Report on a Preliminary Evaluation Study of User Experiences with Health Information Systems

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Health Information System Development in Tanzania - Collaborative Project - Preparatory Phase Finnish Christian Medical Society

EXECUTIVE SUMMARY

This preliminary evaluation study was performed during September - October 2016 in selected Tanzanian health facilities by the students of Nelson Mandela African Institution of Science and Technology (NM-AIST) and by students of University of Dar es Salaam (UDSM). The study has been supervised by professor emerita Pirkko Nykänen from University of Tampere (UTA), Finland, by lecturers Dina Machuve and Anael Sam from NM-AIST, by lecturer Masoud Mahundi from UDSM and by Dr. Khamisi Kalegele from The Tanzania Commission for Science and Technology (COSTECH).

This study is focused on one hand on the users (medical doctors and nurses) of health information systems in hospitals and on the other hand on health IT professionals (IT managers and developers). The methods applied in this study was thematic interviews with questionnaires, one for the users, and one for the health IT professionals. The aim of this preliminary study has been to collect and analyse the user experiences and user opinions on the use of the current health information systems and needs for further improvement and wider adoption and deployment of these systems.

This study is part of the development project of the Finnish Christian Medical Society (FCMS) 'Health Information System Development in Tanzania. Collaborative Project - Preparatory phase'funded by the Ministry of Foreign Affairs for Finland (FORMIN) during years 2015-2016.

The results of this study show that the users are rather satisfied with the systems they have in use. They feel that the systems help them in their daily clinical tasks, many tasks are significantly easier to perform with these systems than manually, and the systems provide many benefits when compared to earlier manual data processing. This is despite of the fact we were told in the interviews that many the doctors and nurses were not originally willing to shift from paper-based records to electronic health records, in some hospitals they had to force the users to use the electronic systems.

The users identify, however, many aspects where the current systems could be improved. The most important improvement aspect being interoperability and integration of the current systems with other organizations' patient information systems in such a way that critical information can be easily and seamlessly exchanged. For instance, referrals and discharge letters could be exchanged when the patient is transferred from one health organization to another. Also usability of the systems could be improved and especially training of users to use these systems. Many users, especially nurses, feel that they need more training to use the systems and that training should be continuous, many times a year to update and maintain their knowledge and skills on the use of health IT systems. Though the study is limited in terms of number of users involved, the results demonstrate the opinions of users and more importantly, identify the important issues that need further development and improvement in the future.

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1. INTRODUCTION

Health IT system refers to an information system that captures, stores, manages and transmits information related to the health of individuals or to the activities of healthcare organizations. This definition covers hospital information system (HIS), regional or district health information systems, disease surveillance systems, and also laboratory information systems (LIS), electronic health records (EHR), electronic medical records (EMR), hospital patient administration systems (PAS), picture archiving and communication systems (PACS) and human resource management information systems (HRMIS) and health management information system (HMIS). A well-functioning health IT system is an integrated system to collect, process, report and use health information and data to plan and monitor patient care, to influence policy and decision-making, individual and public health outcomes and research and to produce reliable health statistics. Many electronic health records are not covering all these features, they are in many cases only focused on storage, documentation and processing of patient health data with interfaces to related laboratory information system, available imaging systems and other organizational health IT systems.

Term eHealth is today widely used to refer to all kinds of health IT systems. Definitions of eHealth conceptualize the term as a broad range of medical informatics applications for facilitating the management and delivery of healthcare (Margulis, 2003). World Health Organisation (WHO) defines eHealth as transfer and exchange of health information between health consumer, subject of care, health professional, researcher and stakeholders having the right to use information using communication networks (e.g. the Internet, mobile networks, social networks) and the delivery of digital health services using networks both at a distance and locally. We use in this report terms eHealth and health IT as synonyms.

A landscape analysis of health information systems in developing countries (Vital, 2009) found that many developing countries are today moving from paper-based implementations to health IT systems and health data is used not only to inform policy but very importantly also to improve care at the point of service. The following future challenges for health information systems in developing countries were identified (Vital, 2009): The role of the private sector in health care will continue to increase, economic development will change the profile of disease challenges, pandemic risks will link developed and developing countries, developments in medical technology enhance the treatments but require improved infrastructure for distribution. Globalization may drain skilled talent away from health systems services in the developing countries, which is a threat for future development. Importantly, population growth and urbanization may be even bigger challenges than globalization.

1.1 Governance of health care system in Tanzania

Many developing countries have decentralized their health services and health information systems to support quality of care at lower health system levels. Regional health information systems have been developed to serve as a hub of information for all health system levels. This is the case also in Tanzania where the district health information system (DHIS) is used to aggregate information from district level to regional and to national level, mostly statistical information, aggregated indicators. The national eHealth strategy in Tanzania (Tanzania eHealth strategy 2013-2018) provides the basis to guide the development of eHealth and the mission is to transform the Tanzanian healthcare system

by leveraging IT to improve health and social welfare of all citizens. The strategy sets the goal to integrate district, regional and local systems with the national health IT architecture in such a way that local needs and requirements are fulfilled but also the national planning and follow-up of the national health care system is made possible and supported with statistical data from the health care system. The Tanzanian strategy also emphasizes openness and mobility of eHealth.

In more detail, the strategy lists the following goals to be achieved (Tanzania eHealth strategy 2013-2018):

- Enable more efficient use of healthcare resources through replacing paper-intensive processes and providing better information,
- Enable the health sector to operate more effectively as a connected system, overcoming fragmentation and duplication of service delivery,
- Make patient care safe and effective by ensuring that the correct information is available in a timely manner where it is needed and to whom it is needed,
- Enable electronic access to appropriate healthcare services for patients in remote, rural, and disadvantaged communities,
- Support improved multi-way communication and sharing of information among clinicians, patients, and caregivers within the health sectors and across partner agencies,
- Support evidence-based policy, investment, and research decisions through access to timely, accurate, and comprehensive reporting of healthcare system information.

The principles that guide the national eHealth strategy implementation are:

- Guarantee the patient information rights, integrity, and confidentiality in line with emerging public health access needs,
- Cost-effective, efficient and benefit-driven solutions in a limited resources environment that lead to future growth potential,
- Exploitation of existing structures and use of an incremental approach,
- Technology development, standardization and convergence
    - Focus on usability,
    - Convergence on fewer and more reusable, cost-effective IT systems that are extensible, scalable and manageable,
    - Common standards and terminology across information systems,
    - Involvement of local partners in development and support of information systems
- Collaboration and consultation with stakeholders, strong leadership and governance mechanism, ensuring availability of local skilled human resources to ensure sustainability of eHealth solutions, and ensuring business continuity mechanism for implemented eHealth system.

The important overall goals listed in the strategy are: Make patient care safe and effective by ensuring that the correct information is available in a timely manner where it is needed and to whom it is needed, enable electronic access to appropriate healthcare services for patients in remote, rural, and disadvantaged communities and support improved multi-way communication and sharing of information among clinicians, patients, and caregivers within the health sectors and across partner agencies.

In addition to the national eHealth strategy, in January 2016, the Tanzanian Ministry of Health has published guidelines and standards for integrated health facility electronic management systems (Guidelines, 2016). These guidelines define minimum requirements for health IT and standards to be applied from the following perspectives: Systems functional and non-functional requirements, general constraints and risks, standards and information exchange and infrastructure and human resource requirements.

Organization of Tanzania national health IT system includes facility-based health statistics, population-based health statistics and research, management statistics, information and communication technology and support management (Figure 1).

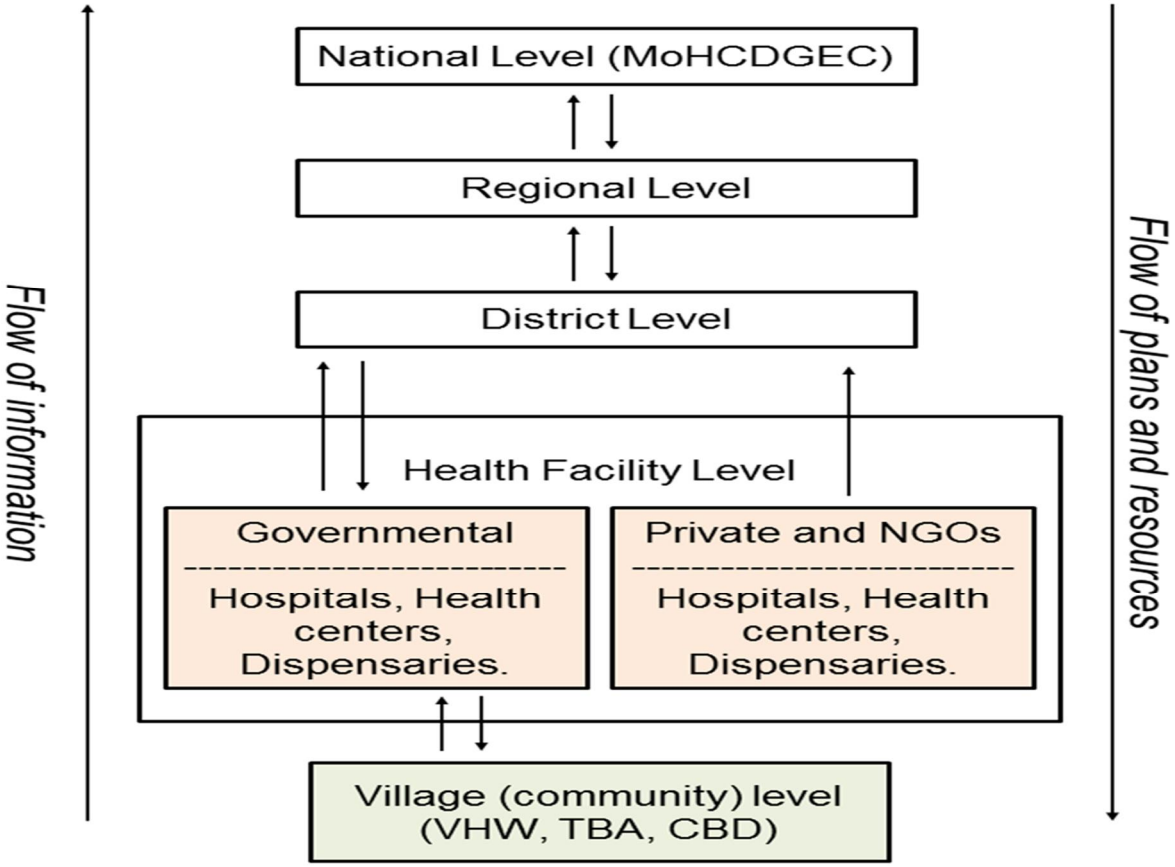

Figure 1: The national health IT system in Tanzania (After Kalegele, 2017)

1.2 Health information system development in Tanzania – Collaborative project

The health IT-project 'Health Information System Development in Tanzania. Collaborative Project' by the Finnish Christian Medical Society (FCMS) has had as one of the main objectives to strengthen the capacity of health IT skills and knowledge of the Tanzanian collaborators. The project has provided training and support to local medical staff and ICT-specialists to maintain, teach and further

develop the health IT systems. The project has the aim to support fulfillment of the health information systems local, regional and national needs and requirements concerning the effectiveness, usability, cost-effectiveness, maintainability and sustainability of health IT. One specific goal of the project has been to complete investigations in defining the requirements for a health information system and evaluating the existing systems together with the Tanzanian partners.

This study is one of the first steps in a joint capacity-building initiative between FCMS and Tanzanian local partners, NM-AIST, UDSM and Evangelic-Lutheran Church of Tanzania (ELCT), to improve local capacities in conducting evaluation of hospital information systems. The focus in this evaluation has been on the users, medical doctors and nurses, how the systems are used and how usable they are, and what are the user experiences from the use of these systems. This study was planned and carried out in collaboration with the Tanzanian partners and the students from NM-AIST and UDSM who were very active participants in the interviews. This report has been produced in collaboration by all persons who participated in the interviews, either as a student or as a mentoring person. This report presents the methods and results of the evaluation study and discusses further actions and decisions needed to improve the current situation with health IT systems.

2. STUDY METHODOLOGY AND PARTICIPANTS

User experience is defined by a standard (ISO 9241-210-2010) as a person's perceptions and responses that result from the use and/or anticipated use of a product, a system or a service. User experience explores how a person feels about using a system, i.e. the experiential, affective, meaningful and valuable aspects of a product use (Vermeeren et al., 2010). When comparing usability and user experience evaluation we find that usability evaluation focuses on task performance, e.g. number of errors or required number of clicks to perform a task, and user experience evaluation focuses on users' lived experience. In user experience evaluation the focus is on how the user feels about the system he/she is using, and the user's motivation and expectations play a strong role in this evaluation.

We have performed user experience evaluation with two thematic questionnaires, one for the health professionals, medical doctors and nurses (Appendix 1) and another for the health IT professionals, either represented by the health IT supplier company or by the health IT department of the hospital (Appendix 2). In the user questionnaire the themes under study were focused on the following: Use of health information system, user satisfaction, user's assessment of the current system in use, and suggestions, comments for further development. With this questionnaire we wanted to collect the users' experiences on the systems they have been using in their routine health care clinical practices.

In the health IT professionals questionnaire the themes studied were the following: Technical details of the system, applied standards, database coverage, decision support options, data exchange with other systems, order-entry system, statistics and reporting, integration options, data security and confidentiality. Additionally, we wanted to find out the details of the system the users have been using, these details may provide additional information that helps interpretation of the user questionnaire results.

The health facilities included in the study interviews were selected by our Tanzanian project partners. The interviews were carried out in these health facilities with the permission granted by the Tanzanian

Ministry of Health, Community Development, Gender, and Elderly & Children (Appendix 3). The health facilities included in the study were using various patient information systems, some open source systems, some closed systems, commercial products. The systems were different in scope and in functionalities. Some included hospitals were public, some private. The interviews were performed face to face by small groups including some students and a mentoring group member. The students had all background studies in information systems and in health informatics.

All interviewed health professionals in Arusha were users of Care2X patient information system. Additionally in Arusha we interviewed the Care2X supplier IT company Luico (Lutheran Investment Company). In Arusha the health facilities visited were Arusha Lutheran Medical Center (ALMC), and St Elizabeth Hospital. Additionally interviews were done in Hydom Lutheran Hospital in Manyara region and in Makiungu Hospital in Singida region. In Dar es Salaam the health facilities visited were Kairuki Hospital, Muhimbili National Hospital (MNH), Muhimbilli Orthopaedic Institute (MOI), and Sanitas hospital and Tumbi Regional Referral Hospital in Coast region (Pwani) (Table 1).

Table 1: Interviewed persons by their profession, site and system in use

Site	***Persons interviewed***	***Patient information system in use***	***Type of hospital***
Arusha Lutheran Medical Center	*Medical doctors 2* *Nurses 2* *Health IT professional-*	*Care2X*	*Private*
Hydom hospital	*Medical doctors 2* *Nurses 1* *Health IT professional 1*	*Care2X*	*Private*
Makiungu hospital	*Medical doctors 2* *Nurses 1* *Health IT professional 1*	*Care2X*	*Private*
St Elisabeth hospital	*Medical doctors 2* *Nurses 2* *Health IT professional -*	*Care2X*	*Private*
Luico	*Health IT professionals 1*		*Care2X Developer/Supplier*
Kairuki hospital	*Medical doctors 2* *Nurses 2* *Health IT professional 1*	*EHMS*	*Private*
Muhimbili Orthopaedic Institute	*Medical doctors 1* *Nurses 1* *Health IT professional 2*	*MEDIPRO*	*Public*
Muhimbili national hospital	*Medical doctors 1* *Nurses 1* *Health IT professional 1*	*JEEVA*	*Public*
Sanitas hospital	*Medical doctors 1* *Nurses -* *Health IT professional 1*	*EHMS*	*Private*
Tumbi regional referral hospital	*Medical doctors 1* *Nurses 1* *Health IT professional 1*	*(GOT) HMIS*	*Public*

The number of persons interviewed in each health organization was very small. This is due to the fact that the doctors and nurses were very busy, heavily occupied by their clinical work and there were lot of patients in the waiting rooms. The health organizations were not able to allocate more time or

professionals to the interviews. With these small numbers, however, we think we have been able to touch the user experience, to collect the feelings of health professionals when using these patient information systems and to identify the important further development needs.

3. USER EXPERIENCES AND OPINIONS FOR FURTHER IMPROVEMENT

3.1 Care 2X system

Care2X in an open source, full hospital health information system, a networked system adopted by ELCT and deployed and supported now by Luico. Care2X has been in deployment since 2004, and the source code is given to the client. Care2X uses ICD10 coding system, but no standard drug coding or laboratory test codes. The system interface is customizable and usable via a tablet and a mobile phone. In Care2X the patient is identified with hospital coding number, local to each site, bar code use is not supported. Referrals to other health organizations are done manually as well as discharge letters. Patient history is stored for future use, as well as the patient demographic data and the allergy list per patient is maintained and a medication list of the patient. Vital signs recordings are not stored, laboratory test results are stored. Drug interactions and adverse drug events are not managed and appointment scheduling is not supported. No clinical decision support is incorporated. Care2X does not exchange information with the district health information system (DHIS2) because DHIS2 uses ICD9 instead of ICD10. The statistical reports for the Ministry are generated at patient level and at facility level. Order-entry is implemented. Security covers user authentication, access control, event log, analysis of audit trail reports, database backup. Care2X supports Windows and Linux. In connection with Care2X the users use a FileSystem to store the patient data. General information on the system at: http://www.care2x.org/

3.1.1 User experiences and further improvement needs

Medical doctors in Arusha were all using the Care2X for their daily clinical tasks. The doctors use the system to review the patient information and enter their daily notes of the patient into the system as well as searching for laboratory results of specific patients. Laboratory test results are received from the laboratory online but the imaging system is not fully integrated with Care2X.

The system does not either support provision of discharge letters, or provision of sick leave forms for the patient or referrals to other health care facilities. Medical doctors are very positive with their user experience with Care2X. They think that the system has made the medical tasks much easier to perform than earlier without the system. Many of the interviewed health professionals had a long history in using Care2X, their use experience ranged from 10 months even to 12 years. Most users had not used any other IT system before Care2X, only manual paper-based systems had earlier been in use. Most users had had some training before starting the daily use of Care2X, but the training had been very short, rather more instruction on-site than training and it had only been offered at the start of system adoption. The nurses also use daily Care2X in performing their tasks. They are also very

positive in their user experiences with the system. Almost all users, especially many nurses, feel that they should have more training to use information systems in general and training should be continuous, many times a year to update and maintain the knowledge and skills of health IT.

User satisfaction with Care2X in Arusha was good, though some medical doctors felt that Care2X provides seldom precise information that they need, and the reports provided seldom meet their needs. They see that the system is most of time accurate and they are rather satisfied with it. On the information presentation they see that half of the time the information is in useful format but they think that, however, information is always clear. Medical doctors see that Care2X is always easy to use, user-friendly and they trust on the system, there are no problems with data security. Only one medical doctor had some suspicions, he said that he cannot always trust that data in the system is safe and secure. One medical doctor felt that finding precise information for inpatients is not easy. One doctor was missing printed reports on patients.

In their summary assessment the medical doctors were very positive, they are happy with the system, though they would welcome more functionalities like digital referrals and discharge letters. One medical doctor said that the system has had positive effects on health care, e.g. the patients need not to queue long time for treatment or visit. Another doctor was very satisfied, he thinks that the system is very perfect, it saves patients' waiting time, and brings accuracy to clinical practice and keeps records on patient information and data. All nurses had a very positive experience with the system, they were satisfied.

All interviewed persons said that the training to use the system has not been good, only short instruction-type training organized when the system as taken into use. Maybe due to the time needed to use the system one medical doctor said that the system has not helped him to use more time with the patients. Also one nurse had the same opinion, she said that using more time with the patient depends on the user's ability to use the computer. Many interviewed professionals agreed that user training should be improved, many employees have not had enough training on how to use the system. There was a remark by one user that the system's safety is also dependent on the user, she/he should have training on these security issues, too.

Further improvement needs

- More training would be needed on how to use the system. Training should be continuous to update and maintain the usage skills. One nurse suggested that training 3 times a year would be an ideal situation. Training is needed because not all health professionals can use computers smoothly.
- The users are asking if it would be possible to merge the Care2X two separate file systems, the electronic health record and manual files, because this causes problems sometimes in finding the patient data as some patient data is in manual files and not in Care2X data base. One user even said that the previous patient history is missing, or difficult to find, especially past investigations. One user had experience that navigation of patient data takes a long time and it is difficult to find laboratory results.
- The users also hoped that the discharge letters, patient summaries and referrals as well as sick leave notes to the patient and other information letters to the patient could be produced by the system in digital form. Overall, exchange of information with other health care organizations was seen as a very important and desired improvement. The exchange should be possible even with organizations which do not use Care2X. The exchange of information will not only facilitate continuum of care but also enable smooth feedback collection.

- The users identified a need to improve the patient data documentation and reporting functionalities in Care2X, e.g. writing different reports from outpatients is difficult today as there is only weak support to this activity. Some users hoped that the patient's passport could be used as patient identification rather than the patient's name, this might reduce potential errors. However, this might also cause problems, if the patient does not have a passport.
- One user hoped that when today the diseases and codes appear together, they should be separated to maintain patient confidentiality.
- One user experienced a situation where he/she could not find a patient's visitation (consultation) history when the patient came for a new visit. The user hoped that the process of care would be a continuum with the steps: register -see the doctor -order and perform investigations -provide feedback and results -produce prescription -process payment -orders to pharmacy. Now the user thought that this process is very slow and complicated, and it is split into separate steps. The process should be re-engineered to be a continuum.
- A medical doctor hoped that the laboratory requests would be compiled in a single page in the same way as the prescriptions, even when the requests are made separately. This would help the medical doctor to get easily a picture of the patient's situation. Also the users hoped that a deleted medicine in a list is marked with a visible color in the medication report. When a nurse assigns a certain medicine to a patient, she/he uses now a manual form, the nurse would prefer to do this through the system digitally.
- Technically the system is sometimes slow and the users do not know why, some of them thought that the slowness may be caused by the network.
- One nurse said that not all nurses do have usernames and passwords though they should use the system. If all potential users are not able to use the system, the planned efficiency will not be achieved.

3.2 EHMS system

Electronic Health Management System EHMS is a closed, commercial patient information system, deployed since 2012 and developed by GPITG, Information Technology Consulting Firm based in Dar es Salaam (http://gpitg.com/node/38). The company provides technical support for the system during its use, the system and the interface are not modifiable by the user, only by the supplier. It is an integrated healthcare management system which is in use in Kairuki and in Sanitas hospitals that were included in this study. EHMS uses ICD10. The system can be used via a tablet. The system uses health site specific patient numbering, identification generated by the system. Bar code based or biometric identification is not supported. Patient data exchange with other health organizations is not supported, referrals and discharge letters, are done manually. Patient demographic data, patient problem lists and medication lists are supported, but not patient allergies or vital signs recording. Laboratory test results are provided by the system. Patient longitudinal medical history is provided. Appointment scheduling is not yet supported, neither patient data longitudinal storage. No clinical decision support provided. Reports are produced in digital format, they are customizable, produced at facility level. The statistical reports for the Ministry are generated. Patient specific medication reports for the patient are produced. Laboratory test orders and prescription orders are generated digitally. In security issues user authentication, role-based access control, audit trail and event log files are supported as well as analysis of audit trail reports. The system supports Windows operating system.

3.2.1 User experiences and further improvement needs

Medical professional users of the EHMS system were positive with the systems. One user had used the system since 2012, only manual systems had been in his use before. He was satisfied with the training he had received to use the system. He thought that all clinical tasks are significantly easier with the system and he uses the system in all possible clinical tasks daily. Two nurses using EHMS were generally satisfied with the system, however, they reported some lacking in the system. E.g. the medication documentation provided of patients with drugs is not always good. Also the nurses reported that the system is sometimes very slow, especially in the morning (9-11). The nurses also saw that system does not support recovering from errors, e.g. errors made are difficult to correct.

In the other health organization the doctor using EHMS system was very happy and satisfied with the system. He had been using the system for 2 years and other health IT systems before. He had received partial assistance in learning to use the system, not real training. He uses the system in all clinical tasks, feels that the clinical work is significantly easier with the system and he is mostly satisfied with the system.

Further improvement needs

- The users system hoped that mobile devices like tablets could be used with the system in order to make the system more usable when on-move in various clinics.
- One doctor said that the users' requirements on the system should be taken into account thoroughly during development.
- One user had some concerns on the security of the system, especially when transferring patients to other departments of the hospital.
- One doctor hoped such improvement that the system would provide information on which doctor has attended which patient, this would be helpful as today the doctor has to go through a long list to find out previous doctor attendance or previous patient history.
- The nurses reported some problems with connections to the pharmacy, e.g. sometimes the doctor's medication order cannot be seen in the pharmacy, and they also hoped that the patient's medication documentation provided should be improved
- The nurses hoped that EHMS would be more user-friendly, the system is now complicated and requires a lot of training on how to use it.

3.3. JEEVA system

JEEVA is a closed, commercial health information system, developed by Napier Healthcare Systems in India (http://www.napierhealthcare.com/). The system has been deployed since 2005 and it is a full hospital information system. The system is further developed by the hospital and the company together. The system is in use in Muhimbili National Hospital. The system uses ICD10, and local coding systems for drug coding. Laboratory test coding is based on the ISO-standards. The system is modifiable by the user in minor extent, the supplier controls all adaptations. The system can be used via mobile devices, tablets and mobile phone. Patients are identified with system-generated patient numbers. Bar codes are used in laboratory samples. Electronic patient referrals as XML-files can be generated and used with the regional hospital, not with other organizations. The system maintains

patient specific allergy lists, patient problem lists and allergy lists of patients. Laboratory lists are produced and results transferred automatically. The clinical summaries of the patient are generated and some drug interactions are managed. Patient data is stored for 10 years after the last visit. Clinical decision support is not provided. Patient data can be exchanged in digital form with other departments inside the hospital. Prescriptions are in digital form. The system supports XML messaging and to some extent also ISO and HL7 standards. The reports are customizable and the reports to the Ministry are generated quarterly and annually. Facility specific reports are generated to each clinic and medication reports for the patient. In security issues user authentication with username and password, access control based on activities, audit trail and trail report analysis are supported as well as automatic database back up. The system supports Windows as a front end operating system and a DB2 relational database by IBM.

3.3.1 User experiences with JEEVA

The medical doctor using the JEEVA system was satisfied with the system. He has been using other system before and have received training on how to use the JEEVA system. The doctor uses the system daily in clinical tasks and is almost always very satisfied with the system. However, he saw that changing diagnosis codes is very difficult. He also reported that sometimes the user may receive incorrect laboratory results, maybe due to errors inside the lab, or maybe due to missing online connections to the lab system and lab equipment. JEEVA is only partially used inside the hospital, not used in the wards, so production of discharge letters is impossible. As a detail he mentioned that syrups and tubes are not well managed in medication, developers have possibly only thought of medication delivered in tablets. The doctor thought that when JEEVA allows the doctor to access information from other clinic inside the hospital this might not be secure. The nurse using JEEVA was satisfied with the JEEVA system, she uses it daily and for most clinical tasks she performs. However, she reported that the system is not user friendly, and it is slow sometimes. She reported also that not all nurses are using the system and therefore the efficiency of the department has not improved.

Further improvement needs

- One medical doctor had found a problem in changing the diagnosis codes, he hoped this will be improved.
- The users thought that JEEVA should be web-based, then it could be accessed from more locations.
- One user thought that the reserved standard fields of symptoms and patient history should not be limited to minimum number of characters, sometimes there is need for more characters.
- One doctor saw that when a doctor can access information from other clinic this might not secure.
- The nurses hoped that JEEVA should provide reports e.g. on how many beds are occupied in the wards.

3.4 MEDIPRO system

MEDIPRO is in use in Muhimbili Orthopaedic Institute. MEDIPRO is an enterprise resource planning (ERP) platform dedicated to health information. It is a closed, commercial system developed by Maxcom Africa Limited in Dar es Salaam (http://maxcomafrica.com/fully-integrated-hospital-management-information-system/). The system is in pilot use in Muhimbili and all modifications will be done under the contract with the supplier. The system is usable via mobile devices, a tablet and a smart phone. The system applies ICD10 coding system and also local coding, e.g. the unique patient identification system inside the hospital. Use of bar codes are supported. Patient data is stored: patient demographic data, patient problem list, medication lists, vital signs, laboratory test results. Discharge letters are generated. For private patients in the departments patient lists are generated. Also educational level information materials are produced for the patients. Clinical decision support is implemented in the form of clinical guidelines, alerts and reminders. Data exchange with other health IT systems or with other health care organizations is not supported. Digital images are exchanged inside the hospital and laboratory test results. No data transmission to district health information system (DHIS2). The reports are customizable, and Ministry reports are produced automatically. Prescriptions are generated in digital form. Security is organized with user authentication, role-based access control, audit trail and log files and their analysis. The database back up is planned to be done every 12 hours in the future. Operating system supported is Windows, database in use is Oracle, a relational database.

3.4.1 User experiences with MEDIPRO system

The doctor using the MEDIPRO system had used other systems before and now 3 years use of MEDIPRO. He uses the system to all clinical tasks daily except for referrals and discharge letters. He thinks that his clinical work has become easier with the system. He is, however, not satisfied with the reports the system produces and he cannot produce information sheets for the patient. He thinks that the system has not helped him to use more time with the patient. The nurse using MEDIPRO thinks that the department has not become more efficient, because not all persons have been trained to use the system, and, accessibility of work stations, computers is still a challenge in the hospital.

Further improvement needs

- One user commented that the information format should be improved and possibly the system connected with the Internet.
- A nurse commented that all health professionals should be trained to use these systems, though accessibility of work stations, computers is still a challenge in the hospital.
- Users saw that mobile devices would be good for easy input of information when on move.
- One user said that the future system users should be involved in system's design to improve usability and user interaction with the system.

3.5 (GOT)HMIS system

GOT (Government of Tanzania) HMIS (Health Management Information System) is a full hospital information system in use in Tumbi regional referral hospital. HMIS is a closed system which is used

via a network. The system uses ICD10 and standard drug codings and international laboratory test codes. The system can be used via tablets and mobile phones. The patient identification used is a patient id number generated by the system. The system records patient information: summary of medical history, demographic data, medication lists, allergy lists, vital signs and laboratory test results. The system generates discharge letters and supports appointment scheduling. Clinical decision support is not provided. Patient data exchange is supported inside the hospital, not with external health organizations. This is also the case for electronic prescriptions, supported inside the hospital. HMIS is able to communicate with the DHIS2. Reports generated are customizable, and can be exported to DHIS2. Also provision of the Ministry reports and statistics are supported. Patient level reports and facility specific reports are generated. Also medication reports, cards, are produced for the patients. Security covers user authentication, role-based access control, audit trail and event logs and their analysis. The system is web-based and uses mysql database.

3.5.1 User experiences with (GOT)HMIS

The doctor using the (GOT) HMIS uses the system in most of his clinical tasks. He seldom uses the system to order lab tests or to receive lab test results or to follow the results of a patient's particular investigation. The system does not support provision and exchange of digital referrals and discharge letters. He feels that the system (GOT)HMIS has made his clinical tasks significantly easier to perform, except to receive the lab test results. He is rather satisfied with the system overall, he feels that half of the time the system provides sufficient information to support clinical tasks. He trusts the system, no problems with data security or with patient privacy. The nurse using the (GOT) HMIS system uses it to search specific information on the patient or to follow the results of specific investigations. The nurse did not have positive feelings on the system, he/she felt that all tasks had become more difficult with the system and he/she was seldom, or even never, satisfied with the system functionalities she/he was using. She/he also disagreed, even strongly, with all the statements in the summary assessment section of the questionnaire. The interviewed nurse had only had a 2-hour training to use the system.

Further improvement needs

- One user hoped that the system would be integrated with other health facilities to make electronic referrals and discharge letters possible.
- One user wanted improvement on how the system is accessible in case of power loss.
- One user hoped that in a big hospital the system should be implemented in all hospital departments to enable communication and information exchange inside the whole organisation.
- One nurse thought that the system was difficult to use, he/she hoped that usability would be improved.

3.6 Summary

Most users were positive on the use of health IT systems. This is despite of the fact we were told in the interviews that most of the doctors and nurses were not originally willing to shift from paper-based records to electronic health IT systems.

The users of all studied systems saw that more training is needed to use the system, especially for the nurses. All medical professionals do not have a long history or experience in using computers and therefore regular training is needed, not only once but regularly during years.

Users had many wishes how the systems could be improved, concerning e.g. additional functionalities, and better usability. The most important improvement issue raised by most of the interviewed persons was interoperability and integration of the current systems with other organizations' patient information systems in such a way that critical information can easily and seamlessly be exchanged. For instance, referrals and discharge letters could be exchanged when the patient is transferred from one to another health organization. This would enable seamless care and decrease the manual data exchange of patient data.

4. RELATED RESEARCH

In the literature (Heeks, 2002; Grandia, 2014) the general requirements settled for a health IT system include utilization of various data sources and ability for data management which enables easy access to relevant information for those who need it while protecting the privacy of individual patients. Information produced, the outputs, need to be relevant, accessible, and useful for decision making. Additionally the health IT system should be able to collect information and produce usable statistics that can be analyzed and compared. The system should provide direct benefit to all those who participate in it, providing an ongoing incentive for users to continue to strengthen the system. From the technical point of view it is required that the health IT system is easy to use, reliable and stable, simple and sustainable and does not overburden the health delivery staff or be too costly to run and maintain.

A study by Kimaro and Nhampossa (2007) found that key issues for sustainable, successful health IT system development in developing countries are: Relationship between the Ministry of Health and software development agency are important, the ministerial experience, interests and requirements and knowledge on the local conditions should not be bypassed. The relationship between the Ministry of health and the donors should be longitudinal, funding should be long-term covering also post-implementation phase such as local capacity development, training, maintenance and system enhancement, and it is important to involve the Ministry in the development to avoid focusing of the development on the donor's interests only, because this leads to the lack of ownership and lack of responsibility of the Ministry over the developed health IT system.

Hanmer (2009) studied in her PhD-thesis success factors in implementation of health information systems in South Africa. The study resulted in a conceptual model of computerized health information system. The model covers factors at two levels, provincial and hospital levels, and provides a framework to study success factors and risks for failure when planning of health information system implementation and use. A weak point of the model is the omission of legal and strategic aspects, and for international validity also cultural aspects should be covered.

Mostert-Pipps (2011) studied in her PhD-thesis the role and tasks of various health information systems in building continuity of care in South Africa. She found that the most important factors that help to build continuity of care are: need for clear guidelines, policies and procedures on how to select a technological solution and how prepare the environment for sustainable implementation; user

support is essential, users need to be involved in stages of implementation; management and decision maker support enables clear ownership and accountability of captured health data; data capturing interfaces need to be easy to use, usable and accurate; staff shortages may lead to lack of capacity to support HIS implementation and meaningful use; education, training and awareness means sufficient computer literacy skills for health professionals and decision makers to understand the technology solutions. Finally infrastructure means that there need to be sufficient IT resources on site and adequate connectivity and communication infrastructure. Mostert-Pipps also found that in many cases the users have unrealistic expectations on new systems, and if the new system does not immediately fulfill these expectations the resistance is born and it hampers future developments. Lack of standards is an issue in developing and developed countries, this hampers interoperability and integration of various health IT systems.

Effah and Abuosi (2013) report their experiences from Ghana where they compared the standard proprietary software with free open source software. The basic differences between these two were that proprietary software are delivered with closed source code and under a commercial license, at high cost, that restricts the users to modify and customize the software. Open source software, instead, is delivered with open source code with full possibilities for modification and customization. Concerns about lack of standardization and security have, however, limited the use of OS in healthcare. This reported Ghana experience resulted in that a standard proprietary software succeeded in meeting the uniform information needs at the national level, but failed to support heterogeneous information needs at regional and district levels. It also failed to support integration and interoperability with other software systems and applications. On the other hand, open source software gave possibilities for local small enterprises to participate in the development and installation project and thus increment their expertise.

Bagayoko et al. (2010) studied the use of open source software for health information management in Mali, Africa. The study resulted in practical recommendations for successful health IT system implementation: to identify organizational realities, to improve local technical skills and IT project management skills, to be aware of the limitations of the information system and to prepare a well-planned implementation plan. They also found in their study that it is important in developing countries to pay attention to local information management culture which has so far been focused on administrative and accounting tasks. A shift should be made to medical knowledge and collective improvement of care practices. Another important aspect is the local implementation strategy which requires development of strong local expertise. Further, Camara and Fonseca (2007) found that the adoption of open source is not only a choice of software, but also a means of acquiring knowledge. Developing countries have to use open source as a way to gain knowledge about the technology itself and as a way of creating technology products that fit their specific needs. They argue that there are two defining properties of any open source software, the first property is the potential for shared conceptualization and the second is the potential for modularity.

Tetteh made a study (2014) on what research reference theories or theoretical frameworks have been employed in examining information system implementation in the health sector in developing countries. Additionally, they asked how are these research theoretical frameworks operationalized and what research theoretical framework can help gain more insight into implementation? They noted that about 20% of the studies lacked any theories and theoretical framework, and 95% of the studies had focused on identification of factors to explain implementation, i.e. factor-based research. It was argued that implementation is more than just factors; implementation is a process; it is a dynamic social change process.

Bakar et al. (2014) studied implementation of the health visualization solutions when bridging the gap with transition period from proprietary software to the free open source software. The developed tool, key indicator data system, facilitated data integration between the two district health information system versions and hence served as a gateway solution during the transition process. Implementation challenges like the reluctance of the key users in coping with the new system technologies were also identified. Participatory action research and interviews were used in understanding the requirements for the new tool to facilitate the smooth system development for better health service delivery.

Kagaruki et al. (2013) found in their Tanzanian study the following main factors that affect the utilisation and management of health information system: lack of strong information system at Medical Store Department and Ministry of Health and Social Welfare to manage the organization, suppliers and clients' needs; lack of compliance to the national ordering and deliveries guideline and procedures; inadequate funds; low capacity in implementing integrated logistic system; lack of national representative data during annual budgeting and forecasting of requirements; and political interests. They concluded that the supply chain at the central levels in Tanzania is not evidence-based. For effective utilization of health information systems in the supply chain there is need to strengthen the capacity in the management and utilisation of health IT systems at facility, district and national levels.

The success criteria for electronic health record implementations in developing countries were studied by Fritz et al. in a systematic review (2015) and they found that most systems in use served a specific disease area (e.g. HIV). Most important success factors were related to system functionality, organizational issues and technical infrastructures. Sufficient training and skillful personnel were mentioned only in 10% of the reviewed articles.

Many health IT implementation projects in developing countries have failed, for various reasons (Vital, 2009). Braa and Hedberg (2002) reported widespread partial failure of high cost systems with little use of data, and Moussa and Schware (1992) reported that almost all World Bank-funded IT projects in Africa were partial failures, often in sustainability issues. One reason for failures may be the fact that the contexts of health IT designer and health IT user are often distant in physical, cultural, economic, and many other ways. The remoteness of designers means that their contextual inscriptions and inscribed assumptions are significantly different from user actuality. Design–actuality gaps may therefore be extreme.

However, health IT systems are critical systems to strengthen the health systems in developing countries. Good information on the performance of the health system and effective interventions are needed to use the scarce resources for the best results. There are many risks with the health IT implementations due to local capabilities in the developing countries. Therefore, it is important to build a solid basis on which to build a sophisticated health IT system. An important step in building the basis is evaluation, as evaluation will provide us with information on what is successful and effective and what is not.

In general, development and use of health IT applications offer tremendous opportunities to improve health care, its delivery and outcomes. However, there are also problems related to the use of IT in health care, for example IT may be inappropriately specified, unreliable, user-unfriendly or the organization may not be properly prepared to adopt IT within the clinical work flows and processes. Health IT may also be ill-functioning, for example administrating incorrect drug doses for patients or inducing medical errors by presenting faulty displays of the electronic health records or having negative impacts on the outcome of care in a specialized care unit (Ammenwerth and Shaw, 2005).

Evaluation is the means to assess the quality, value, effects and impacts of IT in the health care environment. Evaluation is defined as measuring or exploring properties of a health information system (in planning, development, implementation, or operation), the result of which informs a decision to be made concerning that system in a specific context (Brender, 2006). The Declaration of Innsbruck summarizes the importance of evaluation as 'Health information systems are intended to improve the functioning of health professionals and organizations in managing health and delivering healthcare. Given the significance of this type of intervention, and the intended beneficial effect on patients and professionals, it is morally imperative to ensure that the optimum results are achieved and any unanticipated outcomes identified. The necessary process is evaluation and this should be considered an essential adjunct to design and implementation of information systems' (Ammenwerth et al., 2004, p 487).

There exist guidelines and support on how to plan and execute evaluation studies (Nykänen et al., 2011). The dilemma may sometimes be that those who have the will and capacity to evaluate, such as academics, often lack the resources to do evaluation, and on the other hand, those who have the resources, such as funding parties and donor agencies, often lack the will and/or the capacity to evaluate.

5. DISCUSSION AND RECOMMENDATIONS

5.1 Discussion

The results of this small, preliminary study show that the users are, mostly, generally satisfied with the health IT systems they have in use. They feel that the systems help them in their daily clinical tasks, many tasks are significantly easier to perform with these systems than manually, and the systems provide many benefits when compared to earlier manual data processing. However, the users also find many aspects where the current systems could be improved. Some of these improvements are minor, the most important being interoperability and integration of the current systems with other organizations' patient information systems in such a way that e.g. referrals and discharge letters could be exchanged when the patient is transferred to another health organization. Also usability of the systems could be improved and especially training of users to use these systems. Many users, nurses and medical doctors, feel that they should have more training to use information systems generally and training should be continuous, many times a year to update and maintain the knowledge and skills to use health IT systems.

Though this study had only a limited number of users involved, and the questionnaires used for the health professionals were possibly too detailed, especially for the nurses, focusing on the wide varieties of functionalities that could be implemented in an electronic health record, the study results potentially demonstrate the general opinions of users and more importantly identify the important issues that need further development and improvement in the future.

In an earlier evaluation study Musau et al. (2010) identified some weaknesses in the health information systems in use in Tanzania, these include among other: Lack of coordination and sharing of data among systems, fragmentation in the collection and reporting of health information caused by strong vertical programs running their own reporting systems. They also identified a need to create an integrated framework, such as a data warehouse or repository, whereby data across data sources and types can be analyzed and correlated. They found that due to the many various systems in use,

there is not as much consistency as there could be between the data collected and the information required to support decision making processes. Additionally, the staff capacity needs to be strengthened, both in terms of number of staff and skills of health IT at all levels.

These findings (Musau et al., 2010) are very much in-line with the results of this study. Our results also show the need for training and education in health IT skills, regularly and at all levels, and the need for a national framework for data collection and analysis. A very important future improvement would be an operational infrastructure to enable communication and data exchange between the existing and future systems and thus provision of support for seamless care. This study results emphasize very strongly the need for data exchange and interoperability of the systems in such a way that data can be communicated at all levels of the health care system.

5.2 Recommendations

The Tanzanian eHealth Strategy (2013-2018) has listed principles that guide the national eHealth strategy implementation. These include guaranteeing the patient information rights, integrity, and confidentiality in line with emerging public health access needs and develop cost-effective, efficient and benefit-driven solutions in a limited resources environment that lead to future growth potential. From health IT viewpoint the issues emphasized are: Focus on usability; convergence on fewer and more reusable, cost-effective IT systems that are extensible, scalable and manageable; common standards and terminology across information systems and involvement of local partners in development and support of information systems. Additionally, collaboration and consultation with stakeholders, strong leadership and governance mechanism, ensuring availability of local skilled human resources to ensure sustainability of eHealth solutions, and ensuring business continuity mechanism for implemented eHealth system.

Existence of many, different systems makes the targeted national interoperability a challenge. In many cases national guidance is needed to present the principles and minimum requirements for the health IT systems that are adequate to be taken into use. The Ministry has already published guidelines and standards for integrated health facility (2016), these guidelines are very relevant for the current situation. However, the health organizations and health IT system suppliers and developers might additionally need practical, operational guidance on how to apply these standards and guidelines, e.g. how the interoperability of existing, and future systems, can be practically achieved.

Implementation of the digital discharge letters could be an interoperability pilot, it was an improvement most of the interviewed users were looking for. This requires that we define first the needed improvements to the operational, local health IT systems that they can provide and receive discharge letters automatically, and second, the national repository, data base, infrastructure that is capable to utilize information from these discharge letters, and to apply information in national planning and monitoring of the health system. Before these steps, we need to define a harmonized, standardized format, both for the content and for the structure, of the discharge letter, to make information exchange possible.

Usability of the health IT systems was considered by many users in this study rather poor. There are many international guidelines and heuristics that can help in improving the usability when used as design principles. A well-known example are the 10 usability heuristics by Jacob Nielsen (http://tfa.stanford.edu/download/TenUsabilityHeuristics.pdf) that advise to pay attention to the visibility of the system status, match between system and the real world, user control and freedom,

consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, help for users to recover from errors and good help and documentation of the system.

Mostert-Pipps (2011) identified in her study the important factors that help to build continuity of care, these include need for clear guidelines, policies and procedures on how to select a technological solution and how to prepare the environment for sustainable implementation, and need to offer support for the users. In the local health care organizations it would be important to identify and document the strategic and operational organizational needs and to establish reliable data sources and infrastructural resources.

The organizational health IT policy needs to be visible and integrated within organizational framework. Through the identified needs and strategies the planning and implementation of health IT system will be possible and then the systems fulfill the needs and utilize the organizational data sources and infrastructure. And, it is important, that all local and regional plans and implementations are compatible with the national strategies and guidelines

Currently, mobile technologies offer wide possibilities and may extend the use locations and situations. Open source technologies offer user organizations better possibilities for modification and customization of the software than the closed software, and with standardized approach open source supports integration and interoperability with other systems. Open source on the other hand requires skilled health IT personnel for adoption of the system in local environment, and through this, open source gives possibilities for local, even small enterprises to participate in the development and installation project and thus increment their expertise and knowledge. In local health care organizations and health IT supplier companies frequent hands on training with health IT systems will improve the level of health IT literacy and create awareness on the importance of accurate data needed in the health system.

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APPENDIX 1: USER EVALUATION QUESTIONNAIRE

QUESTIONNAIRE ON THE USE OF ELECTRONIC MEDICAL RECORD (EHR)/ HOSPITAL INFORMATION SYSTEM (HIS)

I Respondent

What is your profession?

Are you doing clinical work with patients?

Are you using the EHR or other information systems in your current work?

- EHR system?
- other systems?

How long have you been using this system/these systems?

Did you use another EHR system before the current system?

Did you have some training / courses to help you to use the EHR?

II How often you use EHR/HIS to assist you with the following tasks?

Task	1	2	3	4	5	A	B
	Never/ almost never	Seldom	about half of the occasions	Most of the occasions	Always / almost always	Our system does not support this task	This task does not apply to me
Review the patients problems							
Seek specific patient information from EHR							
Follow the results of a particular test/investigation of a patient							
Enter daily notes from a patient							
Order laboratory tests							
Receive the lab test results							

Order X-ray, ultrasound or CT investigations							
Receive the results from X-ray, us or CT							
Order other supplementary investigations							
Refer the patient to other departments /specialists							
Write prescriptions							
Write sick-leave notes							
Task	1	2	3	4	5	A	B
	Never/ almost never	Seldom	about half of the occasions	Most of the occasions	Always / almost always	Our system does not support this task	This task does not apply to me
Give written individual information to patient, e.g. on medication, disease status							
Collect patient information for discharge letters							
Register to EHR diagnosis codes, or performed procedure codes							
Use of EHR to transfer patient information to other health care organisations (as printings, emails)							

III How has the EHR/HIS in your opinion changed your performance in the following tasks?

Task	1	2	3	4	5	A	B
	Significantly	Slightly more	No change	Slightly easier	Significantly easier	I don't know	Not possible in my system

	more difficult	difficult					
Reviewing patient's problems is							
Seeking patient's information from EHR is							
Ordering x-ray/us/CT is							
Following the patient's X-ray /us/CT investigation results over time is							
To order lab tests is							
To receive the lab test results is							
Referring patient to other health organisations/ specialists is							
Task	1	2	3	4	5	A	B
	Significantly more difficult	Slightly more difficult	No change	Slightly easier	Significantly easier	I don't know	Not possible in my system
Writing prescriptions is							
Producing sick-leave forms is							
Giving written individual information to patient is							
Collecting information for the patient's discharge letter is							
Registering diagnosis codes or performed							

procedure codes is							

IV How satisfied you are with your current EHR/HIS system?

	1	2	3	4	5
	Never/ almost never	Seldom	About half of the time	Most of the time	Always / almost always
Content					
How often does EHR provide precise information that you need					
How often the information content meets your needs					
How often does the reports provided meet your needs					
Does EHR provide sufficient information to support your work					
Accuracy					
Is the system accurate					
Are you satisfied with the system accuracy					
Format					
How often is the information presented in a useful format					
How often is information clear					
Ease of use					
How often you think EHR is user-friendly					
How often you think the system in easy to use					
Timeliness					
How often you get the information you need in time					
How often EHR provides up-to-date information					
Security					

Can you trust that information is safe and secure					
Are there problems in patient data confidentiality and privacy					

V Your summary assessment of EHR/HIS in use

	1	2	3	4	5	6
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	I do not know / no opinion
System is worth of time and effort to use it						
I am satisfied with the current system						
With the use of EHR/HIS our department has become more efficient						
With EHR/HIS our department is more cost-effective						
EHR/HIS has made my work more efficient						
EHR/HIS has helped me to use more time with patients						
EHR/HIS is useful in my clinical work						
The quality of the department work has improved with EHR/HIS						
I am satisfied with training I have received to use EHR/HIS						
EHR/HIS is useful in producing good patient documentation						
I think safety and privacy of patient information is well covered in EHR/HIS						

Any other comments on current EHR/HIS, your wishes to improve the EHR

Thank you for your participation!

Your answers are confidential and your identity will not be revealed.

APPENDIX 2: IT SUPPLIER QUESTIONNAIRE

Thematic interview for the EHR suppliers

General information on the system

Name of the system

Number of months/years system has been in deployment

Current system version

Current system – open source / closed system

Scope of the current EHR system

- disease-specific… disease area supported / primary health care / full hospital health information system

Is the EHR used on a stand-alone computer or on a network of computers

System ownership?

Licensing model

System details and standards

Uses a standardized coding system/classification e.g. ICD10, SNOMED, LOINC

Uses a standard drug coding / listing system

- international / national standard

Uses a standard lab test coding / listing system

- international / national standard

User friendly system prompts and appropriate error messages with clear corrective action

- if no, what is the problem

Customizable user interface (forms and fields)

Built-in backup and restore features implemented

Usable via mobile devices (tablets, phones, etc)

Baseline demographic and clinical health information

Unique patient identification system in use

- if yes, what kind of identification

Biometric, Bar Code support implemented

Supports electronic patient referrals to other health care organisations

- How is this functioning

Records patient demographic data

Maintains up-to-date problem lists per patient

Maintains medication lists per patient

Maintains allergy lists per patient

Records vital signs

Incorporates lab test results

Generates Patient lists for doctors/departments/units

Patient education/information materials accessible

Generates clinical summaries /discharge letters

Provides a longitudinal view of a patient's medical history

Manages drug interactions

Manages adverse drug reactions

Supports Appointment scheduling set up, update and management

Patient data storage – longitudinal storage – how long – how is it organized?

Clinical decision support

Incorporates clinical decision guidelines

Generates alerts to support clinical decision making

Generates reminders for users on certain aspects

Exchange of electronic information

Exchanges clinical information and patient summaries with other systems

Electronically transmits prescriptions

Electronically transmits and receives laboratory orders and results

Electronically transmits and receives digital images

Is able to display images via EHR

Electronically transmits aggregate information to DHIS2 (district health information system)

Supports HL7 messaging

Supports XML generation and messaging

Health reporting

Customizable Reports

Export/import of external reports

Generates MoH required reports and statistics

Generates Patient level reports

Generates facility specific reports

Generates patient-specific medication reports/cards for a patient

Order-entry

Generates prescriptions orders

Generates lab orders

Generates referrals

Security and confidentiality

Supports user authentication

Supports role based access control

Audit trail / event log files supported

Supports analysis of audit trails reports

Manual and automated database back up

Integration

Client operating systems supported, which

Database supported, which

System programming language

User interface type supported

- desktop application / web application / mobile application

Standards applied?

APPENDIX 3: PERMISSION FOR THE STUDY INTERVIEWS

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER, ELDERLY AND CHILDREN

Telegram: "AFYA", DAR ES SALAAM
Telephone: 2342000 –7
Fax No. 2138060
(All letters should be addressed to the Permanent Secretary)
In reply please quote:

6 Samora Machel Avenue
P.O.BOX 9083
11478 DAR ES SALAAM

Ref. No. AB/209/247/08/57 **19th September 2016**

Vice Chancellor,
NM-AIST,
P.O. Box 447,
ARUSHA.

RE: VISITING SOME SELECTED HOSPITALS FOR EVALUATION PRACTICE

Refer to your letter with Ref: No. BD/389/436/01/53 dated 13th September 2016 with above-mentioned heading.

The Ministry of Health Community Development, Gender, Children and Elders (MOHCDGCE) is implementing strategies, including the Health Sector Strategic Plan IV and the Tanzania eHealth Strategy 2013-18, to guide the use of Information and Communication Technology (ICT) in the transformation of the healthcare system as part of the on-going health sector reforms, by enabling information access and supporting healthcare operations, management and decision-making. One of the key areas targeted for transformation is the use of ICT to make health facilities more effective and efficient. This necessitates the need to have an integrated Health Facility Electronic Management System (iHFeMS) in order to make Health facilities operate more efficiently and effectively. In January 2016, the Ministry in collaborations with PORALG (Presidents Office – Regional Administration and Local Government) launched guideline and standards document for implementing an iHFeMS.

I am pleased to inform you of the Ministry approval to visit health facilities in Arusha and Dar es Salaam, in order to select a cluster of health delivery facilities and subsequently identify people who are willing to participate in your interviews. I trust you will keep us apprised of your progress with reports and findings.

We look forward to working towards improving the health outcomes in our country.

Marcos Robert Maeru
FOR: PERMANENT SECRETARY