User Experiences of Hospital Information Systems in Tanzania

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EXECUTIVE SUMMARY

This report, *'User Experiences of Hospital Information Systems in Tanzania - Report of User Experiences of GoTHOMIS, Care2x and AfyaPro'*, presents user experiences of these three hospital information systems used in Tanzanian hospitals. Report is a sequel to a report *'The comparison of GoTHOMIS, Care2x and AfyaPro Hospital information systems in Tanzania - Technical aspects'* (Finne, 2018) that focused on technical aspects of the three systems.

Interview data was collected in 2018 at the seven Tanzanian hospitals and the total number of informants was thirty-six. This report was conducted as part of the *Capacity Building of Developing and Using Health Information Systems in Tanzania* -project (2017-2020), coordinated and owned by Finnish Christian Medical Society and funded by the Ministry for Foreign Affairs of Finland.

The users had mixed views towards the systems they have in use. In general, they felt that the systems provided several benefits compared to manual data processing. Hospital information systems were considered important for improving patient care, data accuracy, and revenue collection. Generally, systems were reported to help hospital staff in their daily clinical work as it has led to a reduction in manual work. However, users also reported systems to pose many challenges. Especially interoperability issues should be improved as in some cases these were the reason for abandoning the system. The users called for interoperability/integration with systems such as MTUHA, NHIF, GePG, and eLMIS (MSD). System deficiencies, such as missing modules, systems not displaying information about the cost and insurance coverage of the medicines to doctors, difficulties editing patients records after the wrong inputs, possibilities to register same person twice into the system, system sometimes duplicating the results, and poor-quality reports, were perceived as challenges in HIS use. Also, hospital personnel's lack of ICT skills and limited training options were considered as challenges: it was reported that system trainings were organized in the beginning, but the need for more training was highlighted. Infrastructure deficits (for instance frequent power cuts) should also be addressed.

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CONTENTS

1. INTRODUCTION

Health care providers must deliver the best care to the patients and at the same time deal with several day-to-day tasks, ranging from collecting patient data to managing medical supplies. In order to improve the quality and continuity of care, and ease the work in general, there has been strong orientation towards more digitized workflows of healthcare professionals. The vision of the Government of Tanzania is also to move towards using digital systems across the country to increase accuracy and efficiency. Thus, Tanzanian health facilities have gradually started the digitalization of their systems.

These digital technologies should respond to users' needs. Poor usability of electronic hospital systems might lead to patient safety risks, increased costs, waste of time, user frustration, and worsen work-related well-being and increase stress among the hospital staff. To fix the possible usability problems of the systems, the first important step is to identify them. Identified barriers may help to support successful implementation process and overcome future challenges.

The aim of this report is to provide information about **user experience of Care2x, GoTHOMIS and AfyaPro hospital information systems**. Detailed technical information of each of the systems can be found from the predecessor report by Finne (2018). In the current report, user experience includes person's perceptions and feelings about the system she/he is using. Semi-structured interviews were conducted to gain insights on healthcare workers' user experiences. Interviews were thematically analysed, and key findings were summarized in this report.

The report reviews of user experiences and opinions of the three HISs. However, the findings in this report must be interpreted with caution due to the fairly small number of interviews. Additionally, due to the time that passed by from the data collection to analysis, authors acknowledge that some of the issues mentioned in this report might not be challenges currently, but that they might have already been resolved in possible system updates.

2. DATA COLLECTION, PARTICIPANTS AND ANALYSIS

Data used in this report was collected by the teams lead by Dr. Kati Kuusinen and Dr. Auvo Finne. Data was collected in the first quarter of 2018. Data was collected through semi-structured interviews. Thirty-six staff members from seven Tanzanian hospital were interviewed to compare selected hospital information management systems from the user perspective. Questions focused on benefits and challenges of the system, suggestions for improvement regarding the system, learnability of the system, support provided at the work place, and system training. Data was collected in seven hospitals, namely Moyo Safi Wa Maria hospital; Sengerema CDH; Arusha Lutheran Medical Centre (ALMC); Tanzania Occupation Health Service (TOHS); Mt Meru hospital; St Elizabeth Hospital; Tumbi Hospital. The informants in health facilities included Doctors (5), Medical Officers (5), Nurse (1), Pharmacists (5), Head of Pharmacy (1), IT Officers (7), Laboratory technician (3), Hospital secretary (1), Inpatients

cashier (1), Receptionist (1), Registration officers (2), Head of Cashier Section (1), Ward attendant (Billing) (1), Medical attendant (Billing) (1), Quality Officer (Lab) (1).

For the data analysis, we utilized thematic analysis. Data was analysed by using matrix which included pre-set themes; benefits of the system, Challenges/bad in the system; Improvement wishes for the system; Learnability; Trainings; and Support.

3. RESULTS

In this section we describe informants' experiences in each of the system and their improvement suggestions**. For comparison purposes, Appendix 1 provides more detailed information about the benefits and challenges identified by the informants for each of the system**.

3.1 CARE2X – USER EXPERIENCES AND IMPROVEMENT SUGGESTIONS

Care2x is a web-based open source information management system for healthcare centres ranging from referral hospitals to dispensaries. The system combines several information systems relevant to hospital management (i.e. registration and admission, patient records, pharmacy, laboratory, billing) into one system giving hospitals the option to store all relevant data securely with less paperwork and more efficiency and accountability. In Tanzania the system is maintained and customized by the Lutheran Investment Company (LUICO).

Data was collected in two hospitals that used Care2x system and ten system users were interviewed. Hospital staff were relatively satisfied with the system as the system was considered as a useful tool to simplify the daily work at the hospital and improve the patient care. Some informants reported that the tracing of patients' records that are already in the system can be difficult. However, in general users considered system as easy to learn and use. One informant also mentioned that ICD10 presentation in Care2x was very good compared to GoTHOMIS.

However, informants reported the lack of ICT skills to use the systems. Informants experienced challenges both in basic computer use and the use of the system. This was the case even though hospital staff had received training when the hospital/department started to use the system and whenever a new functionality/module was added on. Trainings were relatively short and many of the informants expressed the need for more training, both in basic computer skills and system use. IT support was reported to be relatively well organized even though delay of developers to fix some issues was mentioned.

Users mentioned several modules or functions that were missing from the system, which consequently decreased the user satisfaction. For example, system-generated reports were not considered good in quality, and the lack of integration with MTUHA reporting were highlighted as a key weakness. Also, informants told that Care2x does not display information about the cost and insurance coverage of the medicines to doctors nor provide notification if medication is running out of the stock. In this situation doctor had to contact personally a pharmacy staff which hindered efficient workflow. Informants wished to have functions like receiving results

directly from the Radiology and Laboratory machines, indicator for patient history and screen refresher tool, and Human Resource (HR) module.

Improvement Suggestions:

- Users wished that the system should be interoperable with MTUHA. For hospital personnel it would ease their work by removing the double work.
- System generated reports' quality, both internal and external, should be improved
- The system should display information about the medicines' cost, stock status, and insurance coverage
- The system should be able to receive results directly from the radiology and laboratory, including information about the time the laboratory test was requested by a doctor, done at the laboratory and sent back to the doctor
- Users expressed the need for a guidelines/handouts/training manual for hospital personnel about the use of the system
- Users wished to have more training courses on how to use the system as well as on basic computer use
- Facilities should establish stable network and power basis

3.2 GOTHOMIS - USER EXPERIENCES AND IMPROVEMENT SUGGESTIONS

Government of Tanzania - Hospital Management Information System (GoTHOMIS) is an electronic information system intended to collect and report facility level clinical information (basic patient level clinical dataset), and support health facilities in service delivery management. In 2017, it was installed in more than one hundred and seventy (170) health facilities. For this report, data was collected in three hospitals that used the GoTHOMIS and eighteen users were interviewed.

User satisfaction with GoTHOMIS was relatively positive, especially the integration with MTUHA reporting system was appreciated and seen as one of the system's biggest strengths. Informants expressed that system has improved the care. For example, it was mentioned that cashier queue was reduced, it was easy to keep track of the medicine stock, retrieving files was easier and faster, it was possible to store and share images (radiology) digitally, and good financial reports increased the accuracy of financial reporting. One user who had experience from other hospital information system said that GoTHOMIS was faster compared to Care2x.

However, there were several identified challenges. It was mentioned that MTUHA reporting was not working well in GoTHOMIS. Additionally, GoTHOMIS users reported that there was lack of interoperability with National Health Insurance Fund (NHIF) and that medication prices were not visible to doctors. Other system design challenges reported were the system errors. For example, informants told that occasionally prescription disappeared from pharmacy dashboard, laboratory requests were nor always visible, and sometimes there were duplicate orders to cashier. Also, some functions were not considered to be user friendly. For example, describing

the medicines was slow and took time, editing patients records after the wrong input was difficult, there was no means of specifying whether patient is outpatient or inpatient during registration, the system required long route in billing, and the fact that GoTHoMIS used ICD10 while Ministry of Health (MoH) used ICD9.

Additionally, poor infrastructure and users' inadequate competencies were identified as factors affecting efficient HIS usage. It was mentioned that power and network breaks increased the risk of losing patient information. In such cases hospital staff were required to re-enter the information which caused more work. Users' inadequate experiences to use the systems caused problems, for example sometimes some mandatory fields were not filled which resulted imperfect documentation.

Learning the system was generally considered easy, though there was a user who thought the system was hard to use because it was still that time new. Users had received training about the usage of system. However, informants reported that training wasn't enough. In case of problems users reported that they received instant support from TAMISEMI in Dodoma with no delays.

Improvement Suggestions:

- Users expressed their wish to receive more training about the system use, but also basic computer training
- MTUHA reporting should be improved in order to work well. Or some more reports are needed, e.g. 5+days report
- Developers should improve the system's functions deficiencies that slow down the system use
- System should be connected with NHIF
- Support teams for each zone rather than centralized to Dodoma
- Improving the ICD 10 codes search
- Improving the infrastructure to prevent network and powers cut offs

3.3 AFYAPRO – USER EXPERIENCES AND IMPROVEMENT SUGGESTIONS

AfyaPro is a product of Africa eHealth Solutions International (AeHS). It was founded by IICD (a Netherland based NGO) and NPK Technologies (a Tanzanian IT company). For this report data was collected in two hospitals using AfyaPro system and eight informants were interviewed.

Informants reported that the system was simplifying the work an improving the care compared to the paper-based system. System was perceived for example to be easy to use for tracking patient records, ordering and tracking pharmacy utensils, and generating financial reports. Users also mentioned that there has been improvement of the system and it is getting better every day.

The challenges identified by the users were related to the problems with generating MTUHA reports as it caused double work for staff. In one hospital this problem even caused plans to abandon the system and implement GoTHOMIS instead to make the process easier. Users also

reported that system has been difficult to implement as it has been more understood by the developers than the users. Additionally, it was mentioned that the government had not approved the system to be used which has caused mistrust by the government officials to the reports generated by the system.

Identified system deficiencies also included the complicated procedures or system errors. For example, informants mentioned difficulties in processing patient payments, possible loss of the patients' data, possibilities to register same person twice into the system, system sometimes duplicating the results, and poor-quality reports e.g. wrong count of the total patients. Other identified challenges included infrastructure and user factors. Informants reported that power and network cut offs were negatively affecting the system use. Informants reported that there was a lot of resistance, especially doctors were not willing to use the system, mainly because the system did not generate MTUHA reports. It was mentioned that poor system acceptability in one department increased the risk of other departments to abandon it also. Moreover, the lack of competent employees to use the system was considered as a challenge as competitive and well-trained employees were resigning from their posts.

The responses to the issue of system learnability were divided. Some considered system easy to learn whereas some found it difficult to use. Users reported to have received training, but the common opinion was that more training was needed, both basic computer use and the system use, to allow a more competent and comfortable use of the system. IT support was reported to be fairly good. In a case of a problem, users normally called IT officer. However, it was mentioned that there is no technical support from the AfyaPro technical team in case of technical problems. Some hospitals did not get enough support from the AfyaPro developers.

Improvement Suggestions:

- Users wished to have more training on basic computer skills and system use
- System should be interoperability with MTUHA to ensure that departments and hospitals accept the system and use it
- Some informants expressed a wish that there could be a one person responsible for the system issues while other people deal with medical provisions
- It was emphasized that users should be consulted before introducing any new system so that to get the user requirements and reduce confusion or misunderstandings; this could make the system be accepted and adopted more easily by the users
- It was wished that information retrieval mechanism of the patient should be improved to the efficient level
- Adequate network infrastructure should be provided and maintained

4. CONCLUSION

Unreliability and poor user-friendliness of hospital information systems can be major sources of frustration, time pressure and stress for the hospital staff. Therefore, in developing hospital information systems, it is highly recommended to work directly with the people who will be using the system. A user-driven development process ensures an appropriate solution is

selected, developed, implemented, and used. In this report, we have analysed the user experiences of three hospital information systems used in Tanzania, namely Care2x, GoTHOMIS, and AfyaPro.

The findings of this study show that the users were generally satisfied with the electronic hospital information systems. Users perceived hospital information systems as good method to provide more efficient healthcare by saving time from data/file retrieval and transfer, enhancing documentation and reporting, advancing treatment and diagnosis processes, and managing more efficiently the medicine stock, billing and laboratory results. Additionally, it was reported that the systems enable better and safer services for patients by shortening patient waiting time, improving the continuous of the treatment, and reducing errors caused by unclear handwrite.

However, informants also identified several challenges from the user experience perspective. Firstly, they identified **system design dysfunctions and missing functionalities**. Missing functionalities and errors hindered the smooth and efficient work and communication. These system design challenges varied between the three systems. This finding emphasizes that users should be involved in the system design process in the first place, but developers should also create feedback channels after the system has been implemented. Secondly, we found that **lack of ICT skills** among the hospital staff were considered as a challenge for efficient system use. It was also reported that some healthcare professionals have lack of clear understanding of the systems and computers. Therefore, adequate technical support should be easily accessed and hospital staffs' computer skills improved through trainings, both in basic computer skills and hospital information systems. The trainings should be continuous and available of all the staff members using the systems. Inclusive training could also prevent the situation where the trained individuals resign taking the know-how with them leaving un-trained and un-skilled individuals to work with the system. Finally, **deficiencies in ICT infrastructure presented a challenge.** For example, the need for reliable electricity, adequate internet connectivity, and server infrastructure (with backup sources accessible when needed) were highlighted. Technological failures related to ICT infrastructure deficiencies was taking off time from patient care and increasing the risk of patient data ~~loss.~~ 12/01/

Trainings to use new information technologies will not solve the dysfunction of HISs unless the technology and infrastructure itself functions well. Therefore, strategies for improving all challenges are needed. Based on the results it can be recommended to:

- Prioritise user-driven system development, including feedback channels regarding the user experiences
- Develop, implement and support on-site as well as distance computer and HIS courses and training programs for continuous education
- Develop and provide system user guidelines and manuals for hospital staff
- Identify infrastructure requirements and ensure the requirements are met
- Develop system interoperability with MTUHA
- Develop system interoperability with other system such as NHIF, GePG, eLMIS (MSD)
- Implement and update systems functions that are relevant to the user requirements

- Developers should allow modification of sources code to be available for local programs to insure better version on new HIS
- Improve Enterprise Resource Planning (ERP) in Health systems to ensure all the modules are integrated such as laboratory, radiology and overall EMR
- Implement appropriate policies and strategies in developing, implementing and using hospital information systems

12/01/

APPENDIX 1

REPORTED SYSTEM BENEFITS AND CHALLENGES BY THE INFORMANTS

Variable	Care2x	GoTHMOMIS	AfyaPro
Benefits	**Simplifies and improves the daily hospital work** - Reduce the time required for certain tasks e.g. fast retrieving of information, allows to see all the results from different departments in one place - Easy management of medicine stock and inventory handling issues - Good in billing - Improve revenue as doctors can have more patients - Proper record of how many patients have been attended **Safer and enhanced patient care** - Reduce patient time to wait - Ensures that records do not get lost - Easy to read prescriptions - Traceability and accuracy of data/information - Doctors have more time to patients - Able to see chronology of patients' treatments - Able to see previous medicines prescribed to patients	**Simplifies and improves the daily hospital work** - Cashier queue reduced - Report comparable to MTUHA reporting - Information flow from one point to another (e.g. to and from lab) - Easy to keep track of the medicine stock e.g. for doctors the information about the current stock is automatically available - Storing and sharing images (radiology) digitally possible - Retrieving files easier and faster - Easily traceability of patients' information - Good patient's tracing capacity - Financial reports are good and detailed, thus increased the accuracy of financial reporting - Faster compared to Care2X **Safer patient care** - Verification at the pharmacist in case of unintentional overdosed by the doctor	**Simplifies and improves the daily hospital work** - Shortens the work time - Easy to track medical records of the client - Simple and easy ordering and track stock balance at the pharmacist - Shows how much money has been generated - Easy to generate timely financial reports and other reports - Makes it easy to know the number of patients attended in hospital in different category example children, elder, female, male - System can do inventory, it can even offer notifications whether a certain medicine is out of the stock or not - Proper keeping of billing records - In billing it increases transparency and accountability and hence increases income **Enhanced patient care** - Reduces the time for client to stay in the queue

Variable	Care2x	GoTHMOMIS	AfyaPro
	Other - Easy to use - Even for computer illiterate - ICD10 presentation very good compared to GoTHOMIS		
Challenges	**System design deficiencies** - Does not conform to MTUHA reporting scheme - In general, reports, both external & internal, are not good - Lack of Human Resource (HR) module - Screen refresher mechanism missing - No indicator for patient history - A problem with the integration to web ERP - Tracing the patients' records that are already in the system can be difficult - Does not show if insurance covers a medication or not, the pharmacists need to inform doctors about it - Does not show the cost of medicines to doctors → prevent the doctor to immediately offer medication based on the ability the patients to pay - No notification if medication is about to run out from the pharmacy stock **Infrastructure** - Network & power cuts cause waste of time - More work due to the system	**System design deficiencies** - MTUHA report does not work well - Editing of patients records after the wrong input of the user information is hard, the system doesn't accept editing once the user had already been saved after registration - GoTHoMIS uses ICD10 while Ministry of Health (MoH) uses ICD9 - Switching to ICD 10 creates confusion, diagnostic codes are difficult to find or missing - No means of specifying whether patient is outpatient or inpatient during registration - Medication prices not visible to doctors - Sometimes medication available in stock is not seen on doctor's dashboard - Sometimes prescription disappears from pharmacy dashboard - Sometime duplicate orders to cashier - Long route in billing - System cannot issue an invoice to patient - System is not connected to NHIF - Some attachment files from lab do not come in pdf format	**System design deficiencies** - MTUHA reports are not generated automatically and someone still has to fill the forms in the MTUHA manually → double work - System is more understood by the developers than the users hence difficulty in implementing it - The government has not approved the system to be used → mistrust by the government officials to the reports generated by the system - System accessibility is only local - Complicated procedure in processing patient payment as it involves registering a patient, booking and billing and discharging from hospital, all these activities are done by one person - Sometimes the system loses the patients information, hence requiring re-entering the information that had already been entered in the beginning - Sometimes the system accepts the patient's second registration as a new user while in fact the patient had ever registered in the system - Sometimes the patient is discharged from the inpatient but at the registration

Variable	Care2x	GoTHMOMIS	AfyaPro
	downtime because everything done in paper must be filled later in the system **IT-Support** - Delay of developers to fix some issues **Users** - Some doctors do not fill much information in the system about the patient, no full patient history available - Lack of clear understanding of some parts of the system - Lack of general understanding of computers - Older age nurses might face difficulties using the system	- Lab requests not always visible - Prescribing the medicines is slow and takes time **Infrastructure** - Network down (e.g. for system updates) - Power cut offs might lead to loss of patient information **Users** - Lack of experience of the users, e.g. not filling some mandatory fields	department the system still reads that the patient is not yet discharged - Sometimes when the system is updating, data loss occurs - Sometimes the system was duplicating the results - Wrong reporting e.g. sometimes the system gives a wrong count of the total patients **Infrastructure** - Power and network cut offs - Sometimes electric voltage becomes too low to operate the system - Cost of maintaining IT infrastructure as there is no actual budget assigned for it **Users** - Lack of competent employees to the system - Some competitive and well-trained employees are resigning from their posts, e.g. Doctors who got training about the system are no longer working there - Human resistance, especially doctors, since the system does not generate MTUHA work reports - Poor system acceptability in departments; therefore, it makes the workflows in the system not be well captured and causes other departments also to stop using it - Lack of enough competent employees to work well with system