB), with approval number No CMHS IRB/199/2024.

3. Results

Participants' characteristics: In this study we enrolled 10 nurses who piloted the application from three districts. The participants characteristics are highlighted in the table 1 below:

Table 1. Descriptive statistics of participants (nurses)

Variable	
Age (Median, (min, max)	40.1 (31,60)
Years of experience (Median, (min, max)	9.3 (1,25)
Sex (n, %)	
Male	6 (60)
Female	4 (40)
Level of performance (n, %)	
High performers	5 (5)
Low performers	5 (50)
Education level (n, %)	
Secondary	26 (50)
University	24 (46.15)

Use of the application during the observations: most of the nurses we observed were able to complete the tasks in the openMRS. In addition, users mastered the use of system because they worked in NCDs services. The participants with little experience or those who were not trained struggled to complete the tasks although they were able to complete them with more time. In addition, for the fields that required data access from the central server, we observed system slowness and frustrations among the users. In our observation, we found that high performing participants were able to use the system and

navigate through it with comprehension of all steps within the system while the low performing nurses are still struggling with the system navigation.

Nurses experience on the use of the system. System was felt as a useful tool: Nurses felt that the system helped them to explore, to store and to organize patient data. In addition, they expressed the value of the system in helping them to provide timely reports, and to track the missed visits. They suggested making it a national priority by adding other programs offered at the health center. The system as shared by the nurses helped them to follow a patient for a longer period and to manage referrals and transfers either from the community or from another health facility. However, the participants experience challenges related to the increased workload due to double data entry (both paper and system data entry). **Technical support:** Nurses still encountered technical issues when using system such as slowness and navigating through the system. However, they reported a quick response and support from the technical team whenever contacted. In addition, the challenges felt by users is lack of training for new employees who joined the service after the training. *"Yes, it helped us in the follow up of NCD in the community, and If it is possible, it will be better to add other diseases such as asthma adding the notification on the appointment schedule of the patient"* ***a nurse.***

System use and the working environment; the participants reported that the system use is dependent on how the health center is organized and functioning where trained nurses may be transferred and the incoming nurse may experience system use knowledge due to lack of training. The users suggested to expand the system application to other services provided in the health center to avoid turnover of experienced nurses on one program. In addition, the users experienced heavy workload because of using both registers and the system which creates a stressing working environment among the nurses. Thy suggested upgrading fully to digital to avoid the burden on the users. *"...has changed because they overloaded them, for me work has changed because you receive client and you enter data, the work has increased, and we are overloaded"* ***A nurse.***

4. Discussion

This paper explored early user experience of nurses who used the OpenMRS for the management and care of patients with diabetes and hypertension in of Rwanda. In our observations, we found that nurses were familiar and experienced to use the system despite some challenges faced by new employees who were not trained during the implementation. Furthermore, we found that the system was experienced by the nurses as a useful tool to follow up patients and to report the trends of NCDs in their catchment areas. Technically, some of the system design and implementation issues such as having a centralized server makes the system use slow and less responsive. This means that, for the system to be scaled up and widely used by the nurses, some of the technical and implementation barriers needs to be addressed. These include providing opportunities to work as an offline system which can synchronize after work, to merge different forms into one form to avoid system navigation challenges and to have continuous trainings. One of the limitations of this study is that the system was evaluated within the first 12 months of its implementations. The challenges and barriers to the use of the system might be due to lack of system maturity resulting from early-stage implementation and use. In addition, some users had a more experience in the using the system while others had little

experience, some participants might have been affected by lack of training during the implementation leading to user experience frustrations. Future research should focus on how system maturity influence user experience of the system especially in low resources settings.

5. Conclusions

In general, we have found that within 12 months of implementation and use of the OpenMRS, nurses had a positive user experience despite the early-stage implementation and working in resource constrained settings. To ensure the optimum use of the system, some system and implementation barriers highlighted by the nurses will need to be addressed as the system progress to implementation in other health centers.

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