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Evaluation of the Effect of Electronic Medical Record (EMR) on the Workflow in Outpatient Department Comparative Study

By Hajira Mohammed (BSC)

Advisor:

Dr. Getnet Mitike (MD, MPH)

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Informatics

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Chairman, Department Graduation Committee

Signature

Advisor

Signature

Examiner

Signature

Examiner

Signature

Table of contents

List of tables.....	I
List of figures	II
List of Annexes.....	III
Acknowledgment	IV
Acronym.....	V
Abstract	VII
1. Introduction	11
1.1 Background	11
1.2. Statement of the Problem	14
1.3 Significance of the study	16
2. Literature Review	17
3. Objectives.....	25
3.1 General Objective	25
3.2 Specific Objectives.....	25
4. Methodology.....	26
4.1. Study Design	26
4.2. Study Area.....	26
4.3. Study Population	28
4.4. Sample Size	29
4.5. Sampling Procedure	30
4.6. Data Collection Procedure.....	31
4.7. Data quality	32
4.8. Variables of the study	32
4.9. Operational definition.....	33
4.10. Data Analysis Procedure	36
4.11. Ethical Consideration	37
4.12. Dissemination of Results	37
5. Results	38
5.1 Quantitative study.....	38
5.2 Qualitative study	63
6. Discussion	69
7. Strength and Limitation of the study.....	74
7.1 Strength	74
7.2 Limitation	74
8. Conclusion and Recommendation.....	75
8.1 Conclusion.....	75
8.2 Recommendation.....	76
9. References.....	77
10. Annexes.....	81

List of Tables

Table 1	Basic Socio-demographic and other characteristics of the respondents of MCM center and BTGH, Addis Ababa, Ethiopia, April 2009.	31
Table 2	Comparison of patient waiting time on outpatient services by different time variables in MCM center and BTGH, Addis Ababa, Ethiopia, April 2009.	36
Table 3	Mean waiting time on outpatient services across the two hospitals, Addis Ababa, Ethiopia, April 2009.	40
Table 4	Mean patient waiting time difference between MCM and BTGH, Addis Ababa, Ethiopia, 2009	41
Table 5	Comparison of level of client satisfaction on outpatient services in two private hospitals (MCM and BTGH), Addis Ababa, Ethiopia, April 2009.	44
Table 6	Attitude of patients towards EMR, in 2 private hospitals (MCM and BTGH), Addis Ababa, Ethiopia, April 2009.	47
Table 7	Socio-demographic, knowledge and time factors associated with satisfaction Addis Ababa, Ethiopia, April 2009.	51

List of Figures

- Figure 1 Comparative distribution of reason of preference of respondents of MCM center and BTGH for the respective hospital, Addis Ababa, Ethiopia, April 2009. 34
- Figure 2 Comparative distribution of rating quality of care in MCM center and BTGH, Addis Ababa, Ethiopia, 2009. 43

List of Annexes

Annex A	English version questionnaire.	71
Annex B	Amharic version questionnaire.	80
Annex C	Structured in-depth interview guide.	88

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Acronym

AAU	Addis Ababa University
BTGH	Bethel Teaching General Hospital
CBPRS	Computer Based Patient Record System
CPOE	Computer Physician Order Entry
CPR	Computerized Patient Record
CT	Computerized Tomography
EHR	Electronic Health Record
EMAE	Electronic Medication Administration Error
EMR	Electronic Medical Record
EPR	Electronic Patient Record
GP	General practitioner
HIS	Health Information System
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immuno-deficiency Syndrome
ID	Identification
ICU	Intensive Care Unit
MCM	Myungsung Christian Medical center
MDG	Millennium Development Goals
MIS	Management Information System
MOH	Ministry Of Health
MR	Medical Record

MRI	Magnetic Resonance Imaging
NICU	Neonatal Intensive Care Unit
OCS	Order Communication System
OPD	Outpatient Department
OR	Operation Room
POE	Physician Order Entry
SIMS	Spatial Information Management System
USA	United States of America
UN	United Nation
VHA	Veterans Health Administration

Abstract

Background: Uncertainty in clinical decision making is due to lack of complete, accurate and well documented patient data. Electronic Medical Record (EMR) is expected to improve the delivery of health care services and facilitate informed decision.

Objective: - the objective of this study is to determine the effect of EMR on workflow in outpatient department there by assessing its effect on waiting time, patient satisfaction, physician-patient relationship and confidentiality and compare it with the manual system.

Method: - comparative cross sectional study design was employed using both quantitative and qualitative approaches. The study was conducted in two private hospitals found in Addis Ababa namely Myungsung Christian Medical (MCM) center and Bethel Teaching General Hospital (BTGH). The calculated sample size for quantitative study was 768 (384 from each hospital) patients who were selected by systematic random sampling technique from OPD of each hospital. Qualitative data was generated from purposively selected physicians and front line workers (nurse, druggist, data clerks, etc) who have been working at OPD. The data was collected using structured questionnaire and semi-structured interview guide for the quantitative and qualitative methods respectively and analyzed using frequencies, percentages, mean, median, crude and adjusted odds ratio, P value of 0.05 was taken as a level of statistical significance.

Result: The two hospitals were found to be comparable in almost all socio-demographic characteristics with the exception of age and religion. The mean waiting time for registration, service payment, searching MR etc in MCM were significantly lower than the time in BTGH. In addition, the overall mean satisfactions score of MCM 4.42 with SD=0.5 is relatively higher than that of BTGH (mean score 3.8 and SD=0.8). Regarding determinants of patient satisfaction, the presence of EMR,

having knowledge about EMR, patient type and place of residence were found to have significant association with high level of satisfaction. In addition, waiting time has also association with level of satisfaction as the waiting time increases the level of satisfaction decreases.

Conclusion and Recommendation: Electronic patient record handling significantly reduced the patient waiting time and increased patient satisfaction. Thus, promotion of the implementation of EMR both at private and government health institutions will lead to significant change in quality of care.

1. Introduction

1.1 Background

Medical Informatics is the rapidly developing scientific field that deals with the storage, retrieval, and optimal use of biomedical information, data, and knowledge for problem solving and decision making. Development of improved methods of information navigation has been the driving force for the emergence of this field as a discipline. The first use of computers in the medical environment was achieved by Robert Ledly in the mid 1950s for dental projects. In the late 1960s, the first hospital information system (HIS) was implemented at London Hospital. [1]

Health care is an information-based science. Presently, much of clinical practice involves gathering, synthesizing, and acting on information and the need of medical information for clinical decision making become a growing concern. In addition, the organization, availability, accessibility and quality of health data are still poor, as medical records are still predominantly paper based despite well documented shortcomings in terms of accuracy, completeness, availability, legibility, accessibility, and security. [2] Further, information is not being used as effectively as possible in health care resulting in inappropriate and uncertainty in clinical decision-making and medical errors. [2,3,4]

Besides, the continuous increasing of the health care cost has forced the authorities to seek solutions for improvement of the healthcare quality and productivity. These efforts have led to the development of new health care models, restructuring of organizations and redesign of healthcare business. Electronic health record (EHR) systems or electronic patient records (EPR) stand based on this extensive reorganizing procedure.

EHRs enable the continuity of the health care process by sharing the patient information via information networks. ^[1]

Electronic Medical Record (EMR), also known as Electronic Health Record (EHR) or Computerized Patient Record (CPR) is defined as a patients' medical record in an electronic format, accessible by computers on a network for the primary purpose of providing health care and health-related services. Information in an EHR includes documents relating to the past, present and/or future physical and mental health and condition of a patient, medical test reports or multimedia images, and financial and demographic information. In addition, ordering of medical tests, treatments, medications, and clinical guidelines used for the patient's care, are accessible within the EHR during the encounter. EHR data can be captured or transmitted, received or updated, stored or retrieved, securely and in real-time by users at the point of care or distant locations.^[5]

A systematic review of Computer based Patient Record System (CBPRS), has shown some of the strengths of CBPRS. That included offer support in medical decision making, increase coordination between different health care providers thereby improving global quality of care, and promote the use of guidelines, improve the speed of retrieval of medical records, allowing many persons to have simultaneous access to the same medical record, improve data confidentiality while tracing who has accessed it and collect routine data. Finally, development of CBPRS in a care unit has even been proposed as a criterion of quality. ^[4] In addition, recording the health data in an electronic environment avoided handwriting misinterpretations, stored the data more formally, made the data accessible in any time from anywhere, and can be used by more than one user.^[1]

Although, EMR has an advantage of improving quality of health, implementation of it has not been universally successful. The main challenges included managing complex informatics applications and the computer networks upon which they run and, Maintaining large networks and training a myriad of health care providers who use them are expensive user resistance has been implicated as a primary factor in the failure of some systems. [1, 6]

1.2. Statement of the Problem

In the 1980s, efforts to reform health information systems (HIS) to systematically collect, analyze, and report data for improved management in developing countries were undertaken by national program managers of vertically structured programs. ^[7] In recent years HIS in developing countries have gained more and more attention as more effort by governments, international agencies, non governmental organizations, donors and other development partners seek to improve health care as a way to reverse disease trends in these countries. ^[8] Further, The United Nations' Millennium Development Goals (MDGs), give due emphasis for the development of HIS in developing countries along with the major health problems related to poverty. ^[9]

In addition to the above concerns to HIS, the Institute of Medicine has declared electronic medical records as one component of HIS to be an essential technology for health care and a necessary tool for improving patient safety and the quality of care.^[10]

To date, comprehensive computer-based patient records are uncommonly used in developed countries, and are rare to nonexistent in the developing world. However, as explained above, in this era of information, there is a considerable interest of developing and using EMR especially in developing countries like Ethiopia, with the intension to obtain the expected advantages of EMR. ^[10]

EMR is expected to create an overall improvement in the workflow of clinical operations, specifically, to reduce medical error rates, increase efficiency, and in general improve the process of health care delivery and management. Nevertheless, little is known about its actual performance. This is because the focus of many researches is on the factors inhibiting

adoption, rather than on actual EHR performance; and few EHR systems have been implemented on a scale that lends itself to a systematic workflow evaluation. ^[11]

As to my knowledge, there are no studies that have examined the impact of EMR in Outpatient service in Ethiopia. Prior researches ^[4,10,12] in other countries have uncovered about the perceived effect of EMR on the quality of patient care, about factors affecting EMR patient satisfaction, and made comparison with manual system.

Further research exploring the effect of EMR system in health care and patient satisfaction is necessary to aid successful future development and implementation of effective computerized record systems. This study is aimed at evaluating the impact of EMR on workflow in out patient service in terms of average patient waiting time, patient satisfaction, physician and patient relationship, security, eye contact and attitude towards EMR and make comparison with the manual system in two health facilities in Addis Ababa. And the expected out come will be to clearly show which of the two systems can generally improve the quality of health care system.

1.3 Significance of the study

The major justifications of this study includes: EMR is an emerging technology in developing countries including Ethiopia. And some private health sectors start practicing of electronic record keeping. This study will show the apparent effect of EMR on the workflow or quality of patient care and compare its effect with the manual system, so that users can take informed decision in the design, development and implementation of the system. This study will also be used as a baseline or a reference for other studies that may be conducted in this area.

2. Literature Review

2.1 Satisfaction with EMR use

Outpatient EHRs help dramatically with data collection and access, and use during an outpatient visit can improve overall satisfaction. This could be due to a number of reasons, such as increased individualized treatment because of more quickly accessible and accurate patient information or by providing physicians reminders and alerts. ^[12] The following are some research findings that show use of EMR and patients and providers satisfaction level.

According to the systematic review done in US using papers published since 2000, thirteen studies analyzed physician perception for CBPRS use. Out of these, physician satisfaction with the system was reported in nine studies. Their satisfaction is associated with improved knowledge of patients' medical history, better medical examination, and improvement in quality of care. Nevertheless, four studies raised some points of dissatisfaction due to data confidentiality, personal and professional privacy, bug management, and the additional work for physicians. Regarding nurse satisfaction with the introduction of CBPRS in their practice, a global increase in satisfaction was observed in two studies. ^[4]

Based on another study done in USA, the users (Users of EMR) were generally satisfied with Physician Order Entry (POE) (mean = 5.07 on a 1 to 7 scale). The physicians were more satisfied than the nurses were, and the medical staffs were more satisfied than the surgical staff; satisfaction was highly correlated with perceptions about POE's effects on productivity, ease of use, and speed. POE features directed at improving the quality of care were less strongly correlated with satisfaction. The

physicians valued POE's off-floor accessibility most, and the nurses valued legibility and accuracy of POE orders most.^[13]

Regarding patient satisfaction, a review done in US reported that patients were found to have a positive outlook towards CBPRS, with a mean score of 4.6 on a general satisfaction scale of 0–5. ^[4] Moreover, based on a research, an Electronic Medical Record in Primary Care: Impact on Satisfaction, Work Efficiency and Clinic Processes, health care providers (physicians and nurses) were asked about their agreement on the relation between EMR use of providers and increase of patient satisfaction, 62% and 31% of the responses fell in the neutral and agreed category respectively. And also 50% and 45% of respondents (physicians and nurses) were neutral and agreed about the EMR's effect on patient safety respectively. ^[6]

According to Garrison G.M. et al, The Effect of Computer Use by Physicians on Patient Satisfaction at a Family Medicine Clinic: A majority of patients thought that computer use had a positive effect on the overall quality of care at the visit; 74.6% reported that it had a “very positive” or somewhat positive” effect. And their overall satisfaction with the health care received at the clinic was high; 83.5% of the patients rated it either “excellent” or “very good.” As a result, Most of the patients 77.6%, would recommend the clinic to family and friends and 73.0% would recommend their personal health care provider to family and friends. ^[12]

2.2 EMR and paper based medical record

Based on research done in UK, EMR in primary care, paperless patient records contained significantly more words, more abbreviations, and more symbols than the paper based records. No drawings were found in

paperless records (as expected); while there were seven drawings in the paper based records. ^[14]

The same study has shown that there was no difference between the paperless and paper based records in the proportions with an entry, that were medically appropriate. All paperless records were fully legible, whereas 6% of paper based records were totally illegible and 30% were partially legible. The paperless records were also significantly more likely to be fully understandable than the paper based records (89% Vs 69%); have at least one diagnosis recorded (48% Vs 34%); record that advice had been given (24% Vs 11%); when a referral had been made, contain details of the specialty referred to (77% Vs 60%); and when a prescription had been issued specify the drug dose (87% Vs 66%). Twice as many paperless records contained the patient's family history than did paper based records, but the significance was borderline (4% Vs 2%). ^[14]

In the electronic record, compared with the control record (paper based), patient history lacked more information (38%) than did physical examination (15%). In addition, physical examination in the electronic record contained more additional information (39%), compared with the control record, than did patient history (21%). ^[15]

2.3 Use of EMR and its impact on time, quality of care

According to Joos D. et al, the majority of clinicians used all of the EMR features listed, including updating medication (81%) and problem (81%) lists after visits, updating problem lists between visits (74%), using the computer in the exam room (87%), and using the “new results” feature (93%). Only 41% of respondents used reminders to follow up on patient issues, and 46% customized the EMR to support the workflow. Computer-based documentation was used by 88% of respondents for more than 2/3 of their clinic notes, and by 93% of respondents to some

extent. Gender, computer skill, message basket use and years in practice were not associated with higher levels of acceptance; however, more satisfied respondents reported higher use of the EMR. [6]

According to a research conducted to estimate the current adoption of EMR systems and the potential savings, costs, and health and safety benefits, improvement in patient safety from EMR use in hospital and ambulatory care largely focus on alerts, reminders, and other components of Computerized Physician Order Entry (CPOE). CPOE makes information available to physicians at the time they enter an order. Once the order has been entered, the system can track the steps involved in executing the order, providing an additional mechanism for identifying and eliminating errors. [16]

The same study addressed the issue of medication errors and adverse drug events in ambulatory settings. The available data suggest that roughly eight million outpatient events occur each year, of which one-third to one-half are preventable. About two-thirds of preventable adverse drug events might be avoided through widespread use of ambulatory CPOE. Each avoided event saves \$1,000–\$2,000 because of avoided office visits, hospitalizations, and other care. Scaling these numbers to the national level, it is estimated that two million such events could be avoided, generating annual savings of \$3.5 billion. Avoided adverse drug events in patients age sixty-five and older account for 40 percent of the savings. [16]

In another study done in London, though there are number of factors that determine the drug prescription error rate, the implementation of electronic medication administration record (EMAR) almost halved prescribing and administration errors, by reducing prescribing errors from 3.8% to 2.0%. So that more prescribing errors being corrected before the patient received any doses. This intervention reduced non-IV

(intravenous) medication administration error (MAEs) by 39%, predominantly reducing wrong dose and omission errors. However, these gains were achieved at the cost of an increase in staff time on medication-related tasks. [17]

Regarding drug interaction alerting capability, one research presented, as there was no universality in the severity rating scale for drug interaction used by different drug information databases, it is difficult for EMR system to reliably support clinical decision making and dispensing process at the point of care for physicians and pharmacist. [18]

EMR systems can integrate evidence-based recommendations for preventive services such as screening exams with patient data such as age, sex, and family history to identify patients needing specific services. Further it can track the frequency of preventive services and remind physicians to offer needed tests during patients' visits. The system can also remind providers to offer the service during routine visits and remind patients to schedule care. Reminders to patients generated by this systems have been shown to increase patients' compliance for preventive care. Moreover, this system can ensure consistent recording of disease-specific clinical results, leading to better clinical decisions and outcomes. [16]

A study done in Kenya have shown that patients spent 58% less time with providers and the waiting time is reduced by 38% after the implementation of an electronic medical record system in a rural Kenyan health center. In the same study, patient visits were 22% shorter, clinic personnel spent 50% less time interacting with patients, two thirds less time interacting with each other, and more time in personal activities. [5] In another study, two formal time-motion studies suggest that after an

initial period, using an EHR may actually be modestly faster than practicing on paper.^[19]

Based on a research, Impact of an Electronic Chart on the Staff Workload in a Radiation Oncology Department, the use of electronic charts decreased the average total workload by 28.2% (from 2147.9 to 1542.9 seconds). The electronic chart system decreased the workload for three groups of staff. The largest decrease of average workload was observed in the nursing/ clerical staff group, which was an 85.7% decrease (from 654.7 to 93.8 seconds). The average workloads of simulation staff and technologist staff decreased by 61.2% (from 241.5 to 93.8 s) and 20.6% (from 515.3 to 409.4 seconds), respectively. However, the average workload of the dosimetry/physics staff group increased by 28.4% (from 736.5 to 945.9 seconds). ^[20]

Although few empirical data are available regarding Privacy and security, which are the major challenges of a health care system, a study done by David W. Bates, in 2005 has shown that, security may actually be better with electronic records than with paper, although breaches of security can be more catastrophic with electronic records. Security and privacy are also very important to the public, to an extent that could slow or derail the movement toward electronic records. In a recent Harris Poll, 48 percent of adults said that EHRs' benefits to patients and society outweighed the risks, while 47 percent said the opposite. ^[19]

Based on a research, an EMR in Primary Care: Impact on Satisfaction, Work Efficiency and Clinic Processes, Over 80% of physicians believed that they were able to cross-cover (manage patients cared for by another physician) more effectively, and had more chart information available with the EMR. In the same study, respondents were asked to comment about how the EMR affected their daily activities. The majority of clinicians either agreed or strongly agreed that the EMR resulted in

efficiency gains relative to the previous environment with computer-retrievable lab results, but chart-stored notes and other documents.^[6]

Regarding the effect of EMR on quality of care, a research was conducted in US to compare the quality of care between the standardized Veterans Health Administration (VHA, introduced integrated EMR) and national samples (use paper chart). The findings has shown that, VHA patients were more likely to receive the care specified by the indicators than patients in the national sample (67% vs. 51%). Performance in the VHA outpaced that of the national sample for both chronic care (72% vs. 59%) and preventive care (64% vs. 44%) but not for acute care (53% vs. 55%). In particular, the VHA sample received significantly better care for depression, diabetes, hyperlipidemia, and hypertension. The VHA also performed consistently better across the entire spectrum of care, including screening, diagnosis, treatment, and follow-up. ^[21]

In addition to its effect on time, patient satisfaction, drug prescription and staff workload, EMR has impact on the prevention and control of the pandemic disease, HIV/AIDS. A research done in South Africa in 2004 reported that, one of the main challenges for the efficient and effective management of HIV/AIDS in South Africa is the lack of reliable statistics on the disease. The data available are either estimates or projections and therefore range between educated guesses and wild speculation. As a result, the South African Government decided that Spatial Information Management System (SIMS) and HIV/AIDS database should be designed and developed. A research was conducted to evaluate such system, the result has shown that the implementation of the HIV/AIDS database and the Spatial Information Management System can play a critical role in determining where and when to intervene, improving the quality of care for HIV positive patients, increasing accessibility of service and delivering a cost-effective mode of information. ^[22]

As discussed above, prior researches in other countries have assessed the effect of EMR on prescription error, staff workload and quality of care, physician and nurse satisfaction for EMR use, alerting capability of EMR, its effect on specialty clinic such as diabetic quality of care, and oncology department, and its effect on the prevention and control of HIV/AIDS. However these researches are uncovered about the perceived effect of EMR on patient physician relationship in OPD, the knowledge and attitude of patients towards EMR, patient satisfaction with providers use of EMR. Regarding the methodology, most of the researches did not consider comparison of the effect of EMR with the manual system and the sample population was specific group of clients with specific disease type or age group. In addition, almost all were done in the western countries^[4,10,12,16,17,22].

3. Objectives

3.1 General Objective

- To determine the effect of EMR on general workflow in Outpatient Department and compare it with the manual system, and to assess knowledge and attitude towards EMR.

3.2 Specific Objectives

The specific objective of this study were:

- ❖ To assess the effect of EMR on patient waiting time and compare it with the manual system.
- ❖ To assess the effect of EMR on confidentiality and patient physician relationship and compare it with the manual system
- ❖ To assess patient satisfaction level with EMR and compare it with the manual system.
- ❖ To explore knowledge and attitude of patients towards EMR
- ❖ To assess the error detecting capability of EMR
- ❖ To determine the strong and weak points of EMR

4. Methodology

4.1. Study Design

A comparative cross sectional study design was carried out using both quantitative and qualitative methods.

4.2. Study Area

The study was conducted in two private hospitals found in the capital city of Federal Government of Ethiopia, Addis Ababa namely Myungsung Christian Medical (MCM) center and Bethel Teaching General Hospital (BTGH).

MCM center was established by Myungsung Presbyterian Church, Korea on November 2004. It is located in Bole subcity, Addis Ababa, Ethiopia. It offer 24-hour general medical services and train medical professionals.

Regarding the total number of employees, there are 131 administrative staffs and 134 health professionals and of these 22 are physicians including both general practitioners and specialists. Most of the employees are Ethiopians however there are also Koreans and Norwegians.

This hospital comprises of special facilities in addition to the ordinary health care facilities (such as x-ray, laboratory, ultra sound and Operation room (OR)). Some of these special facilities include fluoroscope, angiogram, brain endoscope, Intensive Care Unit (ICU), Neonatal Intensive Care Unit (NICU), laparoscope, infant warmer, incubator and Computerized Tomography (CT) scanner. Besides, it has well equipped emergency room.

This hospital has 94 beds. Concerning the service fee, the registration fee is 30 and 45 Ethiopian Birr (ETB) for General Practitioner (GP) and

Specialist respectively. And the admission fee on daily basis is 50, 100, 200, 600 ETB for 1st, 2nd, 3rd and special classes respectively.

The OPD consists of 16 examination rooms equipped with examination tables and a computer. The average number of patients who visit the OPD ranges from 130 – 150. This includes both new and repeated patients.

It is the only hospital in Ethiopia that provides general medical service and is fully automated with two online systems, Order Communication System (OCS) and internet service. OCS allows professionals to access patient data, order investigations, and communicate with other departments. MCM center has a computer room with two qualified computer technicians that provide maintenance service.^[23]

Regarding BTGH, it was established in November 2001 by a private shareholder. It is located in Kolfe Keranio subcity, in the capital city of Ethiopia. Like MCM center, it provides 24-hour medical service with the vision to see that all disease mitigated and healthy society that strives to happy, useful, and meaningful life. It also trains medical professionals both at diploma and degree level.

Vis-à-vis the hospital staff, there are 248 staffs of which 137 are health professionals and the rest are administrative staffs. There are 13 physicians (include both GP and specialists). Similar to the aforementioned hospital, the majority of employees who work in this hospital are Ethiopians, but there are also Indians, Hungarians and Germanys.

In addition to the routine general medical service, this hospital provide particular services such as endoscopic surgery, laparoscopic surgery, neurosurgery, hemodialysis, in vitro fertilization, ICU and NICU. And

special facilities found are Mammography, Fluoroscopy, Magnetic resonance Imaging (MRI) and Uterosalphingeography.

This hospital has 60 beds. Regarding the service fee, the registration fee is 25 and 50 ETB for GP and Specialist respectively. And the admission fee on daily basis is 50, 100, 200, and 300 ETB for 1st, 2nd, 3rd and special classes respectively.

The OPD consists of six examination rooms equipped with examination tables and order forms. The average number of patients who visit the OPD ranges from 80 – 120 including both new and repeat patient.

Similar to the usual patient medical record keeping system in Ethiopia, BTGH use fully paper based or manual patient record keeping system. All records of a patient including history and physical examination, investigation request and result and financial expenses are documented in paper. Consequently the periodic reports of the hospital are produced manually.

4.3. Study Population

Quantitative study

The source population was all clients who have visited Out Patient Department of the study centers (MCM and BTGH) and appeared during the study period (April 1st to April 25th, 2009); whereas sample population was all clients who were eligible for the study according to inclusion criteria and were selected during the sampling procedure. (see section 4.5 of the methodology part)

Inclusion criteria

All clients who were mentally fit, their age were 18 years old or above, visited the OPD and received a complete medical service, appeared during the study period and willing to participate in the study.

Exclusion criteria

Any client who was below the prescribed age group and has no guardian, seriously ill or chronically sick, who didn't complete his/her medical service and unwilling to participate in the study.

Qualitative study

The source population was all physicians who were working in OPD and front line workers (including nurse, lab technician, pharmacy technician and data clerks) in both hospitals. And the sample population was any employee from the aforementioned group who had detail knowledge about EMR and can explain well.

4.4. Sample Size

Sample size was determined using sample size determination for single population proportion for both hospitals. Sample size was determined considering the proportion (P) of patient satisfaction with EMR as 50%; because there was no well-established research finding in Ethiopia, which can serve as base line information.

$$n = \frac{(Z_{\alpha/2})^2 P (1-P)}{d^2}$$

✓ $Z=1.96$ (95% confidence interval)

✓ $d = 5\%$ margin of error

✓ $P = 0.5$

$$\begin{aligned} n &= \frac{(1.96 \times 1.96) (0.5 \times 0.5)}{0.05 \times 0.05} \\ &= 384 \end{aligned}$$

Therefore, the total sample size became 768 i.e. 384 for each hospital.

4.5. Sampling Procedure

Primarily, purposive sampling was employed to select the two private hospitals this is because MCM is the only hospital found in Addis Ababa, Ethiopia that provide general medical service with fully automated and functional EMR system. And BTGH is comparable with MCM center with respect to the type of service they provide, their daily patient flow, payment for service, the number of professionals and their religious ground however it employed manual (paper) based medical recording system.

Quantitative study

Regarding sampling technique, systematic random sampling were used. For each hospital the initial client was selected by simple random sampling method from the list of patients registered in the reception on each specific data collection day and the next clients were identified using interval of five (the interval is determined based on the daily patient flow of each hospital).

Whenever the sampled client did not fulfill the inclusion criteria, immediately the next client who fulfilled the criteria was interviewed.

Qualitative study

Purposive sampling was employed to select key informants from the physicians and from front line workers. In selecting these interviewees the service year, number of working days and knowledge about EMR was considered.

4.6. Data Collection Procedure

Quantitative

Structured questionnaire was used as a data collection instrument, to collect information from clients in both hospitals. It included socio-demographic characteristics, variables that assess the client satisfaction and variables that assess knowledge and attitude of clients towards EMR. Six third year nursing students were recruited as a data collector and two supervisors who have bachelor in MIS (Management Information System) were recruited.

Both the data collectors and supervisors were given training for 03 days on procedures and ways of expressing questionnaire to collect the necessary information. The training includes pre testing of the instrument.

The data were collected using structured questionnaire and it was translated to Amharic as it is the universally spoken language in the town. Prior to the actual data collection the questionnaire was pre tested on 15 clients to identify potential problems associated with the questionnaire or data collection procedure. Based on the pre test some minor problems were found and the questionnaire was restructured accordingly.

Qualitative study

For this phase of study, semi-structured in-depth interview guide were prepared and used. The in depth interviews were conducted with purposively selected front line workers and medical doctors including the medical director.

The questions addressed issues such as attitudes of professionals towards EMR, impact of EMR on security, waiting time, employee

efficiency and strength and weakness of EMR. Note was taken both through writing and using tape recorder by the principal investigator.

4.7. Data quality

Data quality were assured by using the following procedures:

- ❖ Properly designed data collection instrument was prepared using easily understandable Amharic language
- ❖ Training was given for data collectors and supervisors on the instrument used
- ❖ Pre test was done and thus appropriate correction have been made
- ❖ At the end of every data collection day, the collected data were reviewed and checked for completeness and consistency by the supervisors and principal investigator
- ❖ Problems encountered during data collection were reported to supervisors and principal investigator for immediate action
- ❖ The data cleaning and entry were made by the principal investigator
- ❖ Double entry was conducted for 10% of the total data
- ❖ The qualitative data collection is handled by the principal investigator

4.8. Variables of the study

Dependent variable: patient satisfaction level

Independent variable:

Socio-demographic variables:

- ❖ Age
- ❖ Sex
- ❖ Marital status
- ❖ Educational status
- ❖ Occupation

- ❖ Religion
- ❖ Ethnicity
- ❖ Residence
- ❖ Citizen
- ❖ Type of patient
- ❖ Payment form
- ❖ Department enrolled

Variables to assess patient satisfaction

- ❖ Patient registration time
- ❖ Patient waiting time to get investigation result
- ❖ History of loss of ID card
- ❖ History of loss of investigation request
- ❖ History of loss of investigation result
- ❖ Patient waiting time to search lost results

Variables to assess knowledge and attitude of patients towards EMR

- ❖ Knowledge of EMR
- ❖ Attitude towards EMR

4.9. Operational definition

Confidentiality: the ethical principle or legal right that a physician or other health professional will hold secret all information relating to a patient, unless the patient gives consent permitting disclosure.

Data quality: is the correctness, timeliness, accuracy, and completeness that make data appropriate for use.

EMR: is defined as a patients' medical record which holds information electronically and accessible by computers on a network for the primary purpose of providing health care and health-related services.

Follow up: patients who visit the respective hospital at least twice in six months time or more.

Free: this include patients who are rendered totally free service or some percent free.

Knowledge of EMR: knowledge of the presence of computerized communication system in a hospital.

Lost ID card: refers to losing or forgetting the ID when the patient came to the hospital.

Loss of investigation result: is the condition when the lab or x-ray technicians unable to find the result or the physician claim that he/she doesn't receive the result.

Lost request: is the condition when patients lost their request paper or lab, x-ray or pharmacy technicians claimed they don't receive the prescription or investigation request.

MR retrieval time: refers to time elapsed starting from giving patient's ID to the provider until he/she retrieve existing medical records based on their ID card for patients who have visited the hospital more than once.

MR searching time: is the time required to search and retrieve existing medical records for those patients who lost or forget their ID when they came to the hospital.

Out Patient Department: - Part of a hospital where different clients get different services as an outpatient. It is the first step of getting the hospitals services.

Over all satisfaction: is the average of individual level of satisfaction based on the service they have received. Satisfaction level 4 was taken as a cutoff point as it stands for satisfied in the likert scale.

Patient-physician relation: include both the physician eye contact and the time of physician elapsed discussing with his/her patient.

Physician eye contact: is the degree to which the physician gives a good eye contact to his patient during examination.

Patient satisfaction: is generally considered as the extent to which the patients feel that their needs and expectations are being met by the services provided.

Quality of care: the degree to which care is expected to increase the likelihood desired health outcomes and is consistent with standards of health care.

Revisit: patients who visit the respective hospital at most once in six months time.

Registration time: the time spent by a new patient starting from approaching the data clerk until he/she get registered and directed to other section.

Radiology result retrieval time: time required by the patient from asking radiology result up to receiving it or directed to the section where his/her result is.

Lab result retrieval time: time required by the patient from asking lab result up to receiving it or directed to the section where his/her result is.

Time to get prescribed drug: refers to the time elapsed when the pharmacy technician get the prescription or ID and provide the prescribed drug for the patient.

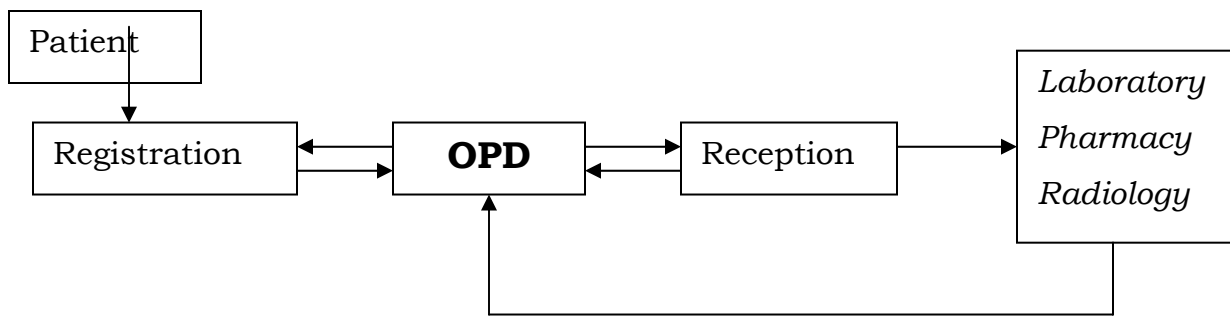
Time to get another copy of request: is the time required to get another copy of request paper or order from the physician for those patients who lost their investigation request.

Time to search lost result: Is the time required to search lost investigation results based on their ID, name, date or other variables.

Time to pay for service: is the time required by a patient starting from giving patient's ID or request paper to the provider and receiving receipt for those patients who pay in cash, where as for credit and free patients, it is the time to have stamp on the request paper or getting confirmation paper after checking the patients payment status.

Time to retrieve MR of follow up cases: it is the same as MR retrieval time but for follow up cases.

Workflow: refers to the path a patient should follow until he/she receives the medical service he/she needs. It is briefly represented in the following diagram.



4.10. Data Analysis Procedure

Quantitative Data Analysis

Data obtained in this phase, were entered and analyzed using SPSS version 12.0 statistical software program. Before analysis was started, data were cleaned and 10% of the data were double entered. Summary tables, graphs and charts were used for descriptive purpose. Measures of central tendency and dispersion were used to describe various relevant findings. Student's t test (independent sample t test) was used to compare means of the two hospitals. Multiple regression models were applied to analyze the association between dependent and independent variables and MSTAT software was used to compare proportions of the two hospitals. Throughout the analysis p value of 0.05 was taken as level of significance.

Qualitative Data Analysis

The qualitative data that was found from in-depth interview were analyzed by applying thematic analysis approach. Once the data was collected, it was transcribed and pattern of common ideas were listed. Then, related data to the classified patterns were identified and combined in to sub themes.

4.11. Ethical Consideration

Prior to data collection, ethical clearance was obtained from School of Public Health and Medical Faculty of AAU. In addition, concerned bodies in both hospitals were informed about the study. During data collection each respondent was informed about the purpose and expected outcome of research and for this appropriate oral informed consent were taken from the respondents.

Any client who was not willing to participate was excluded from the study and during the interview respondents who were interested to skip some questions or discontinue the interview were allowed to do so. Confidentiality of information was maintained by anonymous linkage.

4.12. Dissemination of Results

After the study is completed, the report will be forwarded to the two hospitals where the study was conducted, MOH and AAU. If this research paper may get published it will be useful as a reference for other researches in this area.

5. Results

5.1 Quantitative study

5.1.1 Socio-Demographic Information

A total of 768 patients were enrolled and completed the baseline interview during the study period from January 1st, 2009 to January 25th, 2009 from the two hospitals (MCM and BTGH). As the sample size determination doesn't consider contingency plan, the data were collected until it reached 384 for each hospital by excluding clients who were found to be incompatible with the inclusion criteria on every data collection day. Hence, analysis was done with 768 cases of which 384 (50%) were from MCM center and the rest 50% from BTGH. The non response rate for age was 0.05% in MCM and 0.04% in BTGH.

Majority of respondents 46.4% and 41.7% in MCM and BTGH were aged between 25 – 24 years with a range of 59 and 65 years respectively. The mean age and SD of patients from MCM and BTGH were found to be 33.3 ± 10.3 and 35.3 ± 12.3 respectively, which makes MCM patients younger as compared to BTGH patients. Two hundred one (52.3%) and 216(56.3%) patients from MCM and BTGH were female respectively.

Marital wise, in both hospitals the majority were married contributing about 227 (59.1%) and 235(61.2%) and unmarried respondents constitute 35.7% and 32.0% in MCM and BTGH respectively. Widowed and Divorced study subjects constitute less than 7% of each study group. In both groups majority of respondents 176(45.8%) and 188(49.0%) have their own business. Civil servants account for 79(20.6%) and 75(19.5%) of study subjects of MCM and BTGH respectively, while students, housewife and others (pensioned, no job, etc) constitute less than 30% of the proportion of occupational categories.

In both groups more than half of the study subjects 236(61.5%) of MCM and 217(56.5%) of BTGH have attained beyond high school by educational status. Ninety seven (25.3%) and 33(8.6%) of MCM and 107(27.9%) and 42(9.8%) of BTGH patients were 12 completed and have attained primary education respectively.

Regarding ethnicity, Amhara ethnic group comprises the largest proportion of study subjects 173 (45.6%) and 158 (42.2%) followed by Oromo accounting for 92(24.3%) and 86(23.0%) in MCM and BTGH respectively. Out of all study subjects in MCM and BTGH, 364 (94.8%) and 369(96.1%) were found to be Ethiopians and the rest 5.2% and 3.9% were non-Ethiopians respectively.

The predominant religion in both hospitals was Orthodox Christian contributing 186 (48.4%) and 176(45.8%) in MCM and BTGH respectively; followed by protestant and Muslim in MCM constituting 115(29.9%) and 62(16.1%) respectively. However, the reverse is true for BTGH, which constitute 89 (23.2%) and 106 (27.6%) respectively. The remaining religion categories (Catholic, Jehovah witness, and no religion) constitute less than 5% in each hospital. Majority of respondents 308(80.2%) and 301(78.4%) of MCM and BTGH respectively have been living in Addis Ababa.

All patients were asked about their way of payment for the service they have received. Accordingly, 333(86.7%) and 42(10.9%) of MCM and 340(88.5%) and 35(9.1%) of BTGH patients have paid in cash and with credit respectively. While the remaining 9(2.3%) of patients in each hospital have received the service for free. Mean monthly income for patients in MCM was 1940.2 ± 1211 ETB, as compared to BTGH 1790.5 ± 1319 ETB with a median of 1800 and 1500 ETB respectively.

Of all interviewed patients, 154(40.1%) and 82(21.4%) of MCM and 134(34.9%) and 107(27.9%) of BTGH have visited the hospital for the first time and more than once respectively while 148(38.5%) of MCM and 143(37.2%) of BTGH were follow up patients. Nearly half of the patients 189(49.2%) in MCM and 187(48.7%) in BTGH were enrolled in medical OPD. The remaining half were enrolled in surgical, gyn/obs, pediatrics and other departments (hemodialysis, MRI, physiotherapy, etc). (table 1)

The only statistically significant difference in socio-demographic information between the two groups was religion and monthly income. Evaluation of this variables for survey respondents (table 1) shows that patients of MCM and BTGH differed with respect to religion with more Muslims in BTGH, while patients from MCM were more likely to be Protestants. In addition, Patients from MCM also had a significantly greater income per month (49.2% Vs 38.5%; P-value < 0.05).

Table 1: Socio-demographic characteristics of the respondents of MCM center and BTGH, Addis Ababa, Ethiopia, April 2009.

Characteristics	MCM		BTGH		P-value
	N	%	N	%	
Age					
18 – 24 years	60	16.5	59	16.1	0.44
25 – 34 years	169	46.4	153	41.7	0.10
35 – 44 years	85	23.4	73	19.9	0.13
45 – 54 years	34	9.3	51	13.9	0.03
>55 years	16	4.4	31	8.4	0.01
Sex					
Male	183	47.7	168	43.8	0.15
Female	201	52.3	216	56.3	0.14
Marital Status					
Single	137	35.7	123	32.0	0.14
Married	227	59.1	235	61.2	0.28
Divorced	12	3.1	16	4.2	0.21
Widowed	8	2.1	10	2.6	0.32
Educational status					
Illiterate	18	4.7	18	4.7	0.50
Grade 1 – 8	33	8.6	42	10.9	0.14
Grade 9 – 12	97	25.3	107	27.9	0.21
Diploma and above	236	61.5	217	56.5	0.08
Nationality					
Ethiopian	364	94.8	369	96.1	0.19
Non-Ethiopian	20	5.2	15	3.9	0.19
Religion					

<i>Muslim</i>	62	16.1	106	27.6	< 0.01
<i>Orthodox</i>	186	48.4	176	45.8	0.24
<i>Protestant</i>	115	29.9	89	23.2	0.02
<i>Catholic</i>	10	2.6	8	2.1	0.32
<i>Others</i>	11	2.9	5	1.3	0.06

Occupation

<i>Civil servant</i>	79	20.6	75	19.5	0.35
<i>Private Business</i>	176	45.8	188	49.0	0.19
<i>Housewife</i>	51	13.3	57	14.8	0.27
<i>Student</i>	35	9.1	32	8.3	0.35
<i>Military</i>	8	2.1	11	2.9	0.24
<i>Other</i>	35	9.1	21	5.5	0.03

Ethnicity

<i>Amhara</i>	173	45.6	158	42.2	0.17
<i>Oromia</i>	92	24.3	86	23.0	0.34
<i>Tigray</i>	31	8.2	39	10.4	0.15
<i>Sidama</i>	24	6.3	24	6.3	0.5
<i>Guraghe</i>	18	4.7	34	9.1	0.01
<i>Somalia</i>	12	3.2	15	4.0	0.28
<i>Wolaita</i>	12	3.2	10	2.6	0.31
<i>Others</i>	17	4.4	8	2.1	0.04

Monthly Income

<i>No income</i>	114	29.7	133	34.6	0.07
<i>≤ 1000</i>	81	21.1	103	26.8	0.03
<i>1001 – 2500</i>	98	25.5	73	19.0	0.02
<i>> 2500</i>	91	23.7	75	19.5	0.08

Residence

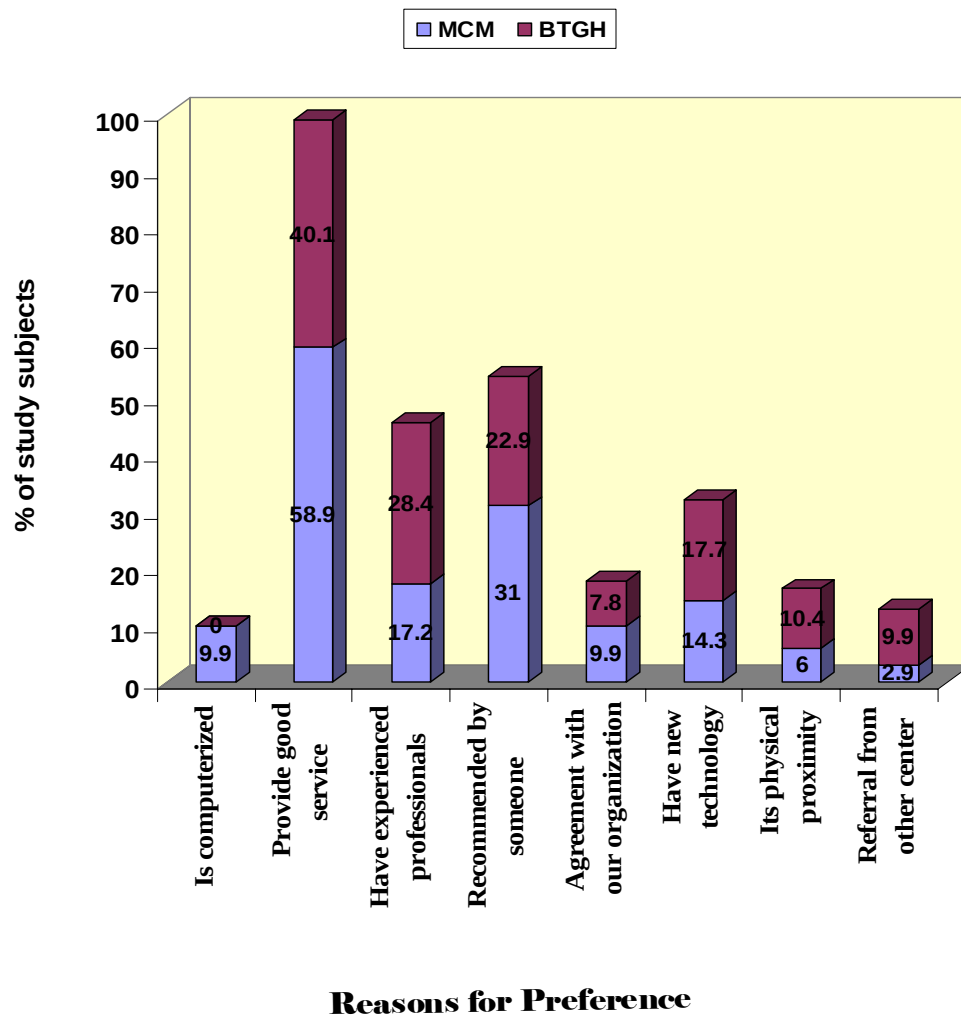
<i>Addis Ababa</i>	308	80.2	301	78.4	0.27
<i>Outside Addis Ababa</i>	76	19.8	83	21.6	0.27

Patient Type					
<i>First visit</i>	78	20.3	102	26.6	0.02
<i>Revisit</i>	157	40.9	138	35.9	0.08
<i>Follow up</i>	149	38.8	144	37.5	0.36
Payment Form					
<i>Cash</i>	333	86.7	340	88.5	0.22
<i>Credit</i>	42	10.9	35	9.1	0.20
<i>Free</i>	9	2.3	9	2.3	0.50
Department					
<i>Medicine</i>	189	49.2	187	48.7	0.44
<i>Surgical</i>	85	22.1	68	17.7	0.06
<i>Pediatrics</i>	34	8.9	27	7.0	0.17
<i>Gyn/ Obs</i>	69	18.0	80	20.8	0.16
<i>Others</i>	7	1.8	22	5.7	0.002

5.1.2 Reasons for preference

All of the 768 respondents, who were included in this study, were asked about their reason of choosing the respective hospital. Of the total clients from MCM only 38(9.9%) preferred this hospital because it is computerized. The majority of patients 226(58.9%) and 154(40.1%) in both MCM and BTGH respectively preferred because the respective hospital's service is good. Relatively higher number of clients in MCM 119(31.0%) preferred the hospital as it is recommended by someone else while 88(22.9%) of BTGH clients claimed such reason. The rest reason of preference is shown in figure1.

Figure1: Comparative distribution of reason for preference of respondents of MCM and BTGH, Addis Ababa, Ethiopia, April 2009.



5.1.3 Patient waiting time

Comparisons of time variables between the two hospitals were summarized in table 2. The majority of patients in MCM 240(62.5%) and 156(40.6%) of BTGH were registered with in 5 minutes. Significantly higher proportion patients at BTGH reported that the time taken for registration to be more than 10minutes compared with patients at MCM (31.5% Versus 6%, p-value < 0.05). In each hospital less than 5% clients didn't specify the waiting time. The average waiting time for patients who

were registered using EMR was less by 3.7 minutes as compared to the mean time of those registered using manual system (table 3). Revisit and follow up patients were asked about the waiting time to register in the reception when they have visited the respective hospital for the second time. The result showed that a significantly higher number of MCM clients had their existing medical record retrieved within 5 minutes compared with BTGH clients (75.2% Vs 40.8%; $p < 0.05$). Comparable number of patients 67(21.9%) of MCM and 59(20.9%) of BTGH have registered within 6 to 10 minutes. About one third of patients 94(33.3%) in BTGH have waited 11 to 30 minutes for registration while no more than 3% of patients in MCM have registered within the aforementioned time. The average retrieval time shows a statistically significant difference (4.7 Vs 11.2; $p\text{-value} < 0.001$) with a median of 5.0 and 10.0 minutes for MCM and BTGH respectively.

Out of the total 306 and 282 clients in MCM and BTGH respectively who have visited the hospital more than once, 62 (20.3%) and 95 (33.7%) clients have either lost their ID card or forgot when they came to hospital. Due to this their medical record was retrieved not based on their card number rather by using different characteristics such as telephone number, name, and registration date. Though clients lost their ID card, all clients in MCM have got their MR (Medical Record) whereas only about half 50(52.6%) of lost MRs were found in BTGH. The MR was found in 5 minutes time for a significantly higher number of cases in MCM 49 (79.0%) as compared with only 3(6.0%) in BTGH ($p\text{-value} < 0.001$). The mean waiting time of MCM was significantly less compared with that of BTGH (4.8 ± 3.8 Versus 20.1 ± 8.4 , $p\text{-value} < 0.001$). Having poor record keeping system was mentioned as primary reason to lose their MR in 42(93.3%) of respondents. Further, 20(44.4%) claimed that; the service providers were careless and less than 10% claimed the reason was not told and I don't know.

Table 2: Comparison of patient waiting time on outpatient services by different time variables in MCM center and BTGH, Addis Ababa, Ethiopia, April 2009.

Time variables (minute)	Hospital		P-value
	N_{MCM} (%)	N_{BTGH} (%)	
Registration time	(n=384)	(n=384)	
1 – 5 minutes	240(52.5)	156(40.6)	< 0.001*
6 – 10 minutes	106(27.6)	90(23.4)	0.09
11 – 15 minutes	15(3.9)	79(20.6)	< 0.001*
16 - 30 minutes	8 (2.1)	43(11.2)	< 0.001*
> 30 minutes	0	1(0.3)	0.14
I don't know	15 (3.9)	15(3.9)	0.5
Retrieval time	(n=306)	(n=282)	
1 – 5 minutes	230(75.2)	115(40.8)	< 0.001*
6 – 10 minutes	67(21.9)	59(20.9)	0.38
11 – 15 minutes	3(1.0)	32(11.3)	< 0.001*
16 - 30 minutes	2(0.7)	62(22.0)	< 0.001*
> 30 minutes	0	5(1.8)	0.009*
I don't know	4(1.3)	9(3.2)	0.06
Searching time	(n=62)	(n=50)	
1 – 5 minutes	49(79.0)	3(6.0)	< 0.001*
6 – 10 minutes	11(17.7)	4(8.0)	0.08
11 – 15 minutes	1(1.6)	9(18.0)	< 0.001*
16 - 30 minutes	1(1.6)	27(54.0)	< 0.001*
> 30 minutes	0	6(12.0)	< 0.001*
I don't know	0	1(2.0)	0.13
Retrieve lab result	(n=301)	(n=323)	
1 – 5 minutes	187(62.2)	67(20.8)	< 0.001*
6 – 10 minutes	65(21.6)	91(28.2)	0.03
11 – 15 minutes	23(7.6)	60(18.6)	< 0.001*
16 - 30 minutes	5(1.7)	82(25.4)	< 0.001*
> 30 minutes	0	3(0.9)	0.049
I don't know	21(7.1)	20(6.2)	0.34
Retrieve Radiology Result	(n=259)	(n=289)	
1 – 5 minutes	193(74.5)	77(26.6)	< 0.001*
6 – 10 minutes	35(13.5)	66(22.8)	0.002*
11 – 15 minutes	10(3.9)	47(16.3)	< 0.001*
16 - 30 minutes	7(2.7)	76(26.3)	< 0.001*
> 30 minutes	0	3(1.0)	0.002*

I don't know	14(5.4)	20(6.9)	0.23
Time to get prescribed drug			
	(n=271)	(n=210)	
1 – 5 minutes	246(90.8)	154(73.3)	< 0.001*
6 – 10 minutes	19(7.0)	26(12.4)	0.02
11 – 15 minutes	3(1.1)	12(5.7)	< 0.001*
16 - 30 minutes	0	9(4.3)	< 0.001*
> 30 minutes	0	0	-
I don't know	3(1.1)	9(4.3)	< 0.001*
To get another copy of request paper			
	(n=12)	(n=36)	
1 – 15 minutes	11(91.6)	4(11.1)	< 0.001*
16 - 30 minutes	1(8.3)	28(77.8)	< 0.001*
> 30 minutes	0	3(8.3)	0.15
I don't know	0	1(2.8)	0.28
Search time for lost Result			
	(n=7)	(n=15)	
1 – 15 minutes	6(85.8)	1(6.7)	< 0.001*
16 - 30 minutes	1(14.3)	8(53.3)	< 0.001*
> 30 minutes	0	5(33.3)	< 0.001*
I don't know	0	1(6.7)	< 0.001*
Time to pay for service			
	(n=384)	(n=384)	
1 – 5 minutes	310(80.7)	163(42.4)	< 0.001*
6 – 10 minutes	60(15.6)	96(25.0)	< 0.001*
11 – 15 minutes	5(1.3)	52(13.5)	< 0.001*
16 - 30 minutes	3(0.8)	54(14.1)	< 0.001*
> 30 minutes	0	4(1.0)	0.02
I don't know	6(1.6)	15(3.9)	0.03
Average time to retrieve MR of follow up cases			
	(n=152)	(n=142)	
1 – 5 minutes	117(77.0)	57(40.1)	< 0.001*
6 – 10 minutes	29(19.1)	38(26.8)	0.06
11 – 15 minutes	2(1.3)	22(15.5)	< 0.001*
16 - 30 minutes	1(0.7)	18(12.7)	< 0.001*
> 30 minutes	0	1(0.7)	0.15
I don't know	3(2.0)	6(4.2)	0.14

* Significant difference at $P < 0.05$

According to the finding of this study, 301(78.4%) and 323 (84.1%) of MCM and BTGH clients had laboratory order. Out of these, 187(62.2%) of MCM and only 67(20.8%) of BTGH have their laboratory result in less than five minutes time. Clients in BTGH were found to wait longer period of time to get laboratory result as compared to MCM clients as the median waiting time to get result is 15 and 5 minutes respectively. The average waiting time of BTGH 13.3 ± 8.1 minutes is about twice higher than the time for MCM 5.6 ± 5.1 minutes. This difference in mean waiting time was statistically significant between the two groups ($p=0.000$). In both hospitals less than 10% of patients didn't specify the waiting time.

Two hundred fifty nine (67.4%) and 289(75.3%) clients from MCM and BTGH respectively had radiology order. Considerable number of MCM clients 193(74.5%) claimed that they have got their lab result with in 5 minutes while significant number 126(43.6%) of BTGH clients have waited more than 10 minutes. On average, patients in BTGH have waited additional 8 minutes in comparison with patients found in MCM. The median waiting time to get radiology result is found to be the same as waiting time for laboratory result for both hospitals.

Regarding drug prescription, 317(82.6%) of clients in each hospital had prescription. Out of these, 271(85.5%) and 210(66.2%) have bought the medication from MCM and BTGH pharmacies respectively. Almost all 246(90.8%) of MCM patients have received their medication with in 5 minutes, similarly more than three-fourth 154(73.3%) of BTGH clients have waited up to five minutes and the remaining 47(22.4%) clients got their result in greater than 5 minutes time. The average waiting time to receive prescribed drug varies significantly between the two groups (2.9 Vs 4.7; $P\text{-value} < 0.001$).

Relatively higher number of investigation or drug requests (including laboratory, radiology and drug prescription) were lost in the hospital with manual patient record handling system 36(9.8%) as compared to the other hospital with EMR 12(3.3%) (P-value < 0.05). In addition, there was a statistically significant difference in the mean waiting time to get another request (6.2 Vs 22.7; $p < 0.05$).

The proportion of lost laboratory or radiology result is also significantly affected by the presence of EMR. There were only 7(2.1%) loss in MCM as compared to 42(11.8%) in BTGH. All lost laboratory results were found in MCM in contrast to BTGH only 15(35.7%). The mean time elapsed in searching these results in BTGH were nearly five times higher than that of MCM (7.6 Vs 34.3; $p < 0.05$). Twenty three (85.2%) of clients claimed that; the primary reason for lost results were the poor recording system of hospital. Carelessness of service providers was being a second major reason for losing MRs which contributing 13(48.1%). The remaining 1(3.7%) contributes to not knowing the reason.

All respondents were asked about the time elapsed to pay for the service they had already used. In MCM, more than one third of clients 310(80.7%) had paid within 5 minutes. While more than half 206(53.6%) of BTGH had paid in more than 5 minutes time. A significant difference was found in the average waiting time to pay for the service between the two hospitals (4.2 Vs 9.8; $p\text{-value} < 0.001$).

Of all the respondents, 149(38.8%) and 144(37.5%) have visited the hospital repeatedly. The registration time for this specific group of patients were analyzed, more than three fourth 117(77.0%) of MCM and 57(40.2%) of BTGH patients have registered within 5 minutes. Averagely, the waiting time for registration of follow up cases in the hospital with

EMR were found to be reduced nearly by half as compared to the hospital with manual record handling system.(table 3)

Table3: Mean waiting time on outpatient services in the two hospitals, Addis Ababa, Ethiopia, April 2009.

Time variables (minute)	MCM		BTGH		P- value
	N	X	n	X	
<i>Registration time</i>	369	6.1	368	9.8	<0.001*
<i>MR retrieval time</i>	302	4.7	271	11.2	<0.001*
<i>MR searching time</i>	62	4.8	45	20.1	<0.001*
<i>Time to retrieve lab result</i>	280	5.6	300	13.3	<0.001*
<i>Time to retrieve Rad result</i>	245	4.6	266	12.9	<0.001*
<i>Time to get prescribed drug</i>	268	2.9	192	4.7	<0.001*
<i>To get another copy of request paper</i>	12	6.2	32	22.7	<0.001*
<i>Time to search lost result</i>	7	7.6	13	34.6	<0.001*
<i>Time to pay for service</i>	378	4.2	365	9.8	<0.001*
<i>Time to retrieve MR of follow up cases</i>	149	4.4	126	8.2	<0.001*

* Significant difference at $P < 0.05$

Generally, the mean time differences for each time variable was computed by subtracting the waiting time in MCM from that of BTGH waiting time and summarized in table 4. The mean time difference for registration of new cases was 3.7 minutes per client, on average daily new patient flow in MCM is about 35, thus MCM center can save 2.2 hours per day than BTGH only from registration of new cases. Similarly, the average waiting time to retrieve existing MRs for patients in MCM was less by 6.4 minutes as compared to the mean time of those registered

using manual system. This implies that on average MCM center can save 11.2 hours per day as compared with BTGH.

Table 4: Mean patient waiting time difference between MCM and BTGH, Addis Ababa, Ethiopia, 2009

<i>Time variables</i>	<i>Mean difference (min)</i>	<i>Average Number of patients per day (in MCM)</i>	<i>Time saved per day (hours)</i>
Registration time	3.7	35	2.2
MR retrieval time	6.4	105	11.2
MR searching time	15.3	23	5.9
Time to retrieve laboratory result	7.6	115	14.6
Time to retrieve Radiology result	8.3	95	13.1
Time to pay for service	5.7	140	13.3

5.1.4 Patient-physician Relationship and Confidentiality

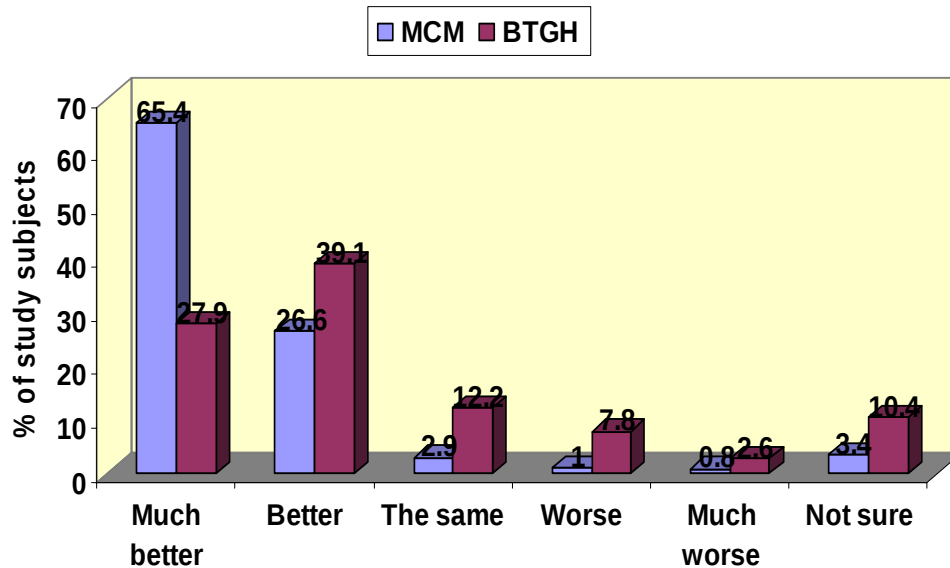
Two hundred fifty two (66.1%) of MCM and 71(20.2%) of BTGH clients reported that they believe the exiting record keeping system keep their health status confidential “all the time”. Majority of BTGH clients 123(34.9%) believed that the manual system could never keep their confidentiality while only 20(5.2%) claimed EMR couldn’t keep confidentiality. This result has shown that the presence of EMR significantly affects patient’s perception towards confidentiality. In contrast to this, the time spent with the physician is not significantly affected by the presence of EMR as 245(63.8%) and 57(14.8%) of MCM and 232(60.4%) and 72(18.8%) of BTGH claimed that the physician spent enough time with the patient “all the time” and “most of the time”

respectively. In each hospital about 205 of patients claimed that provider spent enough time “rarely”, “sometimes” and “never”.

Regarding patient physician relationship, EMR was perceived as a physical barrier that could have a negative impact on the patient-physician relationship particularly by reducing eye-to-eye contact when compared with the manual system. As a total of 271(70.6%) patients from MCM and 330(86.0%) from BTGH reported that the physician eye contact is “all the time” or “most of the time”. The remaining 113(29.4%) and 54(14.1%) claimed that the eye contact is “some times”, “rarely” or “never” in MCM and BTGH respectively.

Based on the overall service provided by each hospital, all patients were asked to rate the quality of the respective hospital where they have received the service. The result has shown that more than half 251(65.4%) of MCM patients and about one fourth 107(27.6%) of BTGH patients rate the hospital quality of care “much better” than other hospitals. Thirteen (3.4%) and 40(10.4%) patients could not rate the quality of care in MCM and BTGH respectively. The rest is shown in figure2.

Figure 1: Comparative distribution of rating quality of care in MCM and BTGH, Addis Ababa, Ethiopia, 2009



The majority of MCM patients, 330(85.9%), and more than half 216(56.3%) of BTGH would recommend the respective hospital to family and friends. The remaining 17(4.4%) of MCM and 47(12.2%) of BTGH would not recommend the hospital. A significant number 121 (31.5%) of BTGH patients were not sure. These results represent a statistically significant difference in the two hospitals.

5.1.5 Patient Satisfaction

Nearly everyone (>90%) of MCM patients were found to be satisfied and only the remaining 10% were not satisfied in almost all variables of waiting time to get the hospital services with the exception of time to retrieve MRs which constitutes about 20% dissatisfaction rate. Physician eye contact and confidentiality were the other aspects where the satisfaction level was less as compared to the other. On the other hand, time elapsed to get lost MR, to get another request, to get lost result and confidentiality were the facets where dissatisfaction was rated highest (65

– 95%) in BTGH while satisfaction was reported highest (>80%) in the time elapsed to get prescribed drug, physician eye contact and patient physician relationship. As expected, overall satisfaction with the health care received at the hospital with EMR was high; 85.7%. The results of several other questions regarding general patient satisfaction are summarized in table 5.

Table 5. Comparison of level of client satisfaction on outpatient services on two private hospitals (MCM and BTGH), Addis Ababa, Ethiopia, April 2009

Time variables	Satisfied (%)		Not satisfied (%)		
	VS	S	N	D	VD
<i>Time spent for registration</i>					
MCM (n =384)	69.0	25.3	2.6	2.3	0.8
BTGH(n =384)	35.7	44.3	7.6	11.5	1.0
<i>Time spent to retrieve existing MR</i>					
MCM (n =306)	68.3	28.1	0.7	2.3	0.7
BTGH(n =282)	33.7	37.2	7.8	18.8	2.5
<i>Time spent to search lost MR</i>					
MCM (n =62)	75.8	19.4	3.2	0	1.6
BTGH(n =50)	4.0	24.0	16.0	44.0	12.0
<i>Time spent to retrieve lab result</i>					
MCM (n =301)	51.8	32.6	5.6	7.6	2.3
BTGH(n =323)	19.3	49.8	11.8	15.8	3.1
<i>Time spent to retrieve radiology result</i>					
MCM (n =259)	62.9	27.0	2.7	6.2	1.2
BTGH(n =289)	23.5	43.9	12.1	16.6	3.8

Time spent to get prescribed drug					
MCM (n=271)	78.6	19.9	0.7	0.7	0
BTGH(n=210)	44.8	42.9	5.2	7.1	0
Time elapsed to get request					
MCM (n=12)	83.3	8.3	0	0	8.3
BTGH(n=36)	8.3	0	13.9	63.9	13.9
Time elapsed to search lost investigation results					
MCM (n=7)	57.1	42.9	0	0	0
BTGH(n=15)	0	6.7	0	66.7	26.7
Time spent to pay for service					
MCM (n=384)	70.1	26.3	1.8	1.3	0.5
BTGH(n=384)	29.9	45.8	9.9	12.5	1.8
Time spent for registration for follow up cases					
MCM (n=152)	59.7	32.2	2.0	4.7	1.4
BTGH(n=142)	25.7	38.9	15.3	14.6	5.6
Confidentiality					
MCM (n=384)	55.2	23.4	16.4	2.9	2.1
BTGH(n=384)	10.9	20.6	25.3	16.4	26.8
Patient physician relationship					
MCM (n=384)	61.5	21.6	4.7	9.9	2.3
BTGH(n=384)	55.2	31.3	3.4	7.0	3.1
Physicians eye contact					
MCM (n=384)	50.5	24.2	8.9	13.8	2.6
BTGH(n=384)	58.1	29.7	4.9	5.2	2.1
VS =Very Satisfied S =Satisfied D =Dissatisfied VD =Very Dissatisfied N =Neutral					

5.1.6 EMR knowledge and attitude

The last part of this research is concerned with assessing the knowledge and attitude of patients towards EMR, so that all patients were asked about their knowledge about EMR. Accordingly, 250(65.1%) of MCM and 134(34.9%) of BTGH clients had knowledge about EMR, where as the remaining clients in both hospitals had no knowledge. Out of all knowledgeable patients, only 73(29.2%) clients in MCM knew other hospital with EMR but the majority 166(66.4%) didn't know the presence of other hospitals with EMR. on the other hand, a significant number of clients 97(72.4%) in BTGH had claimed they knew hospital with EMR. All patients who have the knowledge about EMR were asked about their agreement with different variables. For the notion that EMR "improve service delivery" and EMR "reduce patient waiting time" 77.6% and 29.6% of MCM and 69.4% and 23.9% of BTGH fell in the strongly agree category. 14.0% and 17.2% of MCM and 18.7% and 12.7% of BTGH respondents were neutral about the EMR's effect on cost and its alerting capability of physicians respectively. 56.4% of MCM and 53.0% of BTGH were strongly agreed about its effect on physician patient relationship. 62.8% and 53.7% of MCM and BTGH respectively believed that EMR can increase providers efficiency. Over 50.0% in each hospital believed that EMR will keep patients data confidential. Overall 79.6% and 72.4% of patients have positive attitude towards EMR. Only less than 5% of respondents in each hospital have negative attitude towards EMR. (table 6)

Table 6. Attitude of patients towards EMR, in two private hospitals (MCM and BTGH), Addis Ababa, Ethiopia, April 2009

Variables	Agreed (%)		Not agreed (%)		
	SA	A	NS	D	SD
<i>EMR improve service delivery</i>					
MCM(n =250)	77.6	17.6	2.4	1.6	0.8
BTGH(n =134)	69.4	22.4	4.5	3.0	0.7
<i>EMR increase service cost</i>					
MCM (n =250)	29.6	16.4	14.0	23.2	16.8
BTGH(n =134)	23.9	26.1	18.7	20.1	11.2
<i>EMR reduce patient waiting time</i>					
MCM (n =250)	80.8	14.4	2.0	2.8	0
BTGH(n =134)	73.1	19.4	3.4	2.2	1.5
<i>EMR keep confidentiality</i>					
MCM (n =250)	53.6	20.0	10.8	9.2	6.4
BTGH(n =134)	58.2	21.6	16.4	3.0	0.7
<i>EMR improve physician patient relationship</i>					
MCM (n =250)	56.4	22.0	6.8	7.6	7.2
BTGH(n =134)	53.0	19.4	12.7	11.9	3.0
<i>EMR reduce error</i>					
MCM (n =250)	44.8	25.6	11.6	10.0	8.0
BTGH(n =134)	43.3	25.4	16.4	11.2	3.7
<i>EMR can remind physicians</i>					
MCM (n =250)	45.2	22.8	17.2	6.8	8.0
BTGH(n =134)	50.0	26.1	12.7	8.2	3.0

<i>EMR increase providers efficiency</i>						
MCM (n=250)	62.8	22.8	6.0	6.0	2.4	
BTGH(n=134)	53.7	29.1	5.2	11.9	0	
<i>Have positive attitude towards EMR</i>						
MCM (n=250)	79.6	18.0	1.2	0.8	0.4	
BTGH(n=134)	72.4	23.9	1.5	1.5	0.7	

SA=Strongly Agree **A**=Agree **SD**=Strongly Disagree **D**=Disagree **NS**=Not Sure

5.1.7 Determinants of Patient Satisfaction

Comparative analysis was conducted between two categories of satisfied and not satisfied patients to identify factors that determine satisfaction in the study area. Of the entire total, 514 patients who have scored 4 and above in the over all satisfaction were considered as satisfied and the rest 254 who have scored less than 4 were considered as not satisfied. Over all satisfaction was averaged from individual level of satisfaction based on the service they have received. Satisfaction level 4 was taken as a cutoff point as it stands for satisfied in the likert scale.

Varieties of variables were selected, which can potentially affect patient satisfaction. These include, selected socio-demographic characteristics (sex, religion, monthly income, educational status, residence and occupation), time related factors (waiting time for registration and for payment), type of patient, payment form, the hospital recording system and the patients knowledge about EMR. Multiple regression was used to control confounders and to detect association among variables of interest. Table 7 compares the aforementioned characteristics with the overall level of satisfaction of patients.

Client satisfaction was mainly affected by the hospitals way of recording system. Clients who have obtained their medical service from the hospital with EMR were found to be more satisfied as compared with those treated in the hospital with manual patient record handling system, with odds ratio 6.43 (95% CI, 4.54 – 9.12); p-value <0.001 and 6.66 (95% CI, 4.55 – 9.77); p-value <0.001 in both before and after adjusting for all selected variables except time respectively.

Out of the socio-demographic characteristics of respondents, the usual place of residence was largely found to be associated with satisfaction even after adjusting for other selected socio-demographic variables (sex, monthly income, educational status, religion and occupation) and also other selected variables such as hospital recording system, patient type, waiting time and etc. Patients who live outside of Addis Ababa were found to be less satisfied than those who live in Addis Ababa with odds ratio of 0.629(95%CI, 0.44 – 0.90)(p<0.05).

Regarding educational status, respondents with educational status of 1st – 8th, 9th -12th and 12+ grades didn't show any statistically significant association. However, after adjusting for those selected variables, respondents who had diploma and above were found to be less satisfied compared with illiterates, with odds ratio 0.332(95% CI, 0.12 – 0.91) (p < 0.05).

Religion wise, Muslims were found to be less satisfied as compared with Orthodox Christians. The remaining major religions (Catholic and Protestant) didn't show any significant association with the level of satisfaction. Other socio demographic characteristic like sex, occupation and monthly income were not associated with patient satisfaction. (table 7)

In addition, patient type and payment status were identified as factors that affect client satisfaction. Patients who visit the respective hospital repeatedly and follow up clients were found to be 2.56 and 1.73 times more satisfied in the 95% CI, (1.39 – 3.05); $p=0.000$ and (1.01 – 2.17); $p=0.044$ respectively when compared with patients with only one visit. These group were also found to be more satisfied after adjusting it for selected socio-demographic and other characteristics. About payment status, though it was not significant credit and non-paying patients were more satisfied than paying patients were.

Concerning waiting time for registration, it was significantly associated with dis-satisfaction. Patients who have waited 6 – 10 minutes, 11-15 minutes and more than 15 minutes were found to be less satisfied when compared with patients who have waited less than 5 minutes for registration with odds ratio 0.58 (95% CI, 0.40-0.86), 0.15 (95% CI, 0.09 – 0.25) and 0.12 (95% CI, 0.06 – 0.21) respectively. The result has shown that, as time spent for registration increases, the patient's level of satisfaction significantly reduced. Similarly, the time spent to pay for the service they used is inversely proportional to level of satisfaction. This association is also statistically significant ($p\text{-value} < 0.001$).

Furthermore, a statistically significant difference was observed for knowledge of EMR where patients who have the knowledge about EMR were found to be 1.55 times significantly satisfied than patients who didn't have knowledge of EMR, 95% CI(1.14 – 2.10); $P= 0.005$. However when adjusted for socio demographic and other selected variables there is no significant association, AOR= 1.006; 95% CI (0.67 – 1.51); $P=0.975$.

Table 7: Socio-demographic, knowledge and time factors associated with satisfaction Addis Ababa, Ethiopia, April 2009.

Variables	Frequency		COR	95%CI	AOR	95%CI
	NS	S				
Hospital type						
With EMR	55	329	6.43	4.54-9.12*	6.66	4.55-9.77*
With out EMR	199	185	1 ^R	-	-	-
Sex						
Male	144	237	1.05	0.78-1.42	1.08	0.71-1.64
Female	140	277	1 ^R	-	-	-
Patient Type						
New	77	103	1 ^R	-	-	-
Revisit	99	196	2.06	1.39-3.05*	2.56	1.56-4.19*
Follow up	78	215	1.48	1.01-2.17*	1.73	1.06-2.80*
Payment Form						
Cash	223	450	1 ^R	-	-	-
Credit	25	52	1.03	0.62- 1.71	0.80	0.25-2.57
Free	6	12	0.99	0.37-2.68	1.23	0.63-2.14
Residence						
Addis Ababa	188	421	1 ^R	-	-	-
Outside A.A	66	93	0.63	0.44-0.90*	0.63	0.39-0.99*
Knowledge (763)						
Yes	108	276	1.55	1.14-2.10*	1.01	0.67-1.51
No	143	236	1 ^R	-	-	-
Occupation						
Government	52	102	1 ^R	-	-	-
Private	134	254	1.04	0.70-1.55	0.72	0.29-1.81
Housewife	37	71	0.98	0.58-1.64	0.96	0.45-2.03

<i>Student</i>	26	41	0.80	0.44-1.46	0.96	0.40-2.33
<i>Income</i>						
<i>No income</i>	83	164	1 ^R	-	-	-
<i>< 1000</i>	59	125	1.07	0.71-1.61	0.62	0.35-1.11
<i>1000-2500</i>	46	125	1.38	0.90-2.11	1.12	0.65-1.93
<i>>2500</i>	66	100	0.77	0.51-1.15	1.31	0.72-2.38
<i>Education status</i>						
<i>Illiterate</i>	9	27	1 ^R	-	-	-
<i>1-8 grades</i>	23	52	0.75	0.31-1.85	0.49	0.18-1.36
<i>9-12 grades</i>	82	122	0.50	0.22-1.11	0.79	0.27-2.35
<i>>12 grades</i>	140	313	0.75	0.34-1.66	0.33	0.12-0.91*
<i>Religion</i>						
<i>Orthodox</i>	107	245	1 ^R	-	-	-
<i>Muslim</i>	81	87	0.45	0.31-0.66*	0.65	0.41-1.04
<i>Protestant</i>	56	148	1.11	0.76-1.62	1.19	0.74-1.90
<i>catholic</i>	7	11	0.66	0.25-1.75	0.84	0.24-3.00
<i>Registration time</i>						
<i>1-5 min</i>	81	315	1 ^R	-	-	-
<i>6-10 min</i>	60	136	0.58	0.40-0.86*	0.58	0.37-0.92*
<i>11-15 min</i>	59	35	0.15	0.09-0.25*	0.30	0.17-0.54*
<i>16-30 min</i>	36	15	0.11	0.06-0.21*	0.26	0.12-0.55*
<i>I don't know</i>	17	13	0.20	0.09-0.42*	0.15	0.06-0.35*
<i>Payment time</i>						
<i>1-5 min</i>	100	373	1 ^R	-	-	-
<i>6-10 min</i>	61	95	0.42	0.28-0.62*	0.81	0.51-1.29*
<i>11-15 min</i>	36	21	0.16	0.09-0.28*	0.50	0.25-1.01*
<i>16-30 min</i>	44	13	0.08	0.04-0.15*	0.21	0.10-0.44*
<i>I don't know</i>	10	11	0.30	0.12-0.71*	0.35	0.19-1.62*

* Significant association at P < 0.05 **1^R** Set as reference **NS**=Not Satisfied **S**= Satisfied

5.2 Qualitative study

An in depth interview was carried out to assess the responses of the key personnel of both hospitals about the effect of EMR on general workflow in the outpatient department including the strength and limitations of EMR. A total of 16 individuals were interviewed from both hospital, eight for each. The key personnel were three medical doctors including the medical director, one pharmacy technician, one OPD nurse, one data clerk, one lab technician and one x-ray technician.

5.2.1 Knowledge about EMR

EMR was explained by all respondents of MCM center as a networked computer system that permit easy communication between departments and allow easy access of patient data, since it stores all information related to the patient including clinical and financial information and the data will be accessible by all departments once the patient is registered in the reception and paid for the card. The specific software available in this hospital is OCS (Order Communication System). The respondents of BTGH defined EMR as a computer system that handles patient data. All respondents of both hospitals have positive attitude towards EMR.

“From my experience, I feel that EMR has lot of advantages including ease of data retrieval, reducing workload and reducing medication error. So it will have paramount importance if implemented to other hospitals.”

5.2.2 Impact of EMR

Patient physician relationship

Regarding its impact on patient physician relationship, most of the respondents believed that the relation such as eye-to-eye contact and being concerned for patients is not affected by the presence of EMR rather it depends on physician's behavior. However, an OPD physician

from MCM claimed that the eye contact will be reduced as the format of EMR obliged the physician to fill more number of data fields as compared with the manual system so that the physician's attention may be deviated to the computer to fill all this data fields.

As far as data quality is concerned, all respondents agreed that the implementation of EMR systems significantly enhance readability, consistency and completeness of patient data as it has standardized and uniform data format and permit validity check to monitor data consistency. Furthermore, it provides greater accuracy. All in all, respondents believe that use of EMR maximize the data quality.

Since, the EMR system does not provide separate view for particular departments, all information, related with patients health status, stored in the database is disclosed for all departments including radiology, laboratory, pharmacy and OPD. This implies that almost all health professionals could observe the information once he/she entered his/her username and password. Having this in mind, few respondents from MCM claimed that EMR will not prevent patient data from unauthorized access. In contrast to this the other respondent in the same hospital said that EMR maintain patient confidentiality because any professional can't retrieve, observe or manipulate patient data without knowing the patients ID number (patient ID number can't be known without asking the patient or looking the ID itself). While respondents of BTGH have said that generally, the computer system is better than the manual system to secure patient data.

Concerning its impact on patient waiting time and overall service coordination, all respondents have the same opinion in that it reduces patient waiting time so that patient satisfaction will be maintained and

facilitate communication between departments. However, they claimed that it has no use on patient diagnosis.

According to the MCM respondents, all departments have their own alerting mechanism. For example, EMR alarms the pharmacy technicians whenever the medicine is out of stock (below 5), it also acquaints with the presence of drug in the hospital when physicians want to fill prescription forms. In addition, it can remind physicians about their patients' appointment date if they set the date before. For data clerks, it lends a hand to reduce error, by avoiding duplicate data entry, for example if a patient's identification was registered and after sometime if the same patient is registered with another Id number, the system alerts or shows the presence of this patient's information in the database by displaying message box.

Opposite ideas were raised among respondents concerning documentation time. Most of them reveal that documentation time depends on the employee level of experience and their computer skill, whereas some respondents believe that it is not affected by the EMR. Rather it maximizes providers efficiency there by ordering the data accordingly to make searching and retrieval easy.

All respondents were asked about which problems associated with patient care will be better addressed by EMR. Almost all respondents prefer to implement EMR for handling patient data including generation of periodic reports and for communication between and with in departments. Some respondents further explain this question by relating it with our countries situation; one of the problems that affect quality of care of in our country is the poor data handling and reporting system of health sectors. Thus, the primary objective of implementation of EMR should be to alleviate such problem.

On the other hand, respondents were asked to specify the unit that may be affected more by the implementation of EMR. One respondent have said that laboratory would be more affected than the others as the EMR can avoid loss of investigation request papers and results. The other respondent claimed that the pharmacy department is more affected because unreadable prescriptions can be avoided, drugs that are out of stock can be replaced timely and miscalculation of cost of the drugs can be avoided. While majority of respondents claimed that the recording room will be more influenced by the presence of EMR, since it eases data retrieval, simplify computation of the cost of services, avoid loss of records, and facilitate monitoring of daily patient flow.

Surprisingly all respondents asserted that EMR doesn't address routine health care maintenance topics such as diet, smoking, exercise and etc.

5.2.3 Strength of EMR

Respondents were asked to explain the benefits of EMR when used for their daily activity. Wide-range of benefits were raised: benefits associated with all computerized system and those particular to a hospital setting. As all computerized systems, EMR also facilitate record sharing among service providers, reduce data redundancy, improve data accessibility, avoid data inconsistency, provide prompt data storage and retrieval mechanism, promote use of standards, and generally it helps to maintain data quality. In addition, it could reduce manpower cost by replacing it with computers.

In the hospital setting, EMR has various advantages to different group of practitioners. Relatively, it resulted in efficiency gains by reducing workload and maximize professionals competency by introducing them with the new technology.

In case of clinicians, they agreed that use of EMR in hospital could improve patient safety through reminding and alerting them there by reducing error. It can also assist in patient diagnosis by providing complete and accurate clinical information including computer-retrievable lab results and drug information to support evidence-based clinical decision making.

Specifically for data clerks in the reception, it avoids problems associated with loss of patients medical record and reduce the time they spent to compute the cost of services and eliminate computational errors. It also provides additional mechanism to easily trace and eliminate duplicate entries such as repeated investigation orders and repeated prescriptions.

For pharmacy technicians, it enables them to dispense the right drug with the right dose for the right person by getting rid of problems associated with unreadable prescriptions. It also helps to detect drugs that are expired and/or out of stock.

Furthermore, respondents have explained that EMR will reduce patient waiting time so that it maximizes patient satisfaction. On the other hand, respondents raised some benefits related with financial income of the organization. It has an advantage to prevent service delivery without payment, because the patients name will not be active until they pay for the prescribed service. In other words EMR blocks anyone who doesn't make the payment required from getting medical service.

5.2.4 Weak points

Like its strength, all problems associated with computerized system were raised such as data loss due to virus, poor back up system, and software

corruption. Again as all software, the initial development cost and maintenance cost of is very high.

Responsibility and accountability or medico-legal related problems were raised, once one staff open the OCS software with his/her username and password, and if the other staffs order or prescribe wrong medication using the same computer, the responsible person can't be traced, rather the computer recognize the person who primarily open the software as responsible for the committed error. Physicians or other health professionals can order lab tests without counseling or without the knowledge of the patient.

Usually physicians may not aware patients about the prescribed drug, if incase pharmacists provide incorrect drug, they will not be responsible and patients fail to check weather the drug is correct or not. Similarly, if a physician incorrectly add or miss one number in prescribing drug, the computer calculate in the wrong dose thus the patient may not take the correct dose and it become costly.

6. Discussion

To my knowledge, this is the first research in Ethiopia to document the patient waiting time and patient satisfaction in a quantified way and compare findings between computer and paper-based systems. As shown in the result section, this study assess the effect of EMR on waiting time, patient satisfaction, patient-physician relationship, eye-to-eye contact, and confidentiality and also assess patients knowledge and attitude towards EMR.

EMR is expected to reduce patient waiting time there by reducing the time elapsed to search records, to document and transfer investigation results and to communicate between sections. This study has also demonstrated that the presence of EMR significantly reduces the average patient waiting time as the mean time for registration, service payment, existing record retrieval, searching lost records and etc in the hospital with EMR was significantly lower than the mean time in the hospital with manual system ($p < 0.001$). Though not specific, a study done in Kenya reported that the patient waiting time is reduced by about 38% after the implementation of EMR.^[10] This result is also supported by the qualitative result, as all respondents agreed that the implementation of EMR reduces patient waiting time in all aspects.

Many health care aspects are expected to be improved with EMR implementation. The system improves the speed of retrieval and sorting of medical records, allowing many persons to have simultaneous access to the same medical record in any time from anywhere, increase coordination between different health care providers, and stores the data more formally. ^[4, 1, 24] Likewise, this study revealed that, the presence of EMR significantly reduced the proportion of lost records (0 versus 47.6%; $p\text{-value} < 0.001$). Furthermore, this study has shown that the mean

waiting time for retrieval of existing MR and searching lost records were significantly affected by the presence of EMR (4.7min Vs 11.2min; P-value < 0.001; 4.8min Vs 20.1min; P-value < 0.001;). Once again, this finding was supported by the qualitative data as data clerks in the reception claimed that EMR avoids problems associated with loss of patients medical record and reduce the time spent to retrieve existing or lost records. Regarding time to get laboratory result, the observed mean waiting time to get laboratory result in MCM center was significantly lower than that of BTGH (5.6min Vs 13.3min; P-value < 0.001). A comparable statistically significant reduction in laboratory reporting time were reported (25%, from 31.3 min to 23.4 min; p=0.001) after the implementation of POE at an academic medical center in 2002.^[25]

As shown in table 4 in the result section, the mean time difference for registration of new cases was 3.7 minutes per client. This implies that averagely, MCM center can save 2.2 hours on daily basis than BTGH only from registration of new cases. This implies that, they can register additional 21 cases. Regarding MR retrieval and searching time, MCM can also save 11.2 and 5.9 hours respectively. Furthermore, MCM center can save more than 12 hours from investigation result retrieval and from service payment. All this findings suggested that the presence of EMR reduces the patient waiting time significantly and can enable the hospital to provide service for additional cases.

As expected the overall patient satisfaction with the health care received in the hospital with EMR was found to be 329(85.7%) which is quiet comparable with overall satisfaction of 254(83.5%) among patients at Family medicine clinic in 2002. ^[12] In addition, in this study a mean score 4.42 with SD 0.50 on general satisfaction scale of 0 – 5 was reported in MCM center. This result is consistent with the systematic review on CBPRS and quality of care done in 2004^[4], which showed that

the mean score of overall satisfaction is 4.6. Similarly a study conducted in Kuwait in 2006, reported that 85.6% of study subjects were satisfied with a mean overall satisfaction score 4.9.^[24] Another study done in USA, also support this idea: that users were generally satisfied with physician Order Entry with mean score 5.07 on 1 – 7 scale.^[13]

With reference to a study done in Massey University, New Zealand, patient attitudes to EMR ^[26], 80% of respondents were aware about the storage of personal Health information (PHI) on a computer, which is relatively higher than 65.1% reported in this study. This significant gap can be due to the difference in research methodology, sampling method and sample size of the study. Regarding perception towards EMR, the same study revealed that patients have strong feeling about the use of EMR and wish to be involved in the process of electronically storing. In this study, 79.6% of patients of MCM center claimed that they have positive attitude towards EMR. Similarly, a comparable result was reported in a study done at family medicine clinic in 2002 that majority of patients, 74.6% thought that computer use has a “very positive” or “somewhat positive” effect on the overall quality of care.^[12] Besides a systematic review done in USA revealed that patients were found to have a positive opinion for CBPRS. ^[4]

The observed total proportion of patients who rate the overall quality care based on the service they have received as “much better” or “better” constitutes 90%, which is significantly higher than the 2004 study value that is 81%. In addition, the same study reported relatively lower proportion of patients 77.6% (236), would recommend the clinic to family and friends as compared to this study result 330(85.9%). This difference may be attributable to the participation of older respondents in the study. ^[12]

According to this study, eye-to-eye contact with the use of EMR was reduced as compared with the manual system as a total of 271(70.6%) patients from MCM and 330(86.0%) from BTGH reported that the physician eye contact is “all the time” or “most of the time”. A comparable result was reported based on a study done at family medicine clinic, about 70% of patients reported that the quality of face-to-face communication is “positive” or “very positive”.^[12] However, According to Delpierre C. et al, patients did not report a reduction in eye-to-eye contact with the use of CBPRS. This discrepancy may be due to a difference in physician’s computer skill and number of data fields that must be filled for each patient. ^[4] Concerning the total time spent with the physician for each visit, though it is not significantly affected by the presence of EMR as 245(63.8%) and 57(14.8%) of MCM and 232(60.4%) and 72(18.8%) of BTGH claimed that the physician spent enough time with the patient all the time and most of the time respectively. The proportion of patients who were satisfied with the time spent with the physician for each visit was relatively lower in the study done at family medicine clinic 65% than that of MCM 83.1%.^[12] This satisfaction difference can be attributable to the participation of older patients (age > 65) with only specific diagnosis in the study.

Data confidentiality is considered as a basic measure of quality of care especially in this era of HIV/AIDS. Development of EMR in a care unit has even been proposed as a solution to attain such quality of care by improving data confidentiality while tracing who has accessed it and collect routine data.^[4] Correspondingly, the finding of this study suggested that patients believed that EMR could keep confidentiality better than the manual system. However, respondents of the qualitative study claimed that the existing OCS software doesn’t keep patients confidentiality and fail to trace responsible and accountable

professionals. This difference may be attributable to poor security system of the OCS software found in MCM.

In this study, clients who have obtained their medical service from the hospital with EMR were found to be more satisfied as compared with those treated in the hospital with manual system, with odds ratio 6.43 (95% CI, 4.54 – 9.12). In accordance with this, increment in patient satisfaction after the introduction of computers was reported with odds ratio 1.5 (95% CI 1.01 – 2.22).^[27] According to this study, sex and occupation were not found to be significantly associated with patient satisfaction level, which is similar with a study conducted in Mekele town. ^[28] In this study patients who have been living outside of Addis Ababa were found to be less satisfied than those who live in Addis Ababa with OR=0.63 95%CI (0.44, 0.90); similarly clients from the rural areas were less satisfied as compared to those from the urban areas (p=0.003) in the study done in Mekele. ^[28] In addition the same study has shown that non paying patients were less satisfied than paying patients but it was not statistically significant with OR=0.844; 95%CI (0.561 - 1.271). Likewise, payment status has no significant association with satisfaction in this study. However, there is a slight miss match in the odds ratio, this can be explained by the fact that proportion of non paying patient is higher in government sectors than in private as the study done in Mekele was conducted in government hospitals.

7. Strength and Limitation of the study

7.1 Strength

- ❖ This study being comparative has the advantage of showing the EMR effect evidently.
- ❖ Probably, this study is the first in its kind in Ethiopia as to the knowledge of the principal investigator, which assesses the effect of EMR on general workflow in OPD.
- ❖ The study was supplemented by qualitative data that contribute a lot especially regarding some issues difficult to address with quantitative data only.
- ❖ Since all the data collectors were health professionals and MIS graduates, they understood the data collection instrument thoroughly so that smooth data collection with better quality of data was possible.

7.2 Limitation

- ❖ The fact that the study was done only in private health institution may limit its generalizability as those patients who visit health centers, government or private clinics were not included in the study.
- ❖ As observation is not included as a data collection technique, the actual time elapsed during service delivery was not measured and problems associated with documentation were not detected.
- ❖ The study did not focus on the health care providers.
- ❖ All time variables were estimations this might cause recall bias.

8. Conclusion and Recommendation

8.1 Conclusion

Though there are different factors that affect the quality of care, EMR is considered as one factor that improves the quality of health care. This comparative study, based on 768 patients, has contributed to a better understanding of the effect of use of EMR on general workflow in OPD. Mainly its effect was determined by assessing the patient waiting time and their satisfaction level. In the hospital with EMR, the mean of overall satisfaction score was found to be 4.42 with SD=0.5 and the mean waiting time was significantly lower. As compared with the manual patient record handling system, reduction in patient waiting time and increased satisfaction of patients were noted in the electronic handling of patient information, which could lead to significant changes in quality of care. However, this study demonstrated EMR as a barrier that could have negative impact on patient physician relationship particularly by reducing eye-to-eye contact. This study has also shown that about 65.5% of clients in MCM have knowledge of EMR and out of these more than two-third have positive perception towards EMR. Regarding determinants of patient satisfaction, the presence of EMR, having knowledge about EMR, patient type and place of residence were found to have significant association with high level of satisfaction. In addition, waiting time has also association with level of satisfaction as the waiting time increases the level of satisfaction decreases. These findings should encourage the government and private health institutions to promote and implement computerized patient record handling system.

8.2 Recommendation

- The concerned body (Ministry Of Health) should promote and encourage implementation of EMR both at private and government health institutions through conducting training programs.
- Considering other countries experience and conducting further study to assess its effect including at government centers will help to take informed decision.
- Strengthening and empowering of health sectors including the management body to enable them develop and use a better record handling system.
- Regular provision of on job training for all health workers and data entry technicians to introduce them with new technology and to maximize their awareness about health information and about problems associated with the existing record handling system.
- Patients claimed that EMR reduces patient physician relationship, as health workers lack computer skill and experience. Thus, training on basic computer skills should be provided.
- Respondents (health workers) state that the existing OCS doesn't keep data confidentiality, so it should be modified in such a way to protect unauthorized access and to have separate data view.

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10. Annexes

Annex A

ENGLISH VERSION QUESTIONNAIRE

ADDIS ABABA UNIVERSITY

FUCULTY OF INFORMATICS

HEALTH INFORMATICS PROGRAM

Questionnaire for Assessment of Effect of Electronic Medical Record on workflow in out Patient department

Subject information sheet

Name of Health institution _____

Greetings: Hello, how are you?

My name is _____ I am currently a post-graduate student in AAU program of Health Informatics, who is now going to conduct a survey. This survey is conducted for the partial fulfillment of graduate program of health informatics. The objective of this study is to assess the impact of Electronic Medical Record (EMR is a comprehensive record that consists of all patient information regarding his/her health status) on out patient workflow and compare with manual system, in Myungsung Christian Medical center and Bethel Teaching General Hospital, which will be important to improve the quality of medical recording system. This facility is selected as study area just by chance. You are also selected randomly to participate in this study. And if you want to participate in the study, you will be asked some questions about the quality of services you get in the out patient department of this hospital. Your co-operation and willing for the interview is very helpful in identifying the problems related to this issue. Your name will not be written in the form and I assure you that all information that you give will be kept strictly confidential. Your participation is voluntary and you are not obliged to

answer any question you do not wish to answer. To fill the questionnaire 30-40 minute will be required.

Oral consent form

Considering the information you get from the general information sheet, we would be thankful if you spend sometime with us a solving questions related to the issues. Are you comfortable to participate in this study?

- If yes ☐ (continue to next page)
- If no ☐ (skip to other participant)

Date _____

Name of data collector _____

Signature of data collector _____

Supervisor name _____

Supervisor signature _____

Part I. Background Information

1. Questionnaire number _____
2. Sex 1. Male ☐
 2. Female ☐
3. Age _____ (in completed years)
4. Marital status
 1. Single ☐ 3. Widowed ☐
 2. Married ☐ 4. Divorced ☐
5. Occupation
 1. Civil servant ☐ 4. Pensioned ☐
 2. Private Business ☐ 5. Military ☐
 3. Housewife ☐ 6. Other (specify _____)
6. Educational Status
 1. Illiterate ☐
 2. Grade 1-8 (Primary) ☐
 3. Grade 9-12 (Secondary) ☐
 4. Diploma and above (12+) ☐
7. Nationality
 1. Ethiopian ☐
 2. Non Ethiopian ☐
8. Religion
 1. Muslim ☐ 4. Catholic ☐
 2. Orthodox ☐ 5. Other (specify _____)
 3. Protestant ☐
9. Ethnicity
 1. Amhara ☐ 4. Sidama ☐
 2. Oromo ☐ 5. Somali ☐
 3. Tigray ☐ 6. Other (specify _____)
10. Residence
 1. Addis Ababa ☐
 2. Outside Addis Ababa ☐
11. Monthly income in Ethiopian birr _____
12. Type of patient?
 1. First visit ☐
 2. Revisit ☐
 3. Follow up ☐
13. Payment form
 1. Cash ☐
 2. Credit ☐
 3. Free ☐

14. Department enrolled

- 1. Medicine
- 2. Pediatrics
- 3. Surgery

- 4. Gyn/Obs
- 5. Other (specify _____)

Part II. Questions to assess client's Satisfaction

- 1. Why you select this hospital?(multiple answer is possible)
 - 1) It is computerized
 - 2) Their service is good
 - 3) They have experienced professionals
 - 4) They use modern technologies
 - 5) Referral from other center
 - 6) Recommend by someone else
 - 7) Low service payment
 - 8) Due to physical proximity
 - 9) Our organization has agreement with this hospital
 - 10) Other (specify_____)
- 2. How long did you wait to register in the card room?
 - a) No wait
 - b) _____minute/s
 - c) _____hour/s
 - d) I don't know
- 3. How satisfied are you with the time spent to get registered?
 - 1) Very satisfied
 - 2) Satisfied
 - 3) Neutral
 - 4) Dissatisfied
 - 5) Very dissatisfied

If revisit or follow up (Q No. 4 - 10)

- 4. How long did you wait to get your existing medical record?
 - a) No wait
 - b) _____minute/s
 - c) _____hour/s
 - d) I don't know
- 5. How satisfied are you with the time spent to get your existing medical record?
 - 1) Very satisfied
 - 2) Satisfied
 - 3) Neutral
 - 4) Dissatisfied
 - 5) Very dissatisfied
- 6. Have you ever lost your ID card?
 - Yes
 - No (go to Q No. 11)

7. If yes, does the service provider get your card?
Yes ☐ No ☐ **(go to Q No. 10)**
8. If yes, how long did you wait to retrieve your medical record?
a) No wait
b) _____ minute/s
c) _____ hour/s
d) I don't know
9. How satisfied are you with the time spent to search and get your medical record?
1) Very satisfied
2) Satisfied
3) Neutral
4) Dissatisfied
5) Very dissatisfied
10. If no, do you know any reason why the service provider didn't get your medical record?
1. Was not told
2. The system is poor
3. The providers are careless
4. I don't know
5. Others (specify _____)
11. Were any lab ordered to you?
Yes ☐ No ☐ **(go to Q No. 14)**
12. If yes, how long did you wait to get your lab result?
a) No wait
b) _____ minute/s
c) _____ hour/s
d) I don't know
13. How satisfied are you with the time spent to get your lab result?
1. Very satisfied
2. Satisfied
3. Neutral
4. Dissatisfied
5. Very dissatisfied
14. Were any X-ray or U/S or procedure ordered to you?
Yes ☐ No ☐ **(go to Q No. 17)**
15. If yes, how long did you wait to get your lab result?
a. No wait
b. _____ minute/s
c. _____ hour/s
d. I don't know
16. How satisfied are you with the time spent to get your lab result?
1. Very satisfied
2. Satisfied
3. Neutral
4. Dissatisfied

5. Very dissatisfied
17. Were any drugs or supplies ordered to you?
Yes ☐ No ☐ **(go to Q No. 21)**
18. If yes, were you able to get in hospital pharmacy?
Yes ☐ No ☐ **(go to Q No. 21)**
19. If yes, how long did you wait to get drugs from pharmacy?
a) No wait
b) _____ minute/s
c) _____ hour/s
d) I don't know
20. How satisfied are you with the time spent to get your drugs from pharmacy?
1. Very satisfied
2. Satisfied
3. Neutral
4. Dissatisfied
5. Very dissatisfied
21. Have you ever lost your drug prescription, lab request or radiology request paper?
Yes ☐ No ☐ **(go to Q No. 24)**
22. If yes, how long did you wait to get another request paper?
a) No wait
b) _____ minute/s
c) _____ hour/s
d) I don't know
23. How satisfied are you with the time spent to get your request paper?
1. Very satisfied
2. Satisfied
3. Neutral
4. Dissatisfied
5. Very dissatisfied
24. Have you ever lost your lab or radiology result?
Yes ☐ No ☐ **(go to Q No. 29)**
25. If yes, did the service provider get your result?
Yes ☐ No ☐ **(go to Q No. 28)**
26. If yes, how long did you wait to get your result?
a) No wait
b) _____ minute/s
c) _____ hour/s
d) I don't know
27. How satisfied are you with the time spent to get your result?
2. Very satisfied
3. Satisfied
4. Neutral
5. Dissatisfied
6. Very dissatisfied

28. If no, do you know any reason why the service provider didn't get your result?
1. Was not told
 2. The system is poor
 3. The providers are careless
 4. I don't know
 5. Others (specify _____)
29. How long did you wait to pay for the service?
- a) No wait
 - b) _____ minute/s
 - c) _____ hour/s
 - d) I don't know
30. How satisfied are you with the time spent to pay for the service?
1. Very satisfied
 2. Satisfied
 3. Neutral
 4. Dissatisfied
 5. Very dissatisfied
31. If follow up, how long did you wait to register when you come in the appointment date?
- a) No wait
 - b) _____ minute/s
 - c) _____ hour/s
 - d) I don't know
32. How satisfied are you with the time spent to register on the appointment date?
1. Very satisfied
 2. Satisfied
 3. Neutral
 4. Dissatisfied
 5. Very dissatisfied
33. Do you think the system and service providers keep your health status confidential?
1. All the time
 2. Most time
 3. Sometimes
 4. Rarely
 5. Never
34. How satisfied are you with the confidentiality of your health status?
1. Very satisfied
 2. Satisfied
 3. Neutral
 4. Dissatisfied
 5. Very dissatisfied
35. Does the service provider spend enough time with you?
1. All the time

2. Most time
 3. Sometimes
 4. Rarely
 5. Never
36. How satisfied are you with the time spent with your service provider?
1. Very satisfied
 2. Satisfied
 3. neutral
 4. Dissatisfied
 5. Very dissatisfied
37. Does your service provider have good eye contact during examination?
1. All the time
 2. Most time
 3. Sometimes
 4. Rarely
 5. Never
38. How satisfied are you with the provider's eye contact?
1. Very satisfied
 2. Satisfied
 3. Neutral
 4. Dissatisfied
 5. Very dissatisfied
39. How would you rate your over all level of satisfaction regarding the quality of care at this hospital in comparison to other private hospitals you knew?
1. Much better
 2. Better
 3. The same
 4. Worse
 5. Much worse
 6. Not sure
40. Would you recommend this clinic to your friends?
1. Yes
 2. No
 3. Not sure

Part III. Questions to assess client's Knowledge and attitude

1. Have you ever heard about EMR?
 1. Yes
 2. No _____(end)
 3. Not sure
2. Do you know any hospital that has EMR?
 1. Yes
 2. No
 3. Not sure

If yes,

No	Variable	SA	A	D	SD	NS
3.	EMR can improve the service delivery					
4.	EMR increase the cost of service					
5.	EMR will reduce the patient waiting time					
6.	I have feeling of dislike for EMR					
7.	EMR will keep client's confidentiality better than the manual system					
8.	I can talk easily with my doctor when he/she uses computer					
9.	EMR will correct service providers when they commit error					
10.	EMR can remind service providers whenever they forget					
11.	EMR can increase health care providers efficiency					

Key: SA = Strongly agree A = Agree D = Disagree SD = strongly disagree
NS = Not sure

12. What impressed you about EMR? (*multiple answer possible*)
 - a) Reduce cost
 - b) Improve service delivery
 - c) Reduce waiting time
 - d) Facilitate patient doctor relationship
 - e) Keep client data confidential
 - f) Reduce error
 - g) Maximize health care providers efficiency
 - h) Other (specify _____)

Annex B

Amharic Version Questionnaire

በአዲስ አበባ ዩኒቨርሲቲ

የሂልዝ ኢንፎርማቲክስ የትምህርት ክፍል

አዲስ አበባ

የጥናቱ ምክንያት

ጤና ይስጥልኝ ስሜ-----ይባላል። በአዲስ አበባ የግል ጤና አገልግሎት ድርጅት የኤሌክትሮኒክ ሜዲካል ሪከርድ በህክምና አገልግሎት ላይ ያለውን ተፅዕኖ ለማጥናት በአዲስ አበባ ዩኒቨርሲቲ የ ክፍል አማካኝነት እየተካሄደ ባለው ጥናት ላይ በመረጃ ሰብሳቢነት እየሰራሁ እገኛለሁ።

እርስዎ እዚህ ጤና ተቋም ውስጥ ህክምና አገልግሎት ከሚያገኙት በሽተኞች ውስጥ በእጣ የተመረጡ ሲሆን በጥናቱ ላይ ለመሳተፍ ፈቃድ ከሆኑ የተወሰነ ከሚያገኙት የህክምና አገልግሎት ጋር ተያያዥነት ያላቸውን ጥያቄዎች እጠይቃለሁ። የእርስዎ ስም በዚህ ፎርም ላይ የማይፃፍ ሲሆን ከሚሰጡን መረጃ ጋር በተያያዥነት በምንም መልኩ በስራ ላይ የማይውል ከመሆኑም በተጨማሪ የሚሰጡን መልስም ሙሉ በሙሉ ሚስጥራዊነቱ የተጠበቀ ይሆናል።

የጥናቱ ጥቅም

በጥናቱ በመሳተፍዎ ገንቢ እና ነቀፌታ ጉኖችን ለማወቅ እና ለወደፊቱም ለማሻሻል ይረዳናል።

የጥናቱ ጉዳት

በጥናቱ በመሳተፍዎ በእርስዎ ላይ የሚመጣ ጉዳት የለም።

የዚህ ጥናት ተጠቃሚ ለመሆን የእርስዎን ፈቃደኝነት ይጠይቃል። ነገር ግን በጥናቱ ለመሳተፍ ካልፈለጉ እንዲሁም ከመጠይቆቹ ያልፈለጉትን ላለመመለስ መብትዎ የተጠበቀ ነው። ጥናቱን በፈለጉበት ጊዜ ማቋረጥ ይችላሉ። እንዲሁም ግልፅ ያልሆነልዎት ጥያቄ ካለ ግልፅ እናደርግልዎታለን።

የፍቃደኝነት ውል:

ስለዚህ እስካሁን የተነጋገርነውን ነገሮች ከግምት ውስጥ በማስገባት በዚህ መጠይቅ ነዎት?

አዎ ነኝ: (በሚቀጥለው ገፅ ይጥቀሱ)

ፍቃደኛ አይደለሁም(አመሰግናለሁ ውደ ሌላ በሽተኛ ይሔዱ)

የጤና ተቋም ስም _____

መጠይቁን የሚሞላ ሠው ስምና ፊርማ: _____

ቀን: _____

የተቆጣጣሪ ስምና ፊርማ: _____

1. አጠቃላይ መረጃ

1. መጠይቅ ቁጥር: _____

2. ፆታ: 1. ወንድ ☐ 2. ሴት ☐

3. እድሜ _____ (በሙሉ አመት)

4. የጋብቻ ሁኔታ

1. ያለገባ ☐

2. ያገባ/አብረው የሚኖሩ ☐

3. የፈታ/የተፋቱ/ ☐

4. ሚስት/ባል/ አግብተው የሞቱባቸው ☐

5. ስራ /የሙያው አይነት/

1. የመንግስት ሰራተኛ ☐

2. የግል ሰራተኛ ☐

3. የቤት እመቤት ☐

4. ወታደር ☐

5. ጠረተኛ ☐

6. የትምህርት ደረጃ

1. ያልተማረ ☐

2. ከ 1- 8 ☐

3. ከ 9-12 ☐

4. ከ 12 በላይ ☐

7. ዜግነት

1. ኢትዮጵያዊ ☐

2. ኢትዮጵያዊ ያልሆነ ☐

8. ሀይማኖት

1. ሙስሊም ☐

2. ኦርቶዶክስ ☐

3. ፕሮቴስታንት ☐

4. ካቶሊክ ☐

5. ሌላ ካላ(ይጠቀስ-----)

9. ብሔር

1. አማራ ☐

2. ኦሮሞ ☐

3. ትግሬ ☐

4. ደቡብ ☐

5. ሱማሌ ☐

6. ሌላ ካላ(ይጠቀስ-----)

10. መኖሪያ

1. አዲስ አበባ ☐

2. ከአዲስ አበባ ውጪ ☐

11. የወር ገቢ ደመወዝ በኢትዮጵያ ብር _____

12. የታካሚ አይነት

1. አዲስ ☐

2. በድጋሚ የመጣ ☐

3. የሚከታተል ☐

13. የክፍያ አይነት

1. በጥሬ ገንዘብ ☐

2. በክሬዲት ☐

3. ነፃ ☐

14. የታከሙበት ክፍል

1. የወስጥ ደዌ ☐
2. የህፃናት ☐
3. የቀዶ ጥገና ☐

4. የእናቶች ☐

5. ሌላ ካለ (ይጠቀስ-----)

2. የተገልጋዮችን እርካታ የሚመለከት መጠይቅ

1. ይህን ሆስፒታል ለምን መረጡት

1. በኮሚፒውተር የታገዘ ስለሆነ
2. ጥሩ አገልግሎት ስለሚሰጡ
3. ከሌላ ሆስፒታል ወደዚህ ስለተመራሁ
4. የምፈልገው ሀኪም እዚህ ስላለ
5. ሰው ጠቁሞኝ
6. ክፍያው ትንህ ስለሆነ
7. ይሄ ሆስፒታል ከኛ መስራቤት ጋር ውል ስላለው
8. የተሻል ቴክኖክሎጂ ስላላቸው
9. ይሄ ሆስፒታል ስለሚቀርብኝ
10. ሌላ ካለ (ይፎቀስ-----)

2. በመጀመሪያ ሲመጡ ከካርድ ክፍል ለመመዝገብ ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

3. ለመመዝገብ በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

በድጋሚ የመጣ ወይም የሚከታተሉ ከሆነ (ጥያቄ 4 - 10)

4. ነባሩን ካርድዎን ለማውጣት ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

5. ነባሩን ካርድዎን ለማውጣት በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

6. መለያ ካርድዎ ጠፍቶብዎት ያውቃል?

1. አዎ ☐
2. አያውቅም ☐ (ወደ ጥያቄ ቁ. 11

ይሂዱ)

7. አዎ ከሆነ የክፍሉ ሰራተኛ ካርድዎን አግኝተውሎታል?

1. አዎ ☐
2. አልተገኘም ☐ (ወደ ጥያቄ ቁ. 10

ይሂዱ)

8. አዎ ከሆነ ነባሩን ካርድዎን ፈልጎ ለማግኘት ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

9. ነባሩን ካርድዎን ፈልጎ ለማግኘት በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

10. ካርድዎ ካልተገኘ ምክንያቱ ምን ይመስሎታል?

1. አልተነገረኝም
2. አሰራራቸው ጥሩ ስላልሆነ
3. ሰራተኞቹ ግድየለሽ ስለሆኑ
4. አላውቀውም
5. ሌላ ካለ (ይጠቀስ-----)

11. የሰራተኛ ታዘሎት ያውቃል?

1. አዎ ☐

2. አያውቅም ☐

(ወደ ጥያቄ ቁ. 14

ይሂዱ)

12. አዎ ከሆነ የሰራተኛ ውጤትዎን ለማግኘት ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

13. የሰራተኛ ምርመራ ውጤት ለማግኘት በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

14. ራጅ ወይም አልትራሳውንድ ታዘሎት ያውቃል?

1. አዎ ☐

2. አያውቅም ☐

(ወደ ጥያቄ ቁ. 17

ይሂዱ)

15. አዎ ከሆነ ራጅ ወይም አልትራሳውንድ ውጤትዎን ለማግኘት ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

16. የራጅ ወይም አልትራሳውንድ ውጤትዎን ለማግኘት በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

17. መድሃኒት ታዘውት ያውቃል?

1. አዎ ☐

2. አያውቅም ☐ (ወደ ጥያቄ ቁ. 21

ይሂዱ)

18. አዎ ከሆነ መድሃኒቱን ያገኙት ከዚህ ሆስፒታል ፋርማሲ ነው ?

1. አዎ ☐

2. አይደለም ☐ (ወደ ጥያቄ ቁ. 21

ይሂዱ)

19. አዎ ከሆነ የታዘዘልዎትን መድሃኒት ለማግኘት ምን ያህል ጊዜ ይጠብቃሉ?

5. ምንም አልጠብቅም

6. ----- ደቂቃ

7. ----- ሰአት

8. አላውቀውም

20. የታዘዘልዎትን መድሃኒት ለማግኘት በወሰደብዎት ጊዜ ምን ያህል ረክተዋል?

6. በጣም ረክቻለሁ

7. ረክቻለሁ

8. ገለልተኛ ነኝ

9. አልረካሁም

10. በጣም አልረካሁም

21. የመድሃኒት የሳብራቶሪ ወይም የራጅ ማዘዣ ጠፍቶቦት ያውቃል?

1. አዎ ☐

2. አያውቅም ☐

22. አዎ ከሆነ ማዘዣውን ለማግኘት ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም

2. ----- ደቂቃ

3. ----- ሰአት

4. አላውቀውም

23. ማዘዣውን ለማግኘት በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ

2. ረክቻለሁ

3. ገለልተኛ ነኝ

4. አልረካሁም

5. በጣም አልረካሁም

24. የሳብራቶሪ ወይም የራጅ ውጤት ጠፍቶቦት ያውቃል?

1. አዎ ☐

2. አያውቅም ☐

25. አዎ ከሆነ የክፍሉ ሰራተኛ ውጤትዎን አግኝተውሎታል?

1. አዎ ☐

2. አልተገኘም ☐

26. አዎ ከሆነ ውጤቱን ለማግኘት ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም

2. ----- ደቂቃ

3. ----- ሰአት

4. አላውቀውም

27. ውጤቱን ለማግኘት በወሰደብዎት ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ

2. ረክቻለሁ

3. ገለልተኛ ነኝ

4. አልረካሁም

5. በጣም አልረካሁም

28. ውጤቱ ካልተገኘ ምክንያቱ ምን ይመስሎታል?

1. አልተገኘኝም

2. አሰራራቸው ጥሩ ስላልሆነ

3. ሰራተኞቹ ግድየለሽ ስለሆኑ
4. አላውቀውም
5. ሌላ ካለ (ይጠቀስ-----)

29. የአገልግሎት ክፍያ ለመክፈል ምን ያህል ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

30. የአገልግሎት ክፍያ ለመክፈል በወሰደብዎት ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አላውቀውም
5. ሌላ ካለ (ይጠቀስ-----)

31. ተመላሳሽ ታካሚ ከሆነ በቀጠሮዎ ወቅት ሲመጡ ለመመዝገብ ምን ያህል ጊዜ ይጠብቃሉ?

1. ምንም አልጠብቅም
2. ----- ደቂቃ
3. ----- ሰአት
4. አላውቀውም

32. በቀጠሮዎ ወቅት ሲመጡ ለመመዝገብ በወሰደብዎ ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

33. የሆስፒታሉ ደንብ (ኤሌክትሮኒክ ሜዲካል ሪከርድ) በዚህ ሆስፒታል ውስጥ ሚስጥር ይጠብቁልናል ብለው ያምናሉ?

1. አዎ ሁልጊዜም
2. አብዛኛውን ጊዜ
3. አንዳንድ ጊዜ
4. ሁሉንም አይደለም
5. በጭራሽ አይጠብቁልኝም

34. ሚስጥርዎ በመጠበቁ ምን ያህል ረክተዋል?

1. 1.በጣም ረክቻለሁ
2. 2.ረክቻለሁ
3. 3.ገለልተኛ ነኝ
4. 4.አልረካሁም
5. 5.በጣም አልረካሁም

35. ሀኪምዎን በሚያገኙበት ወቅት በቂ ሰዓት ከእርስዎ ጋር ያሳልፋል ወይ?

1. አዎ ሁልጊዜም
2. አብዛኛውን ጊዜ
3. አንዳንድ ጊዜ
4. ሁሉንም አይደለም
5. በጭራሽ አይጠብቁልኝም

36. ሀኪምዎን በሚያገኙበት ወቅት ከሃኪምዎ ጋር በሚያሳልፉት ጊዜ ምን ያህል ረክተዋል?

1. በጣም ረክቻለሁ
2. ረክቻለሁ
3. ገለልተኛ ነኝ
4. አልረካሁም
5. በጣም አልረካሁም

37. በምርመራ ወቅት ሀኪምዎ ጥሩ የዓይን እይታ አለው ወይ?

- 1) አዎ ሁልጊዜም
- 2) አብዛኛውን ጊዜ
- 3) አንዳንድ ጊዜ
- 4) ሁልጊዜ አይደለም
- 5) በጭራሽ አላገኘሁም

38. ሀኪምዎ ለርስዎ ባለው የአይን እይታ ምን ያህል ረክተዋል?

- 2) በጣም ረክቻለሁ
- 3) ረክቻለሁ
- 4) ገለልተኛ ነኝ
- 5) አልረካሁም
- 6) በጣም አልረካሁም

39. እዚህ የሚያገኙት እንክብካቤ ከሌላ የጤና ተቋማት ጋር ሲነፃፀር እንዴት ነው?

- 1) ይህ በጣም ጥሩ ነው
- 2) ይህ ይሻላል
- 3) ተመሳሳይ ነው
- 4) ይህ ጥሩ አይደለም
- 5) ይህ በጣም መጥፎ ነው
- 6) እርግጠኛ አይደለሁም

40. ይህን ሆስፒታል ሌሎች ጓደኞችዎ እንዲጠቀሙ ይመክራሉን?

- 1) አዎ እመክራለሁ
- 2) የለም አልመክርም
- 3) እርግጠኛ አይደለሁም

3. የተገልጋዮችን እውቀትና አመለካከት የሚመለከት መጠይቅ

1. ስለ ኤሌክትሮኒክ ሜዲካል ሪከርድ (ኤሜር) ያውቃሉ?

1. አዎ አውቃለሁ
2. አላውቅም------(ተፈፀመ)
3. እርግጠኛ አይደለሁም

2. ኤሌክትሮኒክ ሜዲካል ሪከርድ ያለው ሆስፒታል ያውቃሉ?

1. አዎ አውቃለሁ?
2. አላውቅም
3. እርግጠኛ አይደለሁም

አዎ ከሆነ

ተ.ቁ		በአ	እ	አ	በአ	እአ
3	ኤሜሪ አገልግሎት ያሻሻላል ብለው ያምናሉ					
4	ኤሜሪ ታካሚ እንዳይገባላቸው ያደርጋል					
5	ኤሜሪ የአገልግሎት ክፍያን ይጨምራል					
6	ኤሜሪ የታካሚ ሚስጥር ይጠብቃል					

7	ኤሜሪ የሰራተኞችን ስህተት ይቀንሳል					
8	ኤሜሪ ሰራተኞች ቢረሱ ያስታውሳል					
9	ኤሜሪ የሰራተኞች ብቃት ይጨምራል					
10	ለኤሜሪ ጥሩ አመልካክት አለኝ					
11	ሀኪሙ ኮምፒውተር የሚጠቀም ከሆነ በደንብ መግባባት እንችላለን					

12. ጎልቶ የሚታየው የኤሌክትሮኒክ ሜዲካል ሪከርድ ጥቅም የትኛው ነው

1. የአገልግሎት ክፍያ ይቀንሳል
2. አገልግሎት አሰጣጡን ያሻሻላል
3. የታካሚ መጉላላት ይቀንሳል
4. የታካሚን ሚስጥር ይጠብቃል
5. ስህተትን ይቀንሳል
6. የሰራተኞችን ብቃት ይጨምራል
7. በሀኪም እና በበሽተኛ መሀል ጥሩ ግንኙነት እንዲኖር ያደርጋል
8. ሌላ ካለ ይጥቀሱ-----

በእ= በጣም እስማማለሁ

እ= እስማማለሁ

አ= አልስማማም

በአ= በጣም አልስማማም

እአ= እርግጠኛ አይደለሁም

Annex C

Questions for In-depth Interview

1. What do you know about EMR?
2. What is your perception towards EMR?
3. What are the challenges in providing quality service at your institution?
 - Health workers (competence, shortage)
 - Technology (diagnostic, therapeutic, Information System)
 - Policy or program (by MOH)
 - Clients/ patients (awareness)
4. How would you describe the impact or role of EMR in:
 - Patient physician relation ship?
 - Service efficiency (in terms of cost and time)?
 - Data quality (accuracy, consistency, completeness, readability)?

- Confidentiality/ privacy?
 - Patient waiting time?
 - Over all service coordination?
 - Service effectiveness (providing the right service)?
 - Provider's efficiency (data retrieval, documentation time)?
 - Patient diagnosis ?
5. Do you have any mechanism that alerts you whenever you commit error such as drug interaction alerting mechanism, remind patient issue during follow up time, etc
 6. In your opinion what type of problems will be better addressed by EMR?
 - Record handling
 - Decision support
 - Communication
 - Patient safety/ satisfaction
 7. In your opinion which functions or units of the hospital are affected (positively and negatively) by the implementation of EMR?(pharmacy, laboratory, OPD, IPD)
 8. Does EMR address routine health care maintenance topics such as diet, sleep, smoking, behavioral and social developmental milestones, etc?
 9. What are the strong points of EMR?
 10. What are the weak points and challenges of EMR?
 11. Do you have additional comments or recommendation about EMR related with patient, service provider, and policy or other?

Declaration

I, the undersigned declare that this thesis is my original work and has not been presented for a degree in this or another university and all sources of materials used for this thesis have been fully acknowledged.

Name:	<u>Hajira Mohammed</u>
Signature	_____
Place	<u>Addis Ababa</u>
Date of submission	<u>July 20, 2009</u>

This thesis work has been submitted for examination with my approval as university advisor.

Advisor's name: Dr. Getnet Mitike

Signature _____

Date: July 20, 2009