ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

SCHOOL OF INFORMATION SCIENCE

AND

SCHOOL OF PUBLIC HEALTH

CHALLENGES ASSOCIATED WITH PHYSICIANS' ACCEPTANCE AND USAGE OF ELECTRONIC MEDICAL RECORDS (EMR) IN PUBLIC HOSPITALS OF ADDIS ABABA.

BY

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SEPTEMBER, 2013

ADDIS ABABA, ETHIOPIA

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A Thesis submitted to the School of Graduate studies of Addis Ababa University in partial fulfillment of the requirements for the Degree of Master of Science in Health Informatics.

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DEDICATION

This paper is dedicated to my beloved mother, **W/ro ETAFERAHU WOLD, my brothers MINTESINOT, SINTAYEHU, and my sisters SEBLE, RUTI & MESKI.**

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ACRONYMS

CPOE: Computerized Physician Order Entries

e-HMIS: Electronic Health Management Information System

EHR: Electronic Health Record

EMR: Electronic Medical Records

Epinfo: Epidemiological information (software)

EPR: Electronic Patients Record

FMOH: Federal Ministry of Health

HIS: Healthcare Information System

HIT: Health Information Technology

HMIS: Health Management Information System

HSDP: Health Service Development Program

ICT: Information and Communication Technology

MDG: Millennium Development Goal

SPSS: Statistical Package for Social Science.

TAH: Tikur Anbessa Hospital

TBGH: Tirunesh Beijing General Hospital

TUTAPE: Tulane University's Technical Assistance Program for Ethiopia

ABSTRACT

Background: - Electronic Medical Record systems represent a departure from traditional paper records keeping in that they include all records of patient treatment stored in computerized format. When coupled with networked systems and the internet, the EMR platform offers increased versatility in terms of transferability of information, greater communication among doctors, and improvements in quality of care, just to name a few advantages.

Objective: - The general objective of this study is to assess challenges associated with physicians' acceptance and usage of EMR in public hospitals of Addis Ababa.

Methods: - A cross-sectional study design with quantitative method was conducted among 11 Hospitals under Addis Ababa Health bureau, Addis Ababa University and Federal Ministry of health from May to June 2013G.C. A total of 275 physicians were selected using simple random sampling technique. The data were collected using self administer structured questionnaire. The data were entered and cleaned using Epinfo version 3.5.1 and analyzed using SPSS version 15. Frequency and percentages were used to describe the study population.

Result: - The study revealed that among the total respondents 46.5% learned how to use computers by their own. Only 2.5% of the study participants reported they feel discomfort while using computer. About 53.1% respondents have knowledge of Electronic Medical Records (EMR). About 43.4% responded that they didn't get enough support from hospital administration and only 7.9% participants respond they did get full support. More than half percent of participants acknowledged that time required entering data to the system, reluctant to replace a paper based medical records in order to integrate with EMR, lack of technical training and support, EMR increase in physicians work load and Poor typing ability as major factors affecting acceptance of EMR.

Conclusion and Recommendation: - Generally this finding demonstrates that high proportion of physicians was supporting implementation of EMR; however, some factors such as lack of technical training and support, EMR increase work load and time required entering data to the system affect acceptance of it. So stockholders should device adequate training and support to them to solve the problem.

CHAPTER ONE
INTRODUCTION

1.1. Background

Traditionally, hospitals use paper-based profiles of patients to keep track with the patients' illness history, their development and overall general health conditions. Though this traditional technique has long been adopted, it is not without practical problems. One living example of the shortcoming of traditional hospital profiling systems of patients' data was demonstrated by Hurricane Katrina (1). Hurricane Katrina destroyed the medical records of untold numbers of people, bringing new attention to the need for electronic medical data. Lost medical records expose patients to considerable risk of medical mistakes because physicians would not be able to draw connections between the current health conditions of the patients and their medical history; namely, diagnosis, drugs' effects, and surgery risks assessment (1).

The use of paper based medical record system had made the practitioners not be fully informed about patients' present and previous health status and treatment. Practicing health care in this manner with lack of information had become habit. To alleviate such problem, Electronic Medical Record is starting to be used in hospitals throughout developed countries (2).

EMR systems represent a departure from traditional paper records keeping in that they include patient demographics, medical histories, and all records of patient treatment stored in computerized format. When coupled with networked systems and the internet, the EMR platform offers increased versatility in terms of transferability of information, greater communicating among doctors, and improvements in quality of care, just to name a few advantages. In this regard many developed countries like USA, Canada, Norway, have already started to use EMR and significantly improve the provision of health care services (3). All the organizations that are developing or planning to develop EMRs share broad common goals, such as improving the quality and safety of care, reduction of cost and unnecessary labor, improving decision making at the point of care, and creating stronger physician partnerships (3).

In Ethiopia, EMR has been implemented in five regional hospitals, Adama, Bishoftu, Dre Dawa, Mekelle and Addis Ababa since 2007. In Addis Ababa, EMR was implemented in hospitals and few health centers. Like other countries, Ethiopia is also started using EMR to deliver quality health care services and solve problems related to lack of getting appropriate patients' information (4). For wider application of the system in all hospitals and health centers, it needs understanding and developing positive attitude towards the system.

1.2. Statement of the Problem

According to Kaelber et al. (5) some studies suggest that physicians may be more reluctant to adopt EMRs than other health professionals. This reluctant is mainly due to the concerns about whether adoption of EMRs will create additional work that is not reimbursed. Another barrier which may hinder physicians' acceptance of EMR is resistance to change (6).

Researchers have also observed that "Even if physicians are persuaded to extract information from EMR, it will be difficult to convince them to enter information without appropriate incentives." (6). Adoption of EMR requires the behavioral changes because it brings changes in the roles and responsibilities and business processes in the health system. Previous researchers also mentioned that behavioral changes are difficult, and these changes occur if there is a perceived value, if there is a perceived usefulness and if there is the motivation and organizational support to change (7).

Currently in Ethiopia the health care system is being assisted by ICT and there are initiatives by the government. The Government, as part of policy is committed to implementing a number of initiatives aimed at the widespread deployment and exploitation of ICTs to support the health delivery system throughout the country (8). As per the report of health sector development program III (HSDP III), lack of timeliness and completeness of HIS reporting remains a weakness, and such delays contribute to the failure (at all levels) to use data as the basis for informed decision-making in health care planning and management (4). To avail quality and timely Health Information at various levels of decision points throughout the country's health system. However, there are still problems related to the use of EMR in hospitals. Among the problems the one is physicians' acceptance and use of EMR (4).

Therefore it is important to asses physicians' perception on usefulness of EMR, and also the value and trust they have in EMR usage. Evaluation of physicians' awareness level on acceptance and use of EMR is necessary for the successful implementation on EMR system. According to a study conducted by Kaelber et al. (5), there is a need for research focusing on finding the factors associated with the acceptance and use of EMR.

The case in Ethiopia may not be different from other countries and there have not been research works conducted in relation to challenges associated with physicians' acceptance and usage of EMR. It is important to identify those challenges which affect physician acceptance and usage of EMR. In line with this, the research aims to answer the following questions.

- Do physicians have knowledge of Electronic Medical Records?
- What is physicians' perception on use of EMR compared to paper based records?
- Which of the factors are the most crucial obstacles for physicians' acceptance and use of EMR?

1.3. Objective of the Study

1.3.1. General objective

The general objective of this study is to assess physicians' level of computer skill, knowledge and perceptions of EMR and identify the challenges associated with physicians' acceptance and usage of EMR in public hospitals of Addis Ababa.

1.3.2. Specific objectives

- To assess physicians' level of computer skill.
- To assess physician knowledge and perception of electronic medical records in comparison to paper based records.
- To identify factors affecting acceptance and usage of electronic medical records.

1.4. Rationale and Significance of the study

Since paper based medical records are bulky and awkward to use, some health care organizations in developed countries have under taken the transition from a traditional paper

system to an electronic medical records (EMR) system. Research in this field has shown the EMR system can improve the quality of care provided, accuracy of patient information, and over all safety of patients through reduced medical mistakes (3). Therefore, it is important and timely to asses challenges associated with physicians' acceptance and usage of Electronic Medical Record (EMR). Because:-

- Physicians are the main front line user group of EMRs.
- Whether or not they support and use EMRs will have a great influence on other user groups in a medical practice such as nurses and administrative staffs.
- As a result, physicians have a great impact on the overall adoption level of EMRs.

As it requires physicians to actively support and use EMRs to benefit from them, it is essential to understand the possible challenges to their implementation from the physician perspective, to understand awareness level and to identify challenges and problems.

Thus, as the result of these study policy makers, health sector planners and health care organizations will have basic information about challenges associated with physicians' acceptance and usage of Electronic Medical Record (EMR). Furthermore, awareness of the problems may also help to create conducive environment in all aspects to implement EMR.

1.5. Scope of the study

The scope of this study is limited to assess challenges associated with physicians' acceptance and usage of EMR in eleven public hospitals of Addis Ababa, which are administered under FMOH, AAHB and Addis Ababa University. It did not include other health professionals and hospitals that are administered by Federal Police, Defense, NGOs and Private owned. This is not to overlook the importance of their health care services, but since it will not be easy to undertake such a huge task within the time span available for the researcher. The study was started after it was approved by advisors and ended in September, 2013.

1.6. Organization of the study

This thesis is divided in to five chapters. The first chapter deals with the introduction, statement of the problem, rationale, objective and scope of the study. The second chapter presents literature review in the area of the study, conceptual part of it tells us about the definition, Historical perspective and Advantages of Electronic Medical Records (EMR), the empirical part tells us about use of EMR in developed countries, developing countries and sub Saharan Africa, its implementation in Ethiopia, Smartcare's current status in Ethiopia, factors affecting its acceptance and Related works. The third chapter presents the methodology which discusses the overall procedure of study design, data collection, sampling procedure, data analysis and interpretation. The findings, data interpretation, discussion, strength and limitation of the study are presented in chapter four. Finally, the fifth chapter brings to an end of this survey research with, conclusion and recommendations.

CHAPTER TWO
LITERATURE REVIEW

Information and Communication Technology (ICT) is very important nowadays because it has many potential which makes our life easier. The effects of ICT technology on our daily life cannot be refuted. It is impacting on every aspect of human activities and the health industry is no exception. EMR is one type of Healthcare Information System (HIS) like Electronic Health Record (EHR), Computerized Physician Order Entries (CPOE) and Electronic Patients Record (EPR)(1).

2.1. What is Electronic Medical Record (EMR)?

An electronic medical record is, according to the latest definition from the National Alliance of Health Information Technology (NAHIT), "an electronic record of health-related information on an individual that can be created, gathered, managed, and consulted by authorized clinicians and staff within one health care organization." (9). An EMR characteristically contains lists of patient problems, medications, allergies, as well as health maintenance data, progress notes, various test results, and ordering functions (10).

EMR is the software that enables medical data to be digitally processed, stored and communicated. It can also be used to access, process, manage and present medical information of the patients, to doctors, administrative staffs and other users. EMR plays a major role in activating the communication between the users and patients, and between users themselves. It can also be applied for different medical issues, and business areas especially in hospitals. EMR enable the retrieval of the medical information, storage of data for longer period and availability of data at anytime and anywhere. EMR can be defined as an electronic middleman, which allows the users to retrieve the patient data (11). According to Pike (12) and Wald et al. (13), EMR is an electronic record of patient health information such as: patient demographic information, medical history, medical encounters, booking, immunizations, diagnosis data, treatment, laboratory data, radiology, as well as administrative issues. The Electronic Medical Record is a computerized patient tracking and caring system.

2.2. Historical Perspective of Electronic Medical Records

The Department of Family Medicine at the University of South Carolina was one of the first known organizations to develop and use an EMR in 1972 (14). It was a system created and maintained by the Department, not an outside vendor, and consisted of mini-computers maintained by onsite programmers. In the 1990s, it became apparent that a better, more economical system of EMRs could be purchased from a computer software company. In April of 1991, the Department of Family Medicine transitioned to a new system from an outside vendor (14).

By the early nineties, the idea of widespread EMR implementation was on the horizon. Organizations, while not yet utilizing a full-fledged EMR, had begun to use computer programs to manage data on test results and patient demographics Health care information technology planners realized that the next logical step for health information systems was a completely integrated EMR (15).

2.3. Advantages of EMR

According to the Institute of Medicine (IOM) 44,000 to 98,000 deaths occur each year in USA hospitals due to preventable medical errors and over 770,000 individuals are either injured or die each year in hospitals due to adverse drug events. The cost of these errors is about $38 billion per year (16). There are many causes of medical errors, and one of these is due to different physicians treating the same patient. Not all or only a few physicians can access to all the patient's medical records. Some of them do not know anything about the history of their patients (16) and these can have damaging consequences if the wrong drugs or treatments are given to these patients.

Another important cause of medical errors is in prescriptions, as writing them on paper is not clear and is too difficult to read it. Thus, electronic prescription would greatly reduce the prescription errors. Medical errors could be reduced by the use of decision support tools that would check for drug interactions as well as dosage levels and allergies. EMR could receive alert reminders for preventative care treatments, testing, and alert about various treatment procedures, guidelines associated with the diagnosis (17).

Moreover, electronic records improve record keeping, recording and documentation of medical examination. EMR usage in hospitals generally reduces cost, improves clarity of documentation, clinical decision support, and enables better communication of information about patient referred for consultation, potential availability of the record anywhere, anytime as well as increased storage capabilities for longer periods of time. The EMR also enhance the patient provider c communication. EMRs can remove the communication barrier between users and patients. EMR can help public health officials easily detect an outbreak of illness and determine what measures are needed to protect the community (18). Another advantage of using EMR is the patient privacy and security. Electronic files play a significant role in maintaining patient information and confidentiality, as unauthorized access can reveal history of drug abuse, venereal disease, or life-threatening illness, psychiatric notes reveal inner fantasies, sexual activities, crimes, or the crimes and abuses of family members.

Therefore, if anyone could have easy access to this private information without any security, it can cause a lot of problems for patients, and this can affect their daily lives. EMR also make it easier for medical researchers to ask questions or query about diseases that were previously been impossible to ask of it, and it may well lead to the discovery of tens or even hundreds of new diseases and allow reclassifications of existing ones (19). There are many advantages for using EMR such as; playing a major role to improve patient safety, quality of care, and medical records. EMR implementation benefits healthcare related organizations such as hospitals and clinics in reducing medical errors, facilitating access, supporting clinical decisions and others (20). The EMR have some functions associated with patients different than the medical functions such as financial, legal information, research and quality improvement purposes. Due to some reasons, this information must not be shared among many professionals who are not related to the healthcare team.

On the financial side, EMR allows the accounting staff to provide more accurate billing information and allow users to submit their claims electronically. Therefore, receiving payment will be quicker, and the information for any patient will available. Thus, there is no need for the patient to provide the same information over and over again. They may even forget about it. Therefore, there is a general consensus that the widespread use of electronic medical records

improves the coordination and quality of healthcare for patients. However, there are still many barriers in implementing EMR in hospital around the world (20).

2.4. Use of EMR in Developed Countries

Countries such as the United States, United Kingdom and Australia have mature and advanced healthcare infrastructures that receive substantial funding and support from their governments. Although significant failures still exist in these systems, there is strong support and motivation to accomplish goals associated with comprehensive development of successful medical information technology systems (21). These countries are able to make significant investments in research to develop information systems that would meet the need of their particular healthcare system. This is in sharp contrast to the healthcare infrastructure of many developing countries. For many of these countries the delivery and management of healthcare services alone comes with many challenges. In many of these countries, implementers of healthcare information technology based solutions are faced with complex challenges such as inadequate funding, lack of resources and weak healthcare infrastructure.

When EMR systems were first introduced, it was widely believed that their broad adoption will lead to major health care savings, reduce medical errors, and improve health. But there has been little progress toward attaining these benefits. The United States trails a number of other countries in the use of EMR systems. Only 15–20 percent of U.S. physicians' offices and 20–25 percent of hospitals have adopted such systems. Barriers to adoption include high costs, lack of certification and standardization, concerns about privacy, and a disconnection between who pays for EMR systems and who profits from them (22).

Despite the appeal of EMR, available data suggest that the majority of office practices in the United States, especially smaller offices, do not have this technology (22). For example, using 2003 data from the National Ambulatory Medical Care Survey, Burt and Sisk reported that an average of 17.6 % doctors used EMRs in their office-based practices. In contrast, other countries, such as Australia and the United Kingdom, are nearing universal adoption of EMRs (22). In Massachusetts in 2005, only 18% of medical and surgical office practices reported using EMRs. Larger practices that provided primary care and those with other computerized

systems were more likely to have adopted EMRs. Among practices with EMRs, most systems did not include advanced functionalities, such as order entry for medications, laboratory tests and diagnostic imaging. While 58% of practices with EMRs had electronic clinical decision support available, more than 1 in 4 practices indicated that a majority of their clinicians were not actively using that support (23).

In 1995, Newton performed a study entitled "The first implementation of a computerized care planning system in the UK". The implementation included both a new way of structuring work, using the nursing process and a new technology which was the use of computers. The results showed that it took more than a year after implementation until the nurses' negative attitudes towards the system shifted to positive attitudes. The study also showed a significant improvement in the quality of care planning (24). In their review on the use of computers in a health care setting, Smith found no conclusive evidence that could provide the foundation for an effective computer implementation strategy. However, more common use of computers in society today has increased the use of computers in nursing and also made it possible to implement standardized care plans in EMR (25).

Timmons (24) described nurses' resistance to using computerized systems for planning nursing care; their resistance did not entail direct refusal, but was instead quite subtle. They tended to minimize use of the system or postpone it to another time or to the next work shift. Timmons (24) considered that the nurses' behavior was characterized by resistance to changes in the nursing process and to the technology. Smith and others investigated charting time before and after computer implementation and found that no change had occurred. The advantage of using the software was observed when the technology and the concept brought together the care plans and subsequent documentation. This shows that use of the system improved the function and meaning of the care plan process (25).

2.5. Use of EMR in Developing Countries and Sub Saharan Africa

In Africa millions of people die every year, and Sub-Saharan Africa, in particular, shows little progress towards achieving five of the six health-related Millennium Development Goals

(MDG) targets (26). Countries in this region require health information systems that will enable them to generate the data needed to monitor progress towards the achievement of the targets. The health information systems in most African countries currently are primarily paper based and are woefully insufficient to meet both patient and reporting needs. On the other hand, information and communication technologies (ICTs) offer unparalleled opportunities to respond adequately to this challenge (26).

The use of electronic medical records (EMRs) in resource-poor countries in the Global South was, at best, experimental. Few organizations thought their usage was realistic, and fewer still had deployed such systems. The handful of projects that used an EMR system fell mainly into two groups: those that used expensive commercial software in specialist projects and private hospitals and those that developed the software in-house, usually to manage a specific disease (27). Since then, several successful medical information systems and EMRs have been implemented in developing countries and information technology is much more widely available in resource-poor areas. These factors, along with recognition of the benefits of EMRs in improving quality of care in developed countries, have created a broad interest in the use of health information technology systems (HIT) in the management of diseases such as HIV and drug-resistant TB (27).

In 2001, the Departments of Medicine and Child Health and Pediatrics at Moi University, Eldoret and the Department of General Internal Medicine and Geriatrics at the Indiana University School of Medicine, in collaboration with the Moi Teaching and Referral Hospital in Eldoret, Kenya, established the Academic Model for Prevention and Treatment of HIV/AIDS (AMPATH) (28). The AMPATH Medical Record System (AMRS) was the first functioning comprehensive electronic medical record system committed to managing and improving the quality and efficiency of care for patients with HIV/AIDS in sub-Saharan Africa. It has played a significant role in patient care in all AMPATH sites. It has standardized patient data collection and made data retrieval much faster than the traditional paper-based record. It has enabled evidence-based decision-making for patient encounters and for the health system. The AMRS is affordable and represents a model system for recording critical HIV/AIDS data in resource poor settings that will be delivering an increasing amount of HIV care. This model will also allow

those funding the rapid increase in the provision of HAART to know the return they are getting on their investment and hopefully encourage continued treatment of the worst medical disaster to ever befall humanity (28).

While most sophisticated EMRs in low-income regions are in large cities, where infrastructure and staffing needs are more easily met, Partners in Health (PIH) pioneered web-based EMRs for HIV and TB treatment in rural areas (29). The HIV-EMR, developed in Haiti, was deployed in two Rwandan health districts starting in August 2005. In less than six months (August 2005 through January 2006), the EMR tracked over 800 patients on ARV treatment. The addition of new features and adaptation to local needs was happening concurrently with the rapid scale-up and evolution of the medical program itself. The EMR in Rwanda provides support for patient monitoring, program monitoring, and research. Patient monitoring includes information for care of individuals, such as historical medical summaries and alerts. This is especially useful given the large distances between the clinics. The EMR in Rwanda also has an instrument to predict drug requirements and aid pharmacists in packing (29).

PIH in Rwanda learnt that well-trained data entry persons are required to maintain an EMR system; the team also learnt that at least 4 months of on the job-training is needed to properly train data entry persons. Data entry persons must have the ability to solve problems and follow up ambiguous or suspect data, and IT support persons must be available. Care providers must also be trained to properly report changes in treatment (29).

2.6. EMR implementation in Ethiopia

In Ethiopia, as per the report of health sector development program III (HSDP III -2005/06-09/10), lack of timeliness and completeness of HIS reporting remains a weakness, and such delays contribute to the failure (at all levels) to use data as the basis for informed decision-making in health care planning and management. In recognition of this, HMIS has been considered as one of the priority areas for Federal Ministry of Health (FMOH) in its HSDP III (4).

HSDP III has articulated to develop and implement a comprehensive and standardized national HMIS and monitoring and evaluation (M&E), and to ensure the use of information for

evidence-based planning and management of health services. A radical HMIS and M&E were designed in 2006. In 2007, when the decision was made for the nation- wide scale up, FMOH and Regional Health Bureaus (RHBs) defined their respective roles. It removed the redundant parallel reporting, and reduced data burden and number of indicators. Now HMIS is scale up to e-HMIS, which is a system that helps to accurately and timely enter, aggregate, store, analyze and evaluate health related data from health facility to federal level. e-HMIS is composed of a set of interrelated components and procedures organized with the objective of generating health information and intelligence to monitor the health status and health services of the nation to improve public health care leadership and management decisions at all levels (30).

Availing quality and timely Health Information at various levels of decision points throughout the country's Health system is very essential for the improvement of Health Care and overall Health System in Ethiopia. The benefits of using an EMR includes, increasing the quality and speed of access to Health Information and the effectiveness of the Health System. In Ethiopia, the implementation of EMR is through software called SmartCare. TUTAPE (Tulane University's Technical Assistance Program for Ethiopia) is developing the SmartCare software in partnership with Tulane University, CDC and the Federal Ministry of Health of Ethiopia (FMOH) (31).

SmartCare was first developed, tested and deployed in Zambia by CDC for HIV/AIDS care and treatment (31). Besides the rich and advanced functionality and features, SmartCare has also been proven to work in limited resources environment of developing countries particularly in Africa. SmartCare possesses numerous advantages and features in comparison to existing EMR applications. Ethiopia thus adapted SmartCare as the preferred EMR application. SmartCare gained recognition as the Electronic Health System Application for Ethiopia followed by a presentation and live demo of the customized SmartCare EMR. The presentation was to the FMOH officials including Ministers, State Minister, Department/Agency Heads, Regional Health Bureau Heads, and other relevant stake holders (32).

2.7. SmartCare's current status in Ethiopia

More recently, Ethiopia has seen a significant deployment of the SmartCare system used in Zambia. Over 100 clinics and hospitals in the Dire Dawa region, covering the entire area, have successfully deployed this system for building and maintaining electronic medical records, which will improve both the quality of health information as well as patient care (32).

Ethiopia has 9 regions and 2 city administrations. Dire Dawa city administration was identified to be the most favorable since it was possible to create a controlled environment for the initial phase of the deployment. Thus, Dire Dawa nominated for the initial phase and chosen as a pilot site. During the initial phase, interactions will be recorded for future improvement of the system. Prior assessment to identify and map ICT resources was performed. LAN design and deployment was performed at six health centers and one hospital. Currently EMR has been implemented in five regional hospitals, Adama, Bishoftu, Dre Dawa, Mekelle and Addis Ababa since 2007. Physicians, nurses, and other medical staffs are the main users of electronic medical record (33). For wider application of the system in all hospitals and health centers, it needs understanding and developing positive attitude towards the system.

2.8. Factors affecting EMR acceptance

I. Physicians and/or staff lack computer skills

Many researchers have concluded that physicians have insufficient technical knowledge and skills to deal with EMRs, and that this results in resistance (34) Meade et al. (35) observe in this context that most of the current generation of physicians in Ireland received their qualifications before IT programs were introduced. EMR providers appear to underestimate the level of computer skills required from physicians, while the system is not only seen as but in practice actually is very complex to use by these physicians. Further, good typing skills are needed to enter patient medical information, notes and prescriptions into the EMRs, and some physicians lack them. Shachak et al. (36) found that EMR use introduces a new type of medical errors: typos. Further, it is not only the physicians but also other staff at medical practices who lack adequate computer skills. This general lack of skills hinders the wide adoption of EMRs.

In a study conducted among a selected population of doctors in Nigeria by Ozumba in 2002, only about 0.5% of doctors searched the internet for information relating to their clinical

practice/research, though 72% of respondents believed that the internet had a role to play in medical practice (37).

In a survey of health professionals and medical students in Lagos, Nigeria, Bello et al. reported that only 26% of respondents had a computer and only 27% of doctors demonstrated computer literacy (38).A study in 2002 among a selected population of student doctors in Malaysia showed that 94.3% of respondents could use a computer (39). A study carried out in New Zealand in 2002 showed that 99% of practices use specifically designed patient management system software to assist with recording of patient and clinical consultation details and to help with the daily running of their businesses (40).

II. Lack of technical training and support

Many physicians complain of poor service from the vendor, such as poor follow-up with technical issues and a general lack of training and support for problems associated with the EMRs (41). Ludwick et al. (42) similarly note that physicians struggle to get appropriate technical training and support for the systems from the vendor. As physicians are not technical experts and the systems are inherently complicated physicians perceive a need for proper technical training and support, and are reluctant to use EMRs without it. Simon et al. (43) found that two-thirds of physicians indicated a lack of technical support as a barrier to them adopting EMRs, while Ludwick et al. (42) noted that some physicians reported a lack of access to vendor technical support.

Some physicians may have insufficient computer skills or lack the basic knowledge and training necessary to use computers effectively. Others may be unfamiliar with the various types of information technology or the benefits it may provide. A number of systems have failed because users were inadequately trained. Training must be designed to meet the needs of physicians; therefore, it is critical to get strong support of physician leadership of participation in training (44).

III. Complexity of the system

Miller and Sim (45) argue that most physicians consider EMRs to be challenging to use because of the multiplicity of screens, options and navigational aid. The complexity and usability problem associated with EMRs results in physicians having to allocate time and effort if they are to master them. Physicians have to learn how to use the EMR system effectively and efficiently which they may see as a burden. It is also possible that a lack of skills leads the physicians to regard the EMR system as extremely complicated. The complexity of the EMR system also leads to barriers in the "Time" category.

IV. Lack of Reliability

Reliability is the dependability of the technology that comprise of the EMRs (46). High reliability is very important for a system dealing with patient information, and many physicians are concerned about the temporary loss of access to patient records if computers crash, viruses attack or the power fails (46). Moreover, some fear the possibility of record loss due to an unknown technical defect in the system. Further, reliability problems will lead to financial loss, such as in the form of an increase in ongoing costs (47).

V. Lack of belief in EMRs

According to Kemper *et al.* (47) more than half (58.1%) of the physicians without an EMR doubt that EMRs can improve patient care or clinical outcomes. Other researchers have stated that those who are unwilling to use such a system are skeptical about claims that EMRs can successfully improve the quality of medical practices This creates a personal resistance to the adoption of EMRs. However, this is very much a perceived barrier to EMRs, there is a lack of valid statistical data and success stories about EMRs available to non-users. Clearly, implementing EMRs does mean a change in working styles for physicians and, initially, people are generally afraid of change and doubt its necessity (48).

VI. Lack of computers/hardware

The use of EMR systems requires a sufficient quantity of hardware in practices, including computers, phone lines and internet connections. Some researchers state that some practices

lack these 'basic' facilities/hardware needed to support EMR implementation and that this issue blocks the widespread adoption of EMRs (49). Study done in Nigeria (50) indicated 51.7% of physicians own personal computer and 95.9% Surfing the internet, a study among a selected population of student doctors in Malaysia showed that 94.3% of respondents could use a computer (51).

VII. Time to learn the system

Alongside the barriers introduced in the "Technical" category (the lack of computer skills and the complexity of the EMR system), physicians also need to spend time and effort on learning how to use an EMR system. However, "the demands and pressures of delivering office-based care may not afford them the time to learn the system" (43). Given this situation, they report that they lack the time to learn, as it would slow their workflow and increase their workload. However, other researchers argue that mastering an EMR system will help physicians to work more efficiently (35).

VIII. Time required to enter data

The timing of data entry can be highly variable. Some physicians enter the note with the patient present, while others wait until the patient has left the exam room. Those with busy schedules tend to wait until the end of the day to enter their notes for all patients. Waiting until the end of the day to enter notes is potentially risky, as it relies on faulty human memory to reconstruct what occurred hours earlier (52).

It is perhaps surprising that many researchers conclude that data entry is a problem for physicians using EMRs (53, 54). In Loomis's (54) research, more than half of the EMR users stated that data entry was both cumbersome and time-consuming. As such, data-entry is a widely experienced barrier among physicians. It can be related to the complexity of the system, or the inability of physicians to properly handle the system.

A study conducted in Mexico public hospitals, physicians who participated in this study indicated that the EMR systems are very complex and difficult to learn, and this affects their attitude towards using the EMR systems. The participants also mentioned that, it usually takes

too much time to enter data in real time, physician residents required 44 more minutes per day using computerized order entry (55).

2.9. Related Works

2.9.1. Factors that Affect EMR Acceptance

A 2007 survey of almost 1,000 physicians in British Columbia identified some key barriers to the implementation and meaningful use of EMR systems (56). The majority of physicians that had already implemented such systems at the time of the survey 86% had been using them for over a year. The authors reported that physicians found the cost, time and effort involved in implementing such systems to be the biggest hurdles. For those who had not implemented EMRs, non-adoption was attributed to the above factors, as well as the unsatisfactory quality and suitability of existing solutions in the market. Today, physicians and healthcare professionals can access free EMR comparison-shopping resources such as Canadian EMR, which contain evaluations of vendors and EMR solutions as rated by participating physicians (56).

A case study of a successful transition to an EMR system at a 15-person, multidisciplinary family medicine group in Quebec found that modifications to workflow management were the biggest challenge to overcome. In the interim, there was a considerable time cost associated with scanning documents to store electronically as well as what staff perceived to be duplication of effort in creating online records as well as maintaining paper records before the system was fully online (57).

Numerous studies in acceptance of the technology including an EMR have been conducted (58,59). According to Healthcare Information and Management Systems Society (HIMSS) repot (60) EMR; in Denmark, 92% of general practitioners, in Norway, more than 99% of general practitioners use an EMR system for a majority of their clinical and administrative tasks. In Israeli physicians use the EMR in over 98% of the departments and more than 90% of the departments use the EMR for recording patient admissions and discharges (60).

2.9.2. Physician knowledge, attitudes and beliefs

A study done on Resistance to Electronic Medical Records (EMRs) in USA (58) indicated that a majority (56 percent) of the respondents expressed doubt that physicians were familiar with EMR functions and benefits. Over 80 percent of the respondents felt an EMR would improve quality of care, while 76.6 percent expected the impact on quality of practice (i.e., work life) to be positive. Slightly fewer of the respondents (60.2%) expect an EMR will increase productivity. Nearly three-quarters (71.5%) of the respondents felt EMR usage would have to be mandated. Nearly one-third (31.7%) of the respondents expressed doubt that physicians would devote the time required for EMR training. The majority of respondents felt that benefits of an EMR outweigh the costs (72%) and that an EMR should be implemented (79.6%) (61).

A study conducted in Malawi showed 94% of respondents indicated that the EMR was faster and easy to use compared to paper based records, 3% indicated that paper based records was faster and easier while 3% indicated that there was no difference between the two systems the difference may be due to sample size in this study area were greater than the comparative study area (62).

Another study done in northern Pakistan indicated 57% of the participants had heard of e-Health prior to the survey; 28% were of the opinion that Healthcare Professionals should hear about E-Health in medical college; 50% believed that e-Health services for developing countries were useful in general (63).

Conceptual framework

Based on literatures reviewed conceptual framework was constructed to show the factors which affects physicians' acceptance and usage of EMR. Resistance, lack of computer skill, availability of time, lack of computer/hardware, poor typing ability, physicians' attitudes, increase work load, reluctant, lack of time to learn system, lack of reliability and belief in EMRs and time required entering data to the system are identified factors in the reviewed literatures.

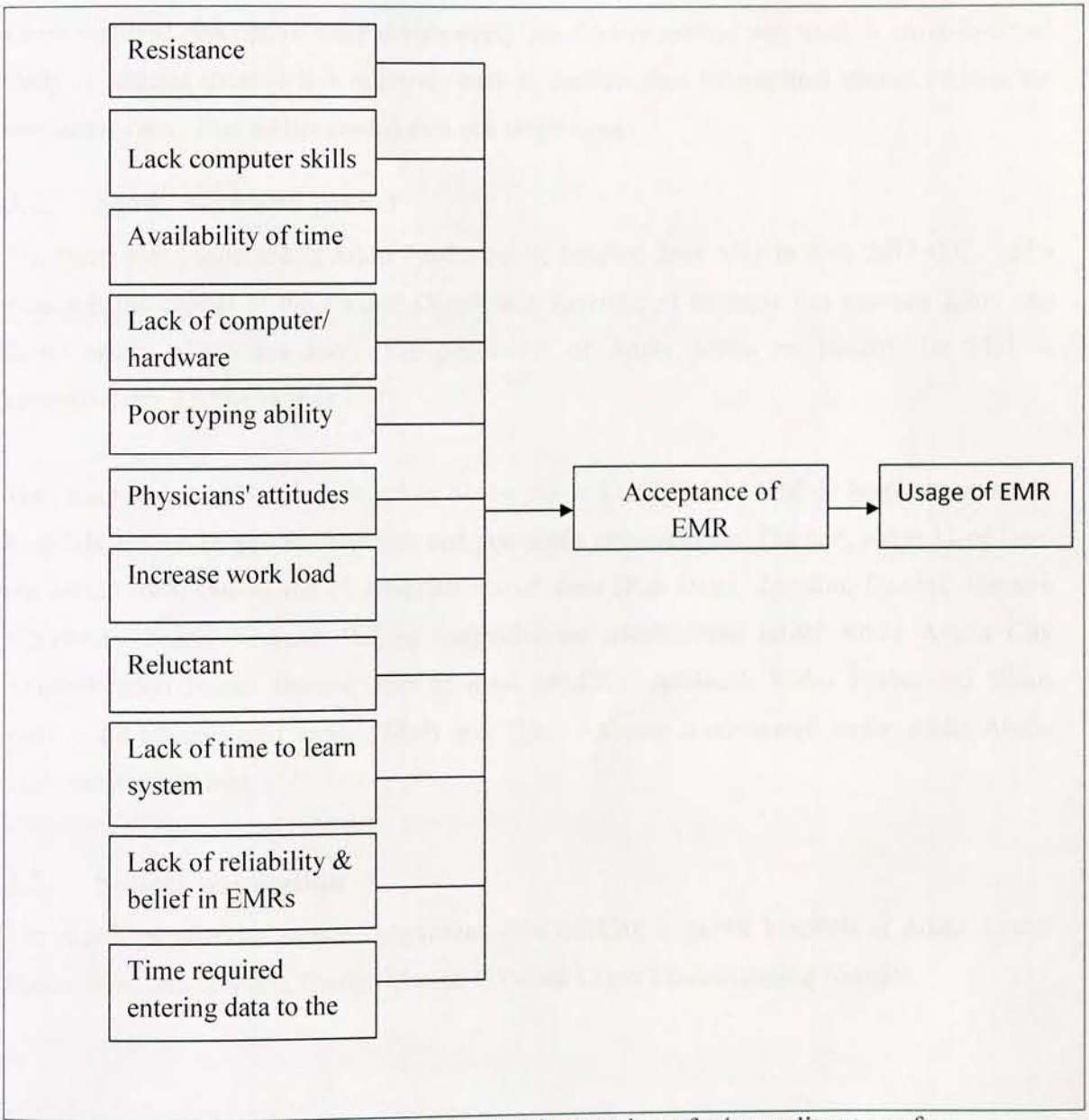

Figure .1: Conceptual frame work constructed from review of relevant literatures for challenges associated with physicians' acceptance and usage of EMR.

CHAPTER THREE

METHODOLOGY

This chapter details the methodology used to conduct the study. It serves to describe the research design and area present the procedures followed in gathering and analyzing data.

3.1. Study design

Cross sectional descriptive study design using quantitative method was used. A cross-sectional study is selected because it is relatively easy to conduct than longitudinal studies because the researcher can collect all the needed data at a single time.

3.2. Study area and period

The study was conducted in Addis Ababa public hospital from May to June 2013 G.C. Addis Ababa is the capital of the Federal Democratic Republic of Ethiopia lies between 2,200 and 2,500 meters above sea level. The population of Addis Ababa on January 1st 2011 is approximately 3,633,154 (64).

The total number of Hospitals in Addis Ababa city is 43. Out of the total 43 hospitals, about 32 hospitals are run by private investors and non-profit organizations. The rest, about 11 of them are public (64). Out of the 11 hospitals six of them (Ras Desta, Zewditu, Gandhi, Menelik II,Yekatit 12 and Tirunesh Beijing hospitals) are administered under Addis Ababa City Administration Health Bureau, four of them (ALERT, Amanuel, Kidus Paulos and Kidus Petros) are administered under FMoH and Tikur Anbessa administered under Addis Ababa University and FMoH.

3.3. Source population

The source populations were all physicians who working in public hospitals of Addis Ababa. Suchas Ras Desta, Zewditu, Gandhi, Menelik II,Yekatit 12 and Tirunesh Beijing hospitals.

3.4. Study population

Study populations were comprises of medical specialists, general practitioners, residents and interns who were working in public hospitals of Addis Ababa and those selected during the sampling procedure.

3.5. Inclusion criteria

- All physicians who are working in the selected public hospitals of Addis Ababa.

3.6. Exclusion criteria

- Physicians who were working in the selected public hospitals of Addis Ababa, on annual and sick leave and unwilling to participate in the study.

3.7. Sample size

The sample size was determined by single population proportion formula. Since factors affecting physicians' acceptance and usage of Electronic Medical Records was not known in Ethiopia and Addis Ababa, an assumption of 50% was taken. An assumption also made any particular outcome to be with 5% marginal error and 95% confidence interval of certainty (alpha=0.05) and with a contingency of 10%. Based on these assumption the actual sample size of the study population was computed using the formula $n= (Z\alpha/2)^2(p\ (1-p)/d^2$ (65).

$n= (Z\alpha/2)^2(p\ (1-p)/d^2$ Assume Where $Z\alpha/2$ =95% CI=1.96, Margin of Error (d) = 5% and p=50%). Thus $n= (1.96)^2(0.5\times0.5)/\ (0.05)^2=384$

Total sample size = 384

But, since the size of the source population is less than 10,000 the sample size will be corrected

Thus; 384x890 / 384+890

Sample size=268

Non respondent rate=10%x268=26.8

Total sample size=268+27=**295**

3.8. Sampling procedure

The number of all physicians was retrieved from the human resource department of hospitals and this was used as a sampling frame for the quantitative data. For the quantitative study the total sample size was proportionally allocated to each hospitals based on the number of physicians in each hospital then the respondents were selected from each hospital by using simple random sampling.

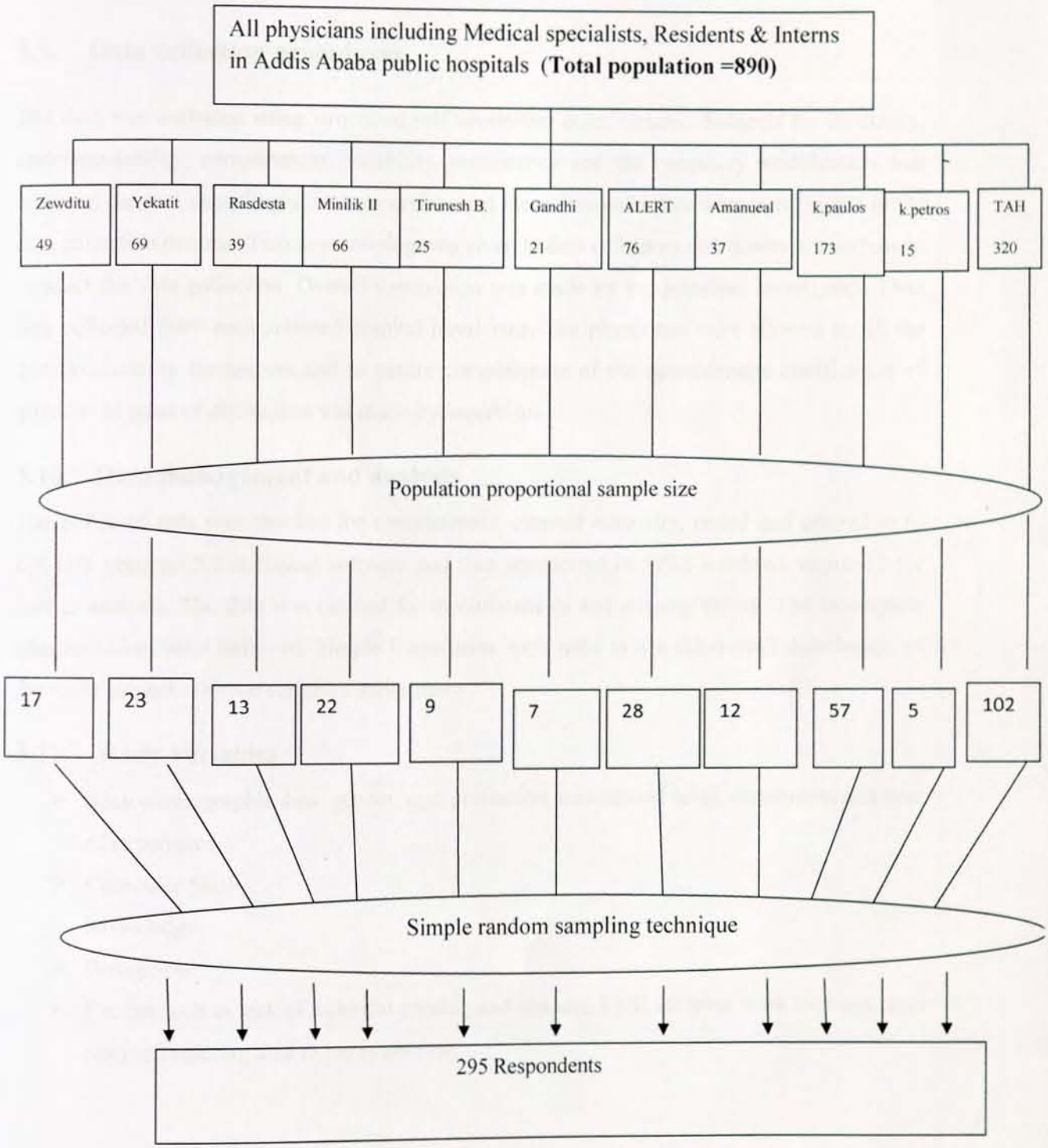

Figure 2: Pictorial representation of sampling procedures.

3.9. Data collection procedures

The data was collected using structured self administer questionnaire. Subjects for its clarity, understandability, completeness, reliability, consistency and the necessary modification was made on the tool accordingly. One supervisor and three data collectors were participated in the data collection process. Two days training was given to data collectors and supervisor on how to conduct the data collection. Overall supervision was made by the principal investigator. Data was collected from each selected hospital physicians. The physicians were allowed to fill the questionnaire by themselves and to ensure completeness of the questionnaire clarification of question in areas of difficulties was made by supervisor.

3.10. Data management and analysis

The collected data was checked for completeness, cleaned manually, coded and entered in to Epi-info version3.5.1 statistical software and then transferred to SPSS windows version15 for further analysis. The data was cleaned for inconsistencies and missing values. The incomplete questionnaires were removed. Simple frequencies were used to see the overall distribution of the study subject with the variables under study.

3.11. Study variables

- Socio-demographic data: gender, age, profession, educational level, department and year of experience.
- Computer Skill
- Knowledge
- Perception
- Factors such as lack of technical training and support, EMR increase work load and time required entering data to the system etc.

3.12. Operational Definition

Electronic medical record: software implemented in a computer and use for patient medical record in health facility by health professionals.

Acceptance: Acceptance is defined as the willingness within a user group to employ electronic medical record for their tasks.

Effectiveness: the extent to which users felt the EMR is able to produce good quality data and help improve quality of service delivery.

Perception: understanding Electro Medical Records service in a positive way.

System reliability: is consistency of Electro Medical Records system in the use of EMR during service delivery.

Attitude: to assess positive or negative views of electronic medical record acceptance.

3.13. Ethical consideration

The study was carried out after getting permission from the Research and Ethics Review committee of Addis Ababa University, School of public health. Further data was then collected after getting formal letter from Addis Ababa Regional Health Bureau Review Ethical committee and hospitals under the study.

During data collection information sheet and written consent forms were delivered along with each questionnaire. The respondents were well informed about the purpose, scope and expected outcome of the research and appropriate informed written consents were taken from the respondents. Anyone who was not willing to participate was excluded from the study and privacy was maintained during data collection.

3.14. Dissemination of results

The results of the research will be forwarded to Addis Ababa University, FMoH, AACAHB and other governmental and nongovernmental organizations that potentially could benefit from the study outcome. The finding of the study may be published in professional journals.

CHAPTER FOUR
RESULTS AND DISCUSSION

In this study an attempt is made to assess challenges associated with physicians' acceptance and usage of EMR in eleven public hospitals of Addis Ababa, such as Tikur Anbessa Hospital, St. Paul Hospital, Yekatit-12 Hospital, ALERT Hospital, Menelik-II Hospital, Zewditu Hosptal, Ras Desta Hospital, Amanuel Hospital, Gandhi Hospital, Kidus Petros Hospital and Tirunesh Beijing General Hospital. Hereunder the assessment result is presented with detailed analysis and interpretation.

4.1. Socio-demographic characteristics of the respondent

A total of 275 questionnaires with a response rate of 93.1 % were found valid and included in the analysis of this study. Out of the total respondents 107(38.9 %) were from Tikur Anbessa Hospital, 49(17.8%) from St. Paul Hospital, 25(9.1%) from Yekatit-12 Hospital, 20(7.3%) from ALERT Hospital, 21(7.6%) from Menelik-II Hospital, 15(5.5%) from Zewditu Hosptal, 12(4.4%) from Ras desta Hospital, 9(3.3%) from Amanuel Hospital, 7(2.5%) Gandhi Hospital, 5(1.8%) Kidus Petros Hospital and 5 (1.8%) Tirunesh Beijing General Hospital.

Among those respondents, 172(62.5%) were males and 103(37.5%) were females. Regarding age of the respondents, 186(67.6%) were between the age group of 21-30 and 5(1.8%) were above 51 years. Among the total 275 respondents, 38(13.8%) were Medical specialists, 96(34.9%) were Residents, 116(42.2%) were General practitioner and 25(9.1%) were final year Internship students. The majority 196(71.3%) respondents were working in their current position for less than five years. Table 4.1 showed the distribution of socio-demographic characteristics of the respondents of the study.

Table: 4.1 Socio-demographic characteristics of the respondents in Addis Ababa Public Hospitals, May 2013 (n=275)

Variable	Category	Frequency	Percent
Sex	Male	172	62.5
	Female	103	37.5
Age	21-30	186	67.6
	31-40	67	24.4
	41-50	17	6.2
	>=51	5	1.8
Qualification	Medical specialist	38	13.8
	Resident	96	34.9
	General practitioner	116	42.2
	Internship	25	9.1
Working experience	<=5	196	71.3
	6-10	53	19.3
	11-15	12	4.4
	>=16	14	5.1

4.2. Level of Computer Skill

The personal skills and information-handling competencies of the respondents are presented in (Table 2). The result shows that the majority, 244(88.7%) of the study participants reported that they do have personal (private) computer, 142(51.6%) have no computer in their office, 268(97.5%) of the respondents used computer in their home and hospital for different activities. Accordingly, majority of the study participants that accounts for 252(91.6%) acknowledged that they used computer for reading, 204(74.2%) to prepare slide for presentation, whereas 139(50.5%) for word processing, 65(23.6%) to browse the internet and 60(21.8%) to manage patient data.

Among the total 275 respondents 128(46.5%) were learnt to use any of computer task by their own (self study), 24(8.7%) by formal basic computer application training and 123(44.7%) by combination of the two (formal training and self study). Most 113(41.1%) of the respondents rate their current computer skill fair and 6(2.2%) rate poor (Figure 4.1).

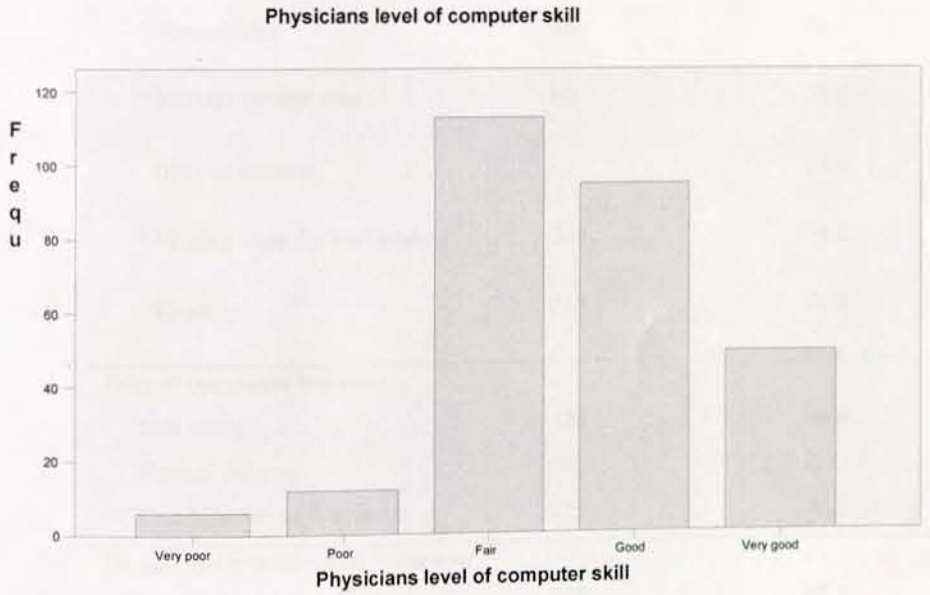

Figure 3 : Physicians level of computer skill in Addis Ababa Public Hospitals, May 2013.

The result shows that only 7(2.5%) of the study participants reported that they were not feel comfort while using computer. The cause of discomfort while using computer were lack of knowledge and skill to operate different tasks, as well as lack of computer.

Table 2: Own personal Computer, Skills and Competencies of respondents in Addis Ababa Public Hospitals, May 2013. (n=275)

Variable	Frequency	Percent
Own personal (private use) computer		
Yes	244	88.7
No	31	11.3
Tasks performed with the computer		
Word processing	139	50.5
Spreadsheet	44	16
Manage patient data	60	21.8
Browse internet	65	23.6
Making slide for presentation	204	74.2
Reading	252	91.6
Way of computer learning		
Self study	128	46.6
Formal training	24	8.7
Combination of the above	123	44.7
Do you feel comfort with computer		
Yes	268	97.5
No	7	2.5

4.3. Knowledge of Physicians towards Electronic Medical Records

The finding showed that 158(57.5%) physicians responded that they used paper based medical records exclusively, 12(4.4%) used computer based and 105(38.2%) used both computer and paper based medical records. Among the total 275 respondents 146(53.1%) respondents acknowledged that they have knowledge of Electronic Medical Records (EMR) prior to the study. From 146 respondents who have knowledge of EMR 92(33.5%) mention their hospital as source of information about Electronic Medical Records.

Only seventy-six (27.6%) physicians responded that electronic medical records were implemented in their hospital and 40(52.6%) of them trained about EMR by FMoH. Among them only 6(7.9%) respondents that took part in the study were felt fully prepared to use EMR after the training. Of the seventy-six participants fifty-five(72.4%) of respondents were used EMR greater than six months, 33(43.4) responded they didn't get enough support from hospital administration and only 6(7.9%) participants respond they did get full support.

Table 3: knowledge of physicians towards Electronic Medical Records in Addis Ababa public hospitals, May 2013.

Variable	Frequency	Percent
Type of medical records system used		
Paper based	158	57.5%
Computer based	12	4.4%
Both	105	38.2%
Do you have knowledge of EMR?		
Yes	146	53.1%
No	129	46.9%
Your source of information about EMR		
My hospital	92	33.5%
Mass media	20	7.3%
Journals	25	9.1%
Internet	65	23.6%
Others*	21	7.6%
Is EMR implemented in your hospital?		
Yes	76	27.6%
No	199	72.4%
How long have you been using EMR? (n=76)		
<6 months	21	27.6%
6-12 months	20	26.3%
13-18 months	12	15.8%
19-24 months	8	10.5%
>24 months	15	19.7%
How adequately did the training prepare you? (n=76)		
Fully	6	7.9%
Mostly	20	26.3%
Somewhat	36	47.4%
Not at all	14	18.4%
Did you get enough support from the hospital administration after the training? (n=76)		
No support	32	42.1%
Some support	38	50.0%
Full support	6	7.9%

Others*(training, visit of other country, private clinics and hospitals)

4.4. Physicians perception towards Electronic Medical Records (EMR)

The result showed that two hundred four (74.2%) of the respondents acknowledged that EMR is faster and easier to complete, fifty five (20%) respondents prefer paper form. One hundred seventy one(62.2%) physicians responded information about patient is more accurate while using Electronic Medical Records, forty eight(17.5%) respondents agreed on paper form and the rest fifty six (20.4 %) acknowledge both EMR and paper form are the same and had no difference at all. Concerning safety (privacy) of patients information one hundred ninety three (70.2%) of respondents acknowledged that EMR is safer, one hundred ninety four (70.5%) of respondents respond patient information is more completed (no missing data) while using EMR.

Considering the time and effort required to use, the study result showed that, two hundred thirty four (85.1%) of the study participants reported that EMR is better than paper based records, two hundred fifty five (92.7%) of respondents acknowledged that EMR is important to provide quality health services and two hundred forty eight (90.2%) of study participants respond EMR is better than paper based medical records.

One hundred thirty two (48.0%) respondents agreed/strongly agreed on the idea of paper based medical records have negative impact on the provision of efficient and effective medical service whereas fifty (18.2%) were indifferent. On the other hand two hundred forty seven (89.8%) respondents agreed/strongly agreed that EMR facilitate the provision of efficient and effective medical service whereas twenty five (9.1%) were indifferent and two hundred forty two (88.0%) of respondents support/strongly support EMR to be implemented in their hospital.

Regarding the advantage of Electronic Medical Records, two hundred seventy five(74.5%) respondents were acknowledged Electronic Medical Records as it can accomplish tasks more quickly, two hundred twenty(80.0%) high data quality, two hundred nineteen(79.6%) better communication, two hundred ten(76.4%) minimize data redundancy and one hundred fifty six(56.7%) high quality patient care.

4.5. Factors that affect the acceptance and usage of Electronic Medical Records

I. Physicians and/or staffs lack computer skills

The study result shows that respondents classified (ranked) the factors which affect their adoption of Electronic Medical Records in to five: Very low, low, moderate, high and very high. Accordingly 105(38.2%) study participants acknowledged and ranked physicians lack of computer skills as high/very high factor to affect the adoption of EMR, 109(39.6%) moderate and 61(22.2%) low/very low.

II. Time required entering data to the system

One hundred forty five (52.7%) respondents reported time required entering data to the system as high/very high factor to affect adoption of EMR, fifty eight(21.1%) moderate and seventy two(26.2%) low/very low.

III. Lack of computer/hardware

One hundred thirty three (48.4%) respondents acknowledged lack of computer or hardware as high/very high factor to affect adoption of EMR, seventy eight (28.4%) moderate and (23.3%) low/very low.

IV. EMR Increase in physicians work load

One hundred fifty two (55.3%) participants respond EMR increase in physicians work load as high/very high factor to affect adoption of it, fifty eight (21.1%) moderate and sixty five (23.6%) low/very low.

V. Reluctant to replace a paper based medical records in order to integrate with EMR

One hundred forty nine (54.2%) physicians acknowledge reluctant to replace a recently acquired system (paper based medical records) in order to integrate with an EMR as high/very high factor to affect adoption of EMR, eighty four (30.5%) moderate and forty two (15.2%) low/very low.

VI. Poor typing ability

Among the total 275 respondents, one hundred seventy three (62.9%) participants ranked poor typing ability of physicians as high/very high factor to affect adoption of EMR, forty six (16.7%) moderate and fifty six (20.4%) low/very low.

VII. Lack of technical training and support

One hundred fifty one (54.9%) participants acknowledged that lack of technical training and support as high/very high factor to affect adoption of EMR, sixty seven (24.4%) moderate and fifty seven (20.7%) low/very low.

VIII. Complexity of the system/technology

One hundred fifteen (41.8%) respondents ranked complexity of the system/technology as high/very high factor to affect adoption of EMR, eighty three (30.2%) moderate and seventy seven (28%) low/very low.

IX. Lack of time to acquire (learn) system knowledge

One hundred sixteen (42.2%) of participants acknowledged lack of time to acquire (learn) system knowledge of Electronic Medical records as high/very high factor to affect adoption of EMR, eighty one (31.3%) moderate and seventy three (26.6%) low/very low.

X. Physicians' attitudes of EMR

One hundred (26.3%) of participants respond physicians' attitudes of Electronic Medical Records as high/very high factor to affect adoption of EMR, eighty five (30.9%) moderate and ninety (32.7%) low/very low.

Table 4: Factors affecting physicians' acceptance and usage of EMR in Addis Ababa public hospitals, May 2013

Variables	Frequency	Low	Moderate	High	Total
Lack of computer skills	N	61	109	105	275
	%	22.2	39.6	38.2	100
Lack of technical training & support	N	57	67	151	275
	%	20.7	24.4	54.9	100
Complexity of system/technology	N	77	83	115	275
	%	28.0	30.3	41.8	100
physicians attitudes of EMR	N	90	85	100	275
	%	32.7	30.9	36.3	100
Increase in physicians work load	N	65	58	152	275
	%	23.6	21.1	55.3	100
Lack of computer/hardware	N	64	78	133	275
	%	23.3	28.4	48.4	100
Time required entering data to the system	N	72	58	145	275
	%	26.2	21.1	52.7	100
Lack of reliability & belief in EMRs	N	103	94	30	275
	%	37.4	34.2	10.9	100
Lack of time to learn system	N	73	86	35	275
	%	26.6	31.3	12.7	100
Reluctant to replace paper based medical record in order to integrate with EMR	N	42	84	66	275
	%	15.2	30.5	24.0	100
Poor typing ability	N	56	46	116	275
	%	20.4	16.7	42.2	100

4.6. Discussion

This institution based cross sectional survey was conducted to assess challenges associated with physicians' acceptance and usage of EMR, and to identify factors affecting acceptance and usage of EMR in Addis Ababa public hospitals.

The field of medicine and medical practice requires the use of computers for support in information processing, decision making and records keeping. The success of information and communications technology applications in health is dependent on the level of computer use by health professionals especially doctors. In this study 88.7% of physicians were found to own personal computer, 97.5% used computer in their hospital/home and 23.6% of physicians had accessed the Internet. This finding is somewhat different from the finding in Nigeria 2004 study showed 51.7% own personal computer and 95.9% Surfing the internet, a study among a selected population of student doctors in Malaysia 2002 study showed that 94.3% of respondents could use a computer (39). The study also showed, only 21.8% of the respondents used the computer to manage patients data which is lower than with a study carried out in New Zealand showed that 99% of practices use specifically designed patient management system software to assist with recording of patient and clinical consultation details and to help with the daily running of their businesses (40).

About 53.1% respondents acknowledged that they have knowledge of Electronic Medical Records (EMR) prior to the study. This finding is found less compared to a study done in Nigeria Health professionals in LAUTECH Teaching hospital where 72.7% had heard about e-Health prior to the study and also study done in northern Pakistan 2009 study indicates 57% of the participants had heard about e-Health prior to the survey (50, 63). The study revealed that 33.5% of physicians mentioned their hospital as source of information about EMR, 23.6% mentioned internet and 7.3% journals. This finding is somewhat different from the finding in Nigeria where17.5% and 23.8% of respondents mentioned internet and journals respectively as source of information about e-Health (50).

The majority of participants (57.5%) had been using paper based records and the study also revealed that 72.4% of participants had used the EMR for more than six months on the date of

data collection. This finding is different from the finding in Malawi 2011 study indicates 93% had been using paper based records and 71% of participants had used the EMR for more than six months (62). According to the 2010 National Physician Survey, only 21.5% of Canadian family practitioners and general practitioners used EMRs exclusively, and 27.5% used a combination of EMRs and paper-based charts (64).

The findings on effectiveness and efficiency on the electronic medical system were all subjective from participants. The study used perceptions of physicians to evaluate the effectiveness and efficiency of the EMR system. EMR effectiveness in this study is defined as the extent to which users felt the EMR was able to produce good quality data and help improve quality of service delivery. Of the total respondents 74.2% indicated that the EMR was faster and easy to use compared to paper based records, 20.0% indicated that paper based records was faster and easier while 5.8% indicated that there was no difference between the two systems. Which is different from study in Malawi where 94% indicated that the EMR was faster and easy to use compared to paper based records, 3% indicated that paper based records was faster and easier while 3% indicated that there was no difference between the two systems the difference may be due to sample size in this study area were greater than the comparative study area (62).

In this study respondents were acknowledged the different advantages of EMR, ranging from 56.7% to 80.8% as it has high quality patient care, accomplish tasks more quickly, minimize data redundancy, better communication and high data quality. This finding is higher than the finding in Australia children hospital and Pakistan where 56% and 50.5% of respondents respectively indicated that e-Health was important to accomplish tasks quickly and high data quality to health professionals (63, 65).

The study showed that more than half of respondents acknowledged that, 62.9% Poor typing ability, 55.3% EMR Increase in physicians work load, 54.9% lack of technical training and support and the rest 54.2% Reluctant to replace a paper based medical records in order to integrate with EMR as the affecting factors for the acceptance of EMR.

Lack of computer skills reinforces delay regarding the implementation of clinical information systems. In addition, a remarkable survey revealed that the clinicians' computer skills level make them more or less reluctant to the usage of information technology, and especially the usage of electronic records instead of the paper based ones (66,67) this study also showed that 38.2% study participants acknowledged and ranked physicians lack of computer skills as high/very high factor to affect the adoption of EMR.

As physicians are not technical experts and the systems are inherently complicated, physicians perceive a need for proper technical training and support, and are reluctant to use EMRs without it. Simon et al. (43) found that two-thirds of physicians indicated a lack of technical support as a barrier to them adopting EMRs. In this study 54.9% of study participants also mentioned it as one of the barriers for the acceptance and usage of EMR. To alleviate this problem adequate training and support should be given to physicians.

It is perhaps surprising that many researchers conclude that data entry is a problem for physicians using EMRs (45). In Loomis's (54) research, more than half of the EMR users stated that data entry was both cumbersome and time-consuming. In this study also more than half 52.7% of respondents agreed with this idea, however it is different from a research done in India indicates that only 55.1% of users and 13.4% of nonusers believe data entry is easy for current EMRs (54).

4.7. Strengths and Limitation of the study

Strengths

- This is believed to pave the way and baseline information to other related researches.

Limitations

- This study is limited to public hospitals with limitation to compare the scenario in private and nongovernmental facilities.
- Shortage of time and logistic.
- Lack of previous similar study in Africa and Ethiopia made it difficult to compare the achievements made in this research.

CHAPTER FIVE
CONCLUSION AND RECOMMENDATION

5.1. CONCLUSION

The result of this research has also showed that physicians' knowledge and perception about EMR is good. However, their knowledge and skill regarding computer was found to be low and almost half of the respondents do not have basic computer training. So, there is a need to work in this area in order to make users qualified to use EMR.

Generally this finding demonstrates that high proportion of physicians was supporting implementation of EMR. However; lack of computer skills, lack of technical training and support, Complexity of the system/technology, attitudes about EMR, increase work load, lack of computer/hardware, time required entering data to the system, lack of reliability and belief in EMRs, lack of time to acquire (learn) system knowledge, reluctant to replace paper based medical records in order to integrate with an EMR and Poor typing ability were found as factors to affect acceptance and usage of EMR by physicians. Therefore, working on the factors that hinder or improve the acceptance of the system could be very important for successful implementation and continual utilization of it at a larger scale in all health institutions of Addis Ababa and other similar places in the country.

5.2. RECOMMENDATION

On the bases of the finding, the following recommendations are forwarded;

- Investigating the effects of EMR implementations on the total quality of care as perceived by the medical users such as physicians, pharmacists, nurses, lab technicians, administration staff and medical records staff at medical organizations.
- Since physicians are front line user of EMR managers must understand the need of them, like continuous follow up, adequate and effective training, technical support, motivation and materials like manuals, computers in order to increase user's capability to use EMR.

- The ministry of health in collaboration with ministry of education should prepare a module for health professionals about EMR and should be integrated as part of academic discipline.
- Strengthening the already existing program (such as, Tulane University's program) on EMR implementation can help to sustain and improve the implementation, acceptance and usage rate.
- Challenges and opportunities created while implementing EMR in pilot's studies should be well documented.
- To minimize the challenges that can arise with implementation, acceptance and usage of EMR, target oriented discussions on EMR should be made in hospitals in order to increase awareness.
- Capacity building programs should be provided for all health sector professionals in order to fill the skill gap in using ICT technologies.

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ANNEXES

Annex I: Information sheet and consent form

Addis Ababa University School of Public Health and Information Science Department of health informatics

Title of the research- Challenges associated with physicians' acceptance and usage of electronic medical records (EMR), April, 2013.

Principal Investigator: Yosef G/Egziabher Tel: +251-911-021609(Mobil)

Introduction

I am doing a research in partial fulfillment of the requirement of Masters Degree in health informatics at Addis Ababa University, school of information science and public health. The research is on electronic medical records (EMR) which is a system of keeping records of patient demographics, medical histories, allergies and all records of patient treatment in a computerized format. It is also important on the health care delivery system to improve the quality and access of health care services.

The objective of this study is to identify challenges associated with physicians' acceptance and usage of electronic medical records (EMR). Even though the study is conducted for the partial fulfillment of master program in health informatics, it is believed to contribute much for understanding the challenge of physicians' acceptance and usage of electronic medical records (EMR) system, and it is hoped to give insight on how to solve the challenges observed. You are going to be asked to fill a questionnaire that will help in investigating the issues. Your cooperation is very helpful. The proposed research does not have any inhuman treatment of research participants and any physical harm, social discrimination, psychological trauma and economic loss.

I inform you that all the information you will provide during data collection process will be kept confidential by using codes instead of names. Your participation in this research is entirely voluntary. If you don't want to answer all of or some of the questions, you do have the right to do so but your willingness to participate in this study is essential and answer all of the questions would be highly appreciated.

Thank you for allowing us to share your precious time.

Signature_____, **Date**_____

Annex II: Self administered questionnaire

1- Socio-demographic data

SN	Question	Response options	Code	Remar
101	Name of your hospital			
102	Sex	1. Male 2. Female		
103	Age	_____Yrs		
104	Type of profession	1. Medical specialist 2. Resident 3. General practitioner 4. Others, specify_____		
105	Your position in the hospital	1.Consultant 2.Department head 3.Team leader 4. Instructor Other, specify_____		
106	Department	1. Surgery 2. Internal medicine 3. Radiology/Imaging 4. Dermatology 5. Pathology 6. Pediatrics 7. Gynecology/obstetrics 8. Ophthalmology 9. Orthopedics 10. ENT 11. Others, specify_____		
107	Year of experiences	_____		

2- Computer skill

SN	Questions	Response options	Code	Remark
201	Do you own personal (private use) computer?	1. Yes 2. No		
202	Do you have computer in your office/ ward?	1. Yes 2. no		
203	Do you use computer at home/ in your office?	3. Yes 4. No		
204	If yes, what are the tasks you perform with the computer?	1. Word processing 2. Spread sheet (MS-Excel) 3. Manage patient data 4. Browse the internet 5. Making slide for presentation 6. Others, specify_____		
205	How did you learn to use any of the above computer tasks?	1. Self study 2. Formal training 3. Combination of the above 4. Others, specify_____		
206	How would you rate your current computer skills?	1.Very poor 2. Poor 3. Fair 4. Good 5. Very Good		
207	Do you feel comfort while using computer?	1. Yes 2. No		
208	If no, why?	_____ _____ _____		

3- Knowledge of electronic medical records

SN	Questions	Response options	Skip	Code
301	What type of medical records system is are you currently used in your hospital?	1. Paper based 2. Computer based 3. Both		
302	Do you have knowledge of electronic medical records (EMR)?	1. Yes 2. No		
303	If yes, for the above question what was your source of information? (Please check all that apply)	1. My hospital 2. Mass media 3. Journals 4. Internet/website 5. Others, specify_____		
304	Is electronic medical records (EMR) implemented in your hospital?	1. Yes 2. No	If no skip to Q401.	
305	If yes how long have you been using it (EMR)?	1. Less than 6 months 2. 6-12 months 3. 13-18 months 4. 18-24 months 5. Greater than 24 months		
306	Who trained you to use the EMR system?	1. No one 2. By hospital staff 3. By FMoH 4. By other_____		
307	How adequately did the training prepare you to use the EMR system?	1. Fully prepared 2. Mostly prepared 3. Somewhat prepared 4. Not at all prepared		
308	Did you get enough support from the hospital administration after the training?	1. No support 2. some support 3. Full support		

4- Perception to electronic medical records (EMR)

SN	Questions	Options	Code	Remark
401	In your opinion which one is faster and easier to complete between the EMR and paper based medical records?	1. EMR 2. Paper form 3. Both are about the same		
402	In which is the information about patients more accurate?	1. EMR 2. Paper form 3. Both are about the same		
403	In which is information about patients safer? (privacy)	1. EMR 2. Paper form 3. Both are about the same		
404	In which is the information about patients more completes (no missing data)?	1. EMR 2. Paper form 3. Both are about the same		
405	Do you think EMR is better than paper based records considering the time and effort required to use it?	1. Yes 2. No		
406	Do you think that EMR is important to provide quality health services?	1. Yes 2. No 3. I don't know		
407	In your opinion, do you think electronic medical records are better than paper based medical records?	1. Yes 2. No		
408	Paper based medical records have negative impact on the provision of efficient and effective medical service.	1. I strongly agree 2. I agree 3. I neither agree nor disagree 4. I don't agree 5. I strongly don't agree		
409	Electronic medical records facilitate the provision of efficient and effective medical service.	1. I strongly agree 2. I agree 3. I neither agree nor disagree 4. I don't agree 5. I strongly don't agree		
410	Do you support EMR to be implemented in your hospital?	1. I strongly support 2. I support 3. I am neutral 4. I don't support 5. I strongly support		
411	If your response to Q#410 is 'NO' the	1. It requires huge amount of money		

	reason is:(multiple answer is possible)	2. It requires training that takes time 3. It affects the privacy of professional as well as patients, since it can be shared by many 4. It is difficult to maintain/repair 5. Others:(please specify)		
412	Which of the following is/are the advantage/s of using EMR? (Please check all that apply)	1.Accomplish tasks more quickly 2.Increase performance 3.Minimize cost 4.Better communication 5.High data quality 6.High quality of patient care 7.Minimize data redundancy 8.Improve data security		

Below there are some major challenges that affect the adoption (acceptance and usage) of electronic medical records (EMR) by physicians. From your experience, observation, opinion and knowledge rank the factors which most affect the adoption (acceptance and usage) of EMR. Please mark in the box below that corresponds with its level. Very low, low, moderate, high and very high.

SN	Factors	Rank					Remark
		Very low	Low	Moderate	High	Very high	
1	Physicians and/or staffs lack computer skills.						
2	Lack of technical training and support.						
3	Complexity of the system/technology.						
4	Physicians' attitudes of EMR.						
5	Increase in physicians work load.						
6	Lack of computer/hardware.						
7	Time required entering data to the system.						
8	Lack of reliability and belief in EMRs.						
9	Lack of time to acquire (learn) system knowledge.						
10	Reluctant to replace a recently acquired system (paper based medical records) in order to integrate with an EMR.						
11	Poor typing ability.						

Declaration

I, the under signed, declare that this is my original work and has never been presented in this or any other Universities. All the source materials used for the thesis have been duly acknowledged.

Name: Yosef G/Egziabher

Signature _____

Place: School of public health and School of Information science Addis Ababa University.

Date of submission 20/11/2013

This thesis has been submitted for examination with our approval as university advisors.

Name of advisor: Dr. Rahel Bekele

Signature _____

Date 20/11/2013

Name of advisor: Dr. Mesfin Addise

Signature _____

Date 20/11/2013