ADDIS ABABA UNIVERSITY

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M.SC IN HEALTH INFORMATICS PROGRAMME

PROJECT TITLE

INVESTIGATING ELECTRO MEDICAL RECORD (SMART CARE SOFTWARE) IMPLEMENTATION IN A HEALTH CARE FACILITY: A GUIDING FRAMEWORK FOR ADAMA HOSPITAL MEDICAL COLLEGE

BY: DILARG ALEMAYEHU

DATE JUNE, 2015

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A PROJECT REPORT SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN HEALTH INFORMATICS.

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Title Page

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Dedication

This paper is dedicated to my mother Kelamua Desta all the families, w/ro Fanaye Babu all the families and my wife S/r Meaza Solomon for her full support in all aspects and my brother Solomon Gezahegn without whom this paper could not have been conducted in full. Above all I dedicate this work to my children's Abigia and Betselot for their moral and spiritual support.

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Acronyms and Abbreviations

AIDS- Acquired immune Deficiency syndrome

ANC- Anti Natal Care

ARRA- American Recovery and Reinvestment Act

CDC – Center for Disease Control

eHealth- Electronic Health

EHR – Electronic Heath Record

eHMIS- Electronic Health Management Information System.

EMR- Electro Medical Record

FGD- Focal Group Discussion

FMOH-Federal Ministry of Health

HIS-Health Information Systems

HIT-Health Information Technology

HIV- Human Immune Virus

HMIS- Health Management Information system

ICT – Information Communication Technology

ISM - Integrated Success Model

IT- Information Technology

MRN-Medical Record Number

MRU-Medical Record Unit

NHRIS-National Health Resource Information System

OPD- Out Patient Department

SCSW- Smart care Software

SW- Software

TAM- Technology Acceptance Model

TUTAPE -Tulane University's Technical Assistance Program for Ethiopia

VCT- Voluntary Counseling and Testing

WHO- World Health Organization

Summary

Background: In Ethiopia, electro medical record (smart care software) was introduced in 2007/2008 in collaboration with the smart care teams' of Zambia and United States as part of HMIS reform. The smart care software has become a necessary tool in health care for improving patient quality care and enhancing quality health management information system. However due to several factors; lack of optimal knowledge on computer usage by health professionals and their commitment there are gaps to implementing electro medical record (EMR).

Objective: The aim of this project is to investigate electro medical record (smart care software) implementation in a health care facility a guiding framework for Adama Hospital medical college.

Methodology: Cross sectional study design with qualitative and quantitative approaches was conducted on 177 EMR users at Adama hospital from January 01, 2015- April 30, 2015. In this study, personal observation on documents related to EMR, interview and questionnaires were used as data collection tools. The data were collected by investigator. Quantitative data were coded and analyzed using SPSS statistically software version 16. The opinion of respondent were recorded, summarized, analyzed and presented in a readable product in comparison form related study conducted in different area. Multiple regressions were used to identify factors contributing to electro medical record (EMR) implementation.

Electro medical record (EMR) implementation success and failure were measured based on twelve nationally stated benefits: legibility of record, safer data, patient data confidentiality, continuous data processing, always up to date, simultaneous remote access to patient data, integration with other information resources, incorporation of electronic data, greater range of data output modalities, flexible data layout, assisted search, and tailored paper output. Meanwhile a guiding framework was designed and evaluated based on experts' opinion.

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Result: According to the investigation made on EMR implementation success or failure based the twelve nationally stated benefits. Parameters as success were; legibility of record (91.5%), safer data (77.4%), patient data confidentiality (78.5%), continuous data processing (57.6%) and always up to date (53.1%). However the following seven parameters that should have been expected as benefits were found as failures. These include simultaneous remote access to patient data (100%), integration with other information resources (100%), incorporation of electronic data (100%), greater range of data output modalities (100%), flexible data layout (41.8%), assisted search (24.9%) and tailored paper output (24.3%)

In this study, attitudes of users towards EMR usage (α= .001), variation in number of training days among users (α = .001) , exchange of electronic information via networking between departments (α = .010), experience variation on using the smart care software among users (α = .001), disparity of the expectation drown by users during the training period and its contradiction on actual working environment (α = .005),were found statistically significant causes for failures EMR usage at Adama hospital.

Discussion and Recommendation: The system was initially implemented in twenty seven service areas. However gradually the implementation was limited only to six departments and currently was functional only in two departments. In this study the overall EMR usage success and failure rates was 41.7 % and 58.3 respectively. This indicates that more remained to be done on EMR implementation success at Adama Hospital. Based on major study findings made a guiding framework is proposed. In this framework inputs introduced from the study findings are system quality, user involvement, human resources, integration, capacity building, perceived usefulness, incentive, perceived easy for use, technical support, monitoring and evaluation, user promotion, interoperability, innovative leadership, and website. Overall this guiding framework is expected to bridge the existing gap in EMR implementation at Adama hospital.

Key words: EMR, Smart care Software, Success, Failure and a guiding framework.

CHAPTER ONE

INTRODUCTION

1.1. Background

World health organization efforts have been targeted towards strengthening the health information systems (HIS) in all countries more especially in the developing ones. It is believed that improved health information systems (HIS) would enhance evidence based policy making leading to improve accountability and effectiveness at all levels of the health system [1].

Ethiopian health information system considers information communication technology (ICT) as core input. To ensuring utilization of resources and proper support of the existing health infrastructure that is faced with a number of challenges. It requires a new approach in delivering the desired health outcomes in the national healthy policy to its citizens. eHealth considered as a means to ensure that the right health information is provided to the right person at the right place with the right time in a secure electronic form to optimize the accessibility, quality of health care delivery, research, education and knowledge for health system [2].

From electronic versions of eHealth applications electronic medical record (EMR) is a comprehensive IT solution package that fully automates all departments of health care facilities. Electro medical record (EMR) tracks each individual's care as well as collective or aggregate patient information for electronic health management information system (eHMIS) purposes. The system aids the provision of quality medical service at the individual client and health institutions level. Using electronic medical record (EMR) system all electronic health management information system (eHMIS) and many other indicators can be produced automatically without further burden to staff. The EMR system automates all points of service within a healthcare facility and promotes easy data use and reporting at health facilities and administrative institutions [2].

Smart Care software is one of electronic medical record (EMR) system deployment in Ethiopia happened in collaboration with the smart care team in Zambia and United States in 2007/2008. Ethiopian Ministry of Health decided smart care software to be an official patient registration

system to gain legibility of record, safer data , patient data confidentiality , continuous data processing , always up to date , simultaneous remote access to patient data , integration with other information resources , incorporation of electronic data , greater range of data output modalities , flexible data layout , assisted search , and tailored paper output benefits. Tulane University Technical Assistance Program to Ethiopia (TUTAPE) developed the smart care software in collaboration with Ethiopian Federal Ministry of Health (FMOH) and partnership with center for disease control (CDC). Besides the rich and advanced functionality and features smart care software has also been proven to work in limited resources environment of developing countries particularly in Africa [3].

Since it was possible to create a controlled environment and most favorable Dire Dawa administrative region was identified for the initial phase of the deployment in 2008/2009. Over one hundred clinics and hospitals in the region covering the entire area have successfully deployed smart care software for building and maintaining electro medical record (EMR) which were improve both the quality of health information as well as patient care .Ethiopian federal ministry of health with Tulane University Technical Assistance Program for Ethiopia (TUTAPE) expand implementation of electro medical record (EMR) to different hospitals of Ethiopia based the success of objective in the pilot testing program [3].

Due to this expansion program electro medical record (EMR) implemented at Adama hospital medical college through smart care software version one since 2010/2011.The system was installed by Tulane University Technical Assistance Program for Ethiopia (TUTAPE) financial and material support in collaboration with regional health bureau [4].

1.2 Statement of the problem

In Ethiopia there were difficulties documented related to paper based medical records [5].These includes inappropriate recording, unsafe record keeping, lack of confidentiality, lack of integration, duplicated recording, missing health records and long waiting hours which contributed to client dissatisfaction and mistrust in health services provision [5].

Consequently, Ethiopia has adopted and integrated electronic medical record in to the health system since 2007/2008. Smart care software is implemented starting from medical record room were bulk of data encoding takes place followed by other clinics including outpatient, inpatient, laboratory, and pharmacy [3]. HMIS has been specifically targeted for endeavored to change inherent constraints including the existing health record. The pilot testing implementation of HMIS in Ethiopia joins to EMR as a pilot in Dire Dawa. The electronic medical record is preferred for security and safety as well as promptness of recording. However, it is not as easy as paper based to access continuously, and its implementation depends on several factors such as technology and infrastructure availability and sustainability [5].

For instance, a study made in Indian indicated the following reasons that may contribute to the failures of electronic medical record (EMR) implementations. Way of converting physician offices to electronic medical record (EMR) system, very short period of time for proper understanding of how the new system works, and cost of electro medical record (EMR) solutions [6].Besides another study made to assess EMR challenges in Indian showed that most users were reluctant to adopt the system and had little or no previous experience using computers [7].In addition, in South Africa the Health information technology lacks meeting the requirements to support the business processes of the health system. This is due to lack of technology regulations and policy frameworks within the health system [8]. Therefore, preparing a guiding framework to health information system is crucial.

In Ethiopia, a study conducted on electronic solution for Ethiopian health sector in 2011 showed smart care software system was successfully deployed. Building and maintaining electronic medical records (EMR) was found to improve both the quality of health information and patient care. However challenges indentified were closed application system and mixing of different version without proper adoption [9]. Besides, a study made to investigate practice and barriers on deployment of electro medical record (EMR) in Addis Ababa indentified challenges related to functionality of smart care software in the health system. These includes structured and organized civilization of smart care software practice, unable to generate monthly report, common securing mechanism, connection problem, follow up, support from concerned body, and lack of trainings [10]. More over study conducted at Saint Paul hospital millennium medical

college on revitalizing the smart care system of surgery inpatient department depicted that the system implemented in 2009 were abandoned for unknown reasons in 2010 [11].

This study is different from previous studies for it not only identifies determinants to EMR implementation but also taking determinants as an input to prepare a corrective guiding framework. The need to study success is to assess the benefits drawn from system implementation in early periods while the system was fully functioning in all departments at Adama Hospital. Furthermore this study aimed to identify parameters and related factors contributed for success and determinants responsible for the system failures. These in turn give clues to prepare a corrective and guiding framework. Therefore this study measures success in terms of the twelve nationally stated benefits provided that each parameter has equal chance from 100%.Overall, this research project is aimed to assess electro medical record (EMR) implementation via measuring success and failure of EMR implementation based on nationally stated benefits. This in turn helps to design a guiding framework. It is thought to guide the implementers in symbolic and description form, helps to take action based on stated phases and easily adoptable to the existing health system.

1.3 Objective of the project

1.3.1. General objective

- To investigate electro medical record (smart care software) implementation in a Health care facility and design a guiding framework for Adama Hospital medical college of Oromia regional state.

1.3.2. Specific objective

- Assess electro medical record usage (smart care software) in the hospital.
- Measure the success and/or failure of electro medical record (smart care software) based on nationally stated benefits.
- Design a guiding framework that can enable effective use of electro medical record (smart care software) in the hospital.
- Evaluating a guiding framework.

1.4.Significance of the project

This study might identify important parameters that could improve patient care and quality of health management information systems at Adama Hospital medical college. More over it would give a general picture for effective EMR usage as it could identify the possible sources of challenges as well. Since it focuses on grass root level from end users prospective, it would give solution for identified failures in implementation of EMR and hence help to design a guiding frame work for sustainable use of smart care software.

1.5.Scope and limitation of the project

The scope of this project is investigation of Electro medical record (smart care software) implementation and design a guiding framework model for Adama hospital Medical College. The data employed were based on nationally stated EMR improvement tools and benefits expected from smart care software implementation. The project limited with evaluating the proposed framework to give solution for identified significant factors for failure. This study considers from the time of smart care software installation at Adama hospital April 30, 2015.

1.6. Organization of the project

This research project consists five chapters. Chapter 1 introduces background, statement of the problem, objective, significance, scope, limitation of the study. Chapter 2 reviews the previous efforts and findings in related areas. Chapter 3 of this report describes the methodology. Chapter 4 presents discussion of the result that shows the finding input and proposed framework. Chapter 5 of this report is a conclusion and recommendation part the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Health information technology

Health care information technology and eHealth have become a key preoccupation of healthcare systems worldwide [11]. Electronic medical records have transition phase from automated medical record then computerized patient record to electronic medical records. Health information systems (HIS) implementation consider different factor among those information communication technology (ICT) infrastructure and eHealth strategy are the main [5].

Health information technology (HIT) is a key factor in improving quality and reducing cost in healthcare and yet the successful implementation of health information technology (HIT) varies greatly among healthcare systems. A review of the health information technology (HIT) literature reveals that barriers like lack of clear benefits, sufficient incentives and adequate support for clinicians as well as payer provider relationships, market place competition and privacy legislation. Critical success factors are innovative leadership, integrated management and collaboration with the doctors based on concrete needs like benefits, incentives and support [12].

Healthcare information technology is an increasingly integral part of how medicine is practiced, with 83% of physicians surveyed in USA already having made the investment in an electronic medical record (EMR) system. More than half of the physicians surveyed are optimistic about the positive impact of health information technology (HIT) on their practice and more than one-quarter already reaping the benefits. While more than half of those surveyed felt that electronic medical record (EMR) might increase the cost of care. The three quarters indicated that electronic medical record (EMR) would increase the quality of care. Just over 20% of physicians surveyed reported some frustration with their chosen technology system [13].

2.2 eHealth and its implementations

Electronic health in European Union countries is changing health care delivery today and the core of responsive health system. The daily business of health relies on information and communication

and, increasingly the technologies that enable it at every level in every country. This leads equally delivering care, deploying personnel, managing programmers and conducting research. Electronic health strategies deliver direct national benefits they can also improve regional cooperation. This is demonstrated by European Union countries which are experiencing a political momentum to advance eHealth for the benefit of their citizens and health system [14]. In South Africa only a third of all Hospitals have some form of functioning electronic medical record system. There are several systems in place and they are not necessarily lack interoperable. The National health has awarded a contract for the development of a National eHealth record which will include the requirement to provide interoperability with legacy systems [15].

Regulation of development and deployment of electronic medical record systems in Kenya is the mandate of the Kenya ministries of health through the division of health information systems. The HIS may appoint a disease program to regulate the implementation of electronic health record (EMR) systems. Those are specific to that disease condition electronic health record (EMR) developers and implementers as well as health facilities intending to implement electronic medical systems [16].

Ethiopia has had a national eGovernment policy since 2009. The Federal Ministry of Health has implemented health management information system. In 2011 the Ministry of health organized an eHealth workshop in order to begin developing appropriate health informatics standards and an architectural framework for interoperability and scalability of the various eHealth initiatives in the country [17].

2.3 Electro medical record usage

Hospitals in Japan utilize computerized practitioner order entry systems from the early 1980s and now computerized practitioner order entry is widely used in hospitals. The installation of EMR systems including medical imaging reference functions is increasing within hospitals and clinics but the data between hospitals is still not easily shared [18].

Israel has 27 different types of systems in use in different hospitals and generally more than one type is used in any given hospital. Physicians work with EMR systems in over 98% of the departments. Also the EMR systems are used for clinical admission and discharge in over 90% of the departments and for medical daily follow up in about 45% of them [18].

In Saudi Arabia integrated Electro medical record system was first developed in the 1980 that was capable of sharing health information across different organizations. Further roll out of EMR systems in Saudi MOH hospitals has been noted as progressing slowly. The MOH has identified the importance of adopting an information system within hospitals that will ultimately link all hospitals within in Saudi Arabia which are 244 in number. In addition there is a reasons leading to the poor uptake of EMRs implementations in Saudi Arabia, which have been considered as barriers to implementation in Saudi hospitals [19]. Pilot project in Zambia worked on the roll out of rapid syphilis testing optimization of data use through the Smart care a national EMR and comprehensive patient level tool for data collection and the development of model Smart Care sites. In this project things are well identified as success and challenge [20].

In Kenya monitoring & evaluation activities for EMR systems aim at generating lessons learned, standards are adhered and best practices that inform further EMR roll out efforts. Monitoring measure continuous process of collecting data at multiple points during the implementation process to ascertain whether set milestones are met or not. Evaluation measures how well the EMR implementation objectives have been met. Evaluation aims at determining how well the main goals of an EMR system have been met by answering the following questions: Does the EMR improve patient care, record keeping and reporting [16].

The aim of many healthcare facilities is for the development of an automated patient information service. That will enable the efficient retrieval of information for patient care, statistics, research and teaching. However, the development and implementation of such a system requires detailed planning and cooperation between the computer medical records clerk staffs and the health care facility administration [5].

Smart care software gained recognition as the electronic medical system application in Ethiopia followed by a presentation and live demo of the customized Smart Care EMR. The presentation was to the FMOH officials including Ministers, Department or agency heads, Regional Health Bureau Heads and other relevant stake holders. To improve the performance of the HMIS Ethiopia contracted with the consulting firm JSI in 2007 to perform an evaluation and redesign of the HMIS. As the HMIS is predominantly paper based this project was to culminate in the design and deployment of an electronic HIS following reform and revision of the existing paper based system [9].

2.4 Related Work on EMR

According to David Blumenthal National coordinator for health information technology at the U.S. Department of Health and Human Services only about 17 % of doctors and around 8-10 % of U.S.A hospitals utilize electro medical record (EMR) at even the most basic level. The claim that the United States is trailing other countries in HIT use often refers to EMRs. But no country really has them in the comprehensive form envisioned by futurists [21].

Assessment conducted in U.S.A within nine hospitals a comprehensive implemented EHR system finds that clinical and administrative leaders built EHR adoption into their strategic plans to integrate inpatient and outpatient care and provide a continuum of coordinated services. The electro medical record (EMR) systems facilitate patient safety and quality improvement through use of checklists, predictive tools, embedded clinical guidelines that promote standardized, evidence based practices, electronic prescribing, test ordering that reduce errors and redundancy and compliance reports. In addition successful implementation depended on: strong leadership, full involvement of clinical staff in design and implementation, staff training, strict adherence to timeline and budget [22].

Study conducted on level of electro medical record (EMR) system implementation in 19 hospitals of Eastern province of Saudi Arabia by the year 2011 explored that only 3 (15.8%) out of the 19 hospitals had an electro medical record (EMR) system. The study noted the low percentage 15.8% and the three hospitals that had implemented electro medical record (EMR) were using the same

electro medical record (EMR) software and had the same functionalities. The study suggested that the low uptake of electro medical record (EMR) might be associated with a lack of inter hospital coordination, collaboration, planning and workload of physician's leads to insufficient time to use the system [23].

Nine years reviews Evaluation conducted on the impact of electro medical record (EMR) on physician practice in office settings examined six areas. The areas were prescribing support, disease management, clinical documentation, work practice, preventive care and patient physician interaction. Overall 51.2% studies and 45.9% individual measures showed positive impacts, 18.6% studies and 18.3% measures had negative impacts, while the remaining had no effect. Several lessons learned were repeated across studies having robust EMR features that support clinical use, redesigning EMR supported work practices for optimal fit, demonstrating value for money, having realistic expectations on implementation and engaging patients in the process [24].

Electro health record (EHR) systems are complex applications their complexity makes it imperative to have good application design, training and implementation. Studies on Electro health record (EHR) evaluation identified various benefits like improved data collection, increased staff productivity, increased visitor satisfaction, improved communication, quality of care, access to data, reduced medical errors and more efficient use of staff time. Some of the limitations noted were time consuming during data entry, slow access of data and decreased quality of patient doctor interaction [25].

In Malawi System designed and built an innovative hardware and software using touch screen. Individual patient information in clinical workstations were collected, analyzed and presented information on national protocols. They demonstrated that the system could efficiently and accurately guide low skilled health care workers through the diagnosis and treatment of patients following national protocols. The system captured and presented clinical data that supplemented clinical decision and policy making [25].

Electro medical record (EMR) systems are available from both closed proprietary systems and free open source software systems. Open source systems have advantages of local sustainable community development and support and lower cost by building on a proven software foundation. Improvements in quality have been demonstrated by increased adherence to guideline based care, enhanced surveillance ,monitoring and decline of medication related errors such as incorrect prescriptions involving the wrong drug, wrong dose or incorrect route of administration [25].

A cross sectional study conducted Addis Ababa five hospitals on practice and barriers on deployment of EMR using self administered questionnaires and interviews were addressed 422 study subjects. Findings show that users had good perception to use but the overall utilization of smart care was not good because of the practice was not similar in all hospitals. Among the participant of the study 68.5% were trained on smart care but from those 34.3% are not comfortable about the system usage because of system difficulty. The qualitative findings indicate that work flow interference, simplicity, training and quality of work were in good position on user perspective [10].

The barriers that hinder the implementation process are connection problems, lack of single responsible body, technical and financial support problem, follow up from health bureau and venders were the major ones. He conclude that perception is not a big problem in user's side but the major problem were functionality of system, unable to generate monthly report, common securing mechanism, connection and follow up and support from concerned body. Researchers recommend that continues and planned training, structured and organized culture of practice and essential to improve handling and strength to make practice sustainable through users [10].

2.4.1 Summary of related work on EMR

Authors	Objective	Key finding
Rachelle K, Ehud K, …	Analysis of the experience of successful IT implementation	Common barriers of HIT implementation are lack of clear benefits, sufficient incentives and adequate support for clinicians. Common critical success factor are Leadership and good management.
Steve A, and Joseph W.	Investigated a battery of EHR components	91.3% departments in the hospitals use EMR systems.
Rihab H., Kirsten V.,and Michele Clark.	Examine the current status and availability of EMRs in Saudi Arabia.	Interconnection between the hospital is important for exchange of patient data and get update result. Major barriers social, technical and resources.
Dr Rosemary Foster	Assessment on eHealth and HIS in Africa to identify architecture assets.	Identification of ehealth status and Health information system of ten African country.
Bill and Melinda Gates Foundation	Create a comprehensive overview of the HIS landscape	Data lost its quality due to factors like inadequate skills for gathering and analyzing data among health care staffs, Unsatisfactory quality of data in the reports and Fragmented information.
Kamil shamil	To explore the practices and barriers on deployment of EMR	68.5% of participants were trained about smart care, 51.8% of participants agree that duration of training were not enough.34.3% participants believed that using smart care difficult.
By open minds and core solutions, Inc.	To measure organization implemented a complete and effective EMR	Sustainability of the EMR benefits depends on good management, capacity building, providing extensive technical support, feedback and monitoring
Nurul and Nor Hazana	Assess issues that arise in adopting the EMR among and proposes a framework of EMR adoption for Malaysia's public hospitals	Low adoption of the system related with attitude problems, lack of computer skills, and human factors.

2.5 Success of EMR implementation

EMR system functionality and usage is critical to improving the effectiveness and efficiency of health care provider organizations. ARRA of 2009 which included financial incentives for medical care providers to meet specific health information technology (HIT) performance benchmarks related to the meaningful use of an electronic medical record [26].

In USA there are different awards for successful implementation electro medical record (EMR) from those the Davies awards of excellence is the one. The program is managed with the health care information and management systems society. The award has annually highlighted healthcare providers who successfully led efforts to transform their organizations through technology. The award largely focusing on the implementation of healthcare information technology based practice physician committed to the ideal of improving patient care through better health information management in larger institutions ranging from rural health systems to big city hospitals. As a member of the institute of medicine's patient record study committee Dr. Davies helped coin the term computer based patient record [1].

The NHGA has four hospitals and 60 primary and secondary healthcare centers in different regions of Saudi Arabia. Those facilities has 2000 in patient's beds and serve 2.5 million out patients and 60,000 in patients annually. All hospitals have electro medical record (EMR) systems that are integrated with each other and share electro medical record (EMR) with quality of data exchange [23].

From a health system perspective benefits gained thought use of technological platform are a comprehensive dataset for public health research, richer community health demographic information and ability to better treat highly mobile patients and populations. Electronic health record (EHR) systems have a potential to improve the performance of individual provider organizations. A high functioning electronic health record (EHR) system improves information sharing and communication between health care providers allowing access to comprehensive, legible, and remote health care records. Well designed and executed electronic health record (EHRR) system will increase both provider and patient satisfaction by better aligning workflow and job functions with patient care [26].

Study in Zambia tells that there are different factors leads to success like training of Health workers in Smart Care, provided extensive technical support; feedback and monitoring on Smart Care use in collaboration with MOH are basic [20].

Study on electro medical record solution in Ethiopia by the year 2011 until Dire Dawa region pilot project revealed that successfully deployed electronic medical records system, which improves both the quality of health information as well as patient care. This also identify different problems like system has insufficient documentation, closed application of system, overcoming of different version and system's analysis is not matured enough to suggest solution. The researchers were concluding his assessment with the following recommendations on system administration. Even if upcoming versions of the system is good the user must understand the previous one, Based on the country current infrastructure and existing problem the system will be well defined and analysis before implementation and local man power mandatory to gain capacity building about the system [9].

2.6 Challenges of EMR implementation

Study on health information System in Malaysia hospitals shows adopting of HIS is important to provide more accurate and timely information related to patient care. The level of adoption of information technology in Malaysia's public hospitals is still only16 were using the system out of 135 public hospitals. The challenge behind this are cost, technology, human factor, attitudes and legal are cause of the low adoption of the system. Additional factor cause of low adoption of system is gender and age. Male and younger physicians with experience in computer skills are more interested and comfortable in using the EMR system than physicians who are female, older, and having lack of computer skills [27]

The 2013 annual report in Zambia reported different challenges on Smart Care deployment like ongoing maintenance; technical support, poor network coverage, and lack of transportation to health facilities, lack of understand the value of electronic health records and data use, health facility staff regards data entry as an additional task, lack of equipment maintenance strategy including a strategy to provide continuous antivirus updates, resulting in inconsistent data entry

being done by the end of the day due to the perception that patients have to be seen first before data entry, Several staff people have remarked that entering data into Smart Care should be a task that comes with added incentives, Some Health worker feel that Smart Care is a parallel system to HMIS that only brings additional work for them, without additional benefits and Computer literacy continues to be a challenge for most Health workers [20].

Study conducted in America EMR implemented hospitals identified five major challenges. First hospitals faced tremendous logistical challenges in training virtually all hospital staff and many community clinicians in how to use the EHRs. Second in the early stages, the challenges were to streamline processes while maintaining quality, to design and tailor the EHR to promote standardization while not alienating physicians and to maximize performance improvement capabilities. Third facilitate reporting, particularly inability to generate reports. Difficulties include having too many free text fields or a mismatch between the reporting requirements and data storage formats, necessitating data abstraction and manual translation. Fourth cost and timing issues adopting a comprehensive EHR is an expensive and long process. Fifth lack encouraging appropriate user of EHR systems [22].

Literatures revealed that major HMIS challenges and weaknesses were; Absence of an implementation strategy and guidelines, Shortage of human resources and high staff turnover, Inadequate skills for gathering and analyzing data among health care staff at lower levels, Unsatisfactory quality of data in the reports and resulting in a compromised ability to make informed decisions and fragmented information flow including parallel reporting system channels resulting increased workload [28].

Most significant barriers to the adoption of Electro medical record is the lack of appropriate incentives [21] Prognosis Health information summary report revealed major barriers related with EMR implementation. A major challenge were starting the EHR search process, staffs does not want to do, lack of enough training for the implementation process of EMR, difficulty of physicians and early gain of horror history about the technology [29].

2.7 Framework model

The health metrics network review of Mexico health information systems all public and private institutions and providers feed data on health provision, resources and results to the national health information system which is overseen by the Ministry of Health. In addition National Health Information System also collects information from survey, statistical agencies, geography and informatics. This shows the layout of health metrics network at the local level. The subsystems for services provided and health needs are used to provide information about supply and demand for health services and about disease prevalence though the system for Epidemiological Surveillance [28].

Technical committee on health statistics is headed by the Minister of Health and comprised of the heads of the various agencies and institutions that contribute data to the NHIS. The Ministry of health acts as the guardian and disseminator of health data back to these sectors and to the population at large. Because of health provision is largely done by the states the NHIS is effectively the sum of the state health ministries and systems and the quality of NHIS data are therefore dependent on the quality of regional data. The federal government enforces compliance with data forms and standards through visits to state facilities. The federal MOH aggregates data and publishes reports used to evaluate the success of individual health programs and to gain a clearer picture of the nation's health status and challenges [28].

Health information systems created directly by the MOH in Mozambique. There are a variety of third parties implementing HIT but no coordination between the MOH and the national ICT council. In addition the quality of these systems was highly variable. The assessments revealed a large number of different systems in use at the larger hospitals and some of the district level health offices [28].

In Ethiopia the health matrices network framework division of the six components and standards of health information system (HIS) made by World Health Organization in 2008 validated in 2011 as a step towards developing a national health information system strategic plan. Data management on health management information system was established to support informed strategic decision

making by providing quality data that help managers and health workers plan and manage the health service system. Health information system (HIS) resource; computers, Networks (WAN and LAN), internet access, databases and transport facilities are required to ensure data quality, to enhance feedback, information use and greatly facilitate the ability of health information systems to produce timely, relevant and high quality information [30].

Timely disseminated and used for strategic decision making at all levels of the health system [30]. Concerning data source the FMOH has implemented the Ethiopian HMIS. While the CSA a division of the Ethiopian government, manages population based health information sources i.e. censuses, surveys and registering vital events. Indicators are a set of measures that show changes in the country's health profile. Indicators measure determinants of health, health system and health status. In information products lack of timeliness and completeness of health information system (HIS) reporting remains a weakness. Such delays contribute to the failure to use data as the basis for informed decision making in health care planning and management [30].

2.8 Information system success model

De Lone and McLean introduced a comprehensive and multidimensional model of IS success a framework for measuring different dependent variables in IS research. The communications research of Shannon and Weaver categorized IS success into six major dimensions. From those parameters system quality measures the information processing system. Information quality measures information system output [31]. Information use measures the recipient consumption in the output of an information system. User satisfaction tells the recipient response to the use of the output of an information system. Individual impact measure of the effect of information on the behavior of the recipient and Organizational impact measure the effect of information on organizational performance [31].

Technology acceptance model (TAM) was introduced by Davis in 1986 by adapting the theory of reasoned action specifically modified for modeling user acceptance of information systems. The goal of technology acceptance model (TAM) is to explain the determinants of computer acceptance related to user behavior across a broad range of end user computing technologies and

user populations. In addition it provides a basis for tracing the impact of external variables on internal beliefs, attitudes, and intentions [32].

Integrated success model (ISM) is a model that incorporated technology acceptance model (TAM) and De Lone and McLean updated model that evaluating information system success. In view of this model there are ten dimensions for measuring information system success. The dimensions are Behavior intention, Information quality, and Management support, Perceived ease of use, Perceived usefulness, Service quality, System quality, Training, User satisfaction and User involvement [33]. The model assumes that information quality, system quality and service quality are linked to management support, training and user involvement. Other dimensions Influence perceived usefulness and perceived ease of use which affect on behavior intention and user satisfaction [33].

2.9 Framework model evaluation

The empirical study conducted to developing an architecture model for enterprise knowledge based on the Zachman framework in Iran. John Zachman is one of the pioneers of information systems architecture, believes in the analysis of the organization based on an architectural framework. Zachman framework presents a two dimensional matrix. The first dimension embodies the viewpoint of the people who are involved in the development of information systems. The second one defines the several system operations to categorize the related traits. Data compilation implements are scientific documents, articles and books by which the scientific framework and the model are adjusted [34].

The validity of the model is completed by known knowledge architecture experts. After collect the data using questionnaire and the data were analyzed standard deviation and mean. The standard deviation was calculated for each question and the standard of acceptability level of calculated standard division is less than one. To expresses the model in the opinion of KMA specialists is desirable it fit the criteria that; the mean score of completed questionnaires was more than the questionnaire's average score [34].

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study area and period

Adama is found in Oromia regional state which is 99 km away from Addis Ababa city in eastern direction. Adama hospital was established in 1942. Following the reform since from 2005 e.c the institution is known by name Adama hospital medical college. Currently the hospital has catchment population of about five million and serving as referral center for all nearby hospitals and adjacent regions [35].

Since 2010/2011 it was the known hospital to implement different health reforms including business reprocess re-engineering, health care finance and electronic medical recording. Those implementations in the hospital have under gone momentous changes in provision of services. The hospital has capacity serve 200 patient in inpatient and about 850 patients per day in outpatient department. This service was given by 210 technical (Pharmacy 20, midwifery 20,Anestesia 11, laboratory 36, nurse 98, physician 19 and specialist 6) and 164 supportive staffs [35] .This study was conducted from January 01, 2015- June 30, 2015 in Adama Hospital medical college.

3.2 Study design

Cross sectional study design was used to investigate electro medical record (smart care software) implementation from early time of system installation until current electro medical record (EMR) usage at Adama hospital medical college. Guiding framework was designed based on the study findings. P-value is set at 0.05. The model was developed taking in to account principles of integrated success model and the boundary of the frame work was based on Health Matrix Network of Ethiopia. The guiding framework was evaluated by polling the opinion of electro medical record (EMR) experts from government institutions.

3.3 Source population

The Source populations of this research project were all health professionals and administrative staff of Adama hospital that have a common future in electro medical record usage and wish to draw conclusion.

3.4 Study population

Participants of the study were health professionals, health management information system officers, registration workers and finance officers that work on inpatient and outpatient electro medical record (EMR) users' at Adama hospital. Determination of study participant is based on a general rule [36] in quantitative research. That is the larger the sample the more accurate the results and the need to choose a higher proportion of research population. And by taking factors like time, money and manageable study unit [37]. Based on the above general rule, all smart care software users who are 177 in number were included in the study. For interview part, six experienced smart care software users were interviewed. Quantitative study participant were addressed based on the staff attendance sheet in each department. Besides that, qualitative study unit were selected using non probability purposive sampling method.

Including criteria: Who were used EMR (smart care software) for patient care and quality of health management health information system those are physically present in the study area during the study period.

Excluding criteria: Who were used EMR (smart care software) for patient care and quality of health management health information system those has absent in the study area during the study period due to different personal or governmental reason.

3.5 Data collection procedure and instruments

Primary data were collected using questionnaire and semi structured interview. Using more data collection instruments in this study creates an opportunity for triangulation of data [36].

3.5.1 Quantitative

In this study quantitative method was used to measure the success and failure of EMR implementation at Adama Hospital. Questionnaire is very important data gathering tool to manage large sample and to employ descriptive analysis as a research approach. The questionnaire was adopted based on similar studies made on smart care software in Addis Ababa and different regional hospitals [[10], [39], [38]] Finally it was modified and validated according to the situations at Adama Hospital. The questionnaire was both open and close ended. Open ended is

thought to allow respondents to freely offer any additional answers where as in closed ended the respondents must choose from a fixed set of answers as per the objective of the study.

Before the actual study, a pretest was conducted in Bishoftu hospital to measure study instrument. Seventeen smart care software users' were used in the pilot study. Using SPSS chronbach's alpha reliability coefficients was computed to determine internal consistency of study constructs and measure with the standard reliability above 0.70 [39, (62)].The pretest analysis result chronbach's alpha reliability 0.84 was obtained.

3.5.2 Qualitative

In this study, qualitative method was used to support and strengthen the quantitative study made on EMR implementation at Adama Hospital. Here, Semi structured interview questions were used. This qualitative study was thought to gain the prosperity of people's experience in people's own terms. The responses of the respondents were captured in audio and written form. This helped to understand how and why specific success and failure occurred in next of kin to smart care software.

3.6 Variables

The variables in this study were majorly categorized as dependent and independent for electro medical record (smart care software) implementation success.

3.6.1. Independent variables

The independent variables were computer usage experience, training on EMR, number of training, form of training, full training material, training adequacy, experience on smart care software usage, networking between the department, and availability of system element, attitude, expectancy of users, profession, department and educational status of the respondent.

3.6.2. Dependent variable

Smart care software implementation success.

3.7. Data quality management

For easily understanding, the questionnaires were modified in a simple understandable English language and study subjects were informed about the aim of the study. The questionnaire format was revised before the main study for its reliability and validity finally the data was checked for its completeness before analysis.

3.8. Data processing and analysis

3.8.1 Quantitative

Quantitative data were collected manually, coded and analyzed using statistical package software SPSS version 16. Multiple regressions were used to identify and measure the effect p-value contributing factors to electro medical record implementation success or failure. Descriptive summarizations were made using cross tabulation, graphs and charts.

3.8.2 Qualitative

The interviews were conducted based on semi structured questioner to find out what happed and happen in relation to smart care software implementation. The opinion of respondent were collected, summarized, analyzed and presented in a readable product in comparison form related study conducted in different area.

3.9 Ethical Considerations

Ethical clearance thought to be obtained from ethical clearance committee of Addis Ababa University School of public health and School of information science. For the respondent verbal consent was obtained from each respondent and purpose of the project were informed to each participant. Any study participant has a full right to refuse to reply and discontinue the interview if any inconvenience they fill.

3.10 Plan Utilization of the Project

The final project report was presented to the representative of Addis Ababa University School of public health and school of information science based on defense schedule of Health informatics department. After the defense a report was submitted to Addiss Ababa University and a copy of final report send to Adama hospital medical college.

3.11 Operational definition

Assisted search: In a small fraction of the time required using a manual system, computers can Search free text as well as structured data to find a specific data value or to determine whether a particular item has ever been recorded [9]

Always up to date: Electronic record is integrated then all data is immediately available to all practitioners [9]

Basic computer Skill: The skill of users' how to use the mouse , keyboard, open a program, turn the computer on and off, how to start office , how to click a menu item and choose an item on the menu and basics about how files are stored in folders.

Continuous data processing: Provided that data are structured and coded in an unambiguous fashion, programs can continuously check and filter the data for errors, summarize and interpret data and issue alerts and reminders to clinicians following the detection of potentially life threatening events[9]

Electro medical record: Electronic record of health related information on an individual that can be created, gathered, managed and consulted by authorized clinicians and staff within one health care institution [9]

EMR implementation success: Nationally stated benefits were taken as parameters to measure EMR implementation success.

EMR implementation success score: The score was calculated out of 100% by giving equal chance for each parameter (nationally stated benefits).

Evaluating framework: Evaluated and validated proposed framework model by EMR experts before the actual implementation.

Experienced Smart care software user: Users' which were used smart care software more than six month for electro medical record purpose.

Flexible data layout: Users can have a separate data display and data entry screen recall data in any order chronologically or in reverse chronological order and create disease or condition specific data review formats [9]

Framework: A solution framework that are developed based on findings that integrate all hospital EMR smart care unit for effective transfer of patient data.

Greater range of data output modalities: Data can be presented to users via computer generated voice, two way pagers, or email [9]

Incorporation of electronic data: Physiologic data can be captured automatically from bedside monitors, laboratory analyzers, and imaging devices located throughout the healthcare enterprise. Such data capture is free from the uncertainties and unreliability of human data entry efforts [9]

Integration with other information resources: Once in electronic form a patient's data can be linked to reference information Stored and maintained via the internet, on a computer half way around the world [9]

Legibility record: Handwritten charts are notoriously difficult to read. On screen or printed text is often far more legible than hand writing [9]

Nationally stated benefits: Are simultaneously remote access to patient data, Legibility record, Safer data, Patient data confidentiality, Flexible data layout, Integration with other Information Resources, Incorporation of Electronic data, Continuous data processing, Assisted search, Greater range of data output modalities, Tailored paper output and Always up to date [9]

Patient data confidentiality: Record access can be restricted and monitored automatically each user can have specific levels of access to various data types. Audit logs can be screened electronically to look for statistical abnormalities which may signal unauthorized record accesses [9]

Simultaneously remote access to patient data: Multiple clinicians can access a patient's record simultaneously from many locations. With the recent advent of secure data transmission over the web, clinicians can now review and edit patient records from anywhere in the world [9]

Safer data: New users often fret over the potential for lost data due to system malfunctions. With a well designed and tested backup scheme and disaster recovery system a computer based record is much more reliable and less prone to data loss than Conventional paper based records [9]

Tailored paper output: Data can be printed using a variety of fonts, colors, and sizes to help focus the Clinician's attention on the most important data [9]

CHAPTER FOUR

RESULT AND DISCUSSION

4.1. RESULT

4.1.1 Overview

This study was designed to assess EMR implementation success using cross sectional study design on 177 EMR users at Adama hospital from January 01, 2015- April 30, 2015. Using observation checklist 29 service areas were identified and expected to use EMR. However 27 of the departments were found implementing EMR on average for two years and seven months. Two departments x-ray and radiology were not addressed by smart care software version one. The details of the finding are presented below.

4.1.2. Socio demographic characteristic of respondents

Among 177 EMR users, 102 (57.6%) were found between 25-34 age group. Female accounts 107 (60.5%) and the remaining 70 (39.5%) were males. Majority of the respondents was married (75.7 %, 134 in count) and orthodox (45.8 %, 81 in count) in religion. More than half of the (58.8%, 104 in count) of participants were found first degree holders and around 3/4th (122 in count) of the participants were from inpatient and outpatient departments. (Table 1, Figure 1 and 2).

Table 1: Socio demographic characteristic of the respondents at Adama Hospital, Adama, Ethiopia, April 2015

Variables	Category	Frequency	Percent	Valid Percent	Cumulative Percent
Age	20-24	15	8.5	8.5	8.5
	25-34	102	57.6	57.6	66.1
	35-44	40	22.6	22.6	88.7
	45-54	20	11.3	11.3	100.0
Gender	Male	70	39.5	39.5	39.5
	Female	107	60.5	60.5	100.0
Religion	Orthodox	81	45.8	45.8	45.8
	Muslim	30	16.9	16.9	62.7
	Catholic	20	11.3	11.3	74.0
	Protestant	44	24.9	24.9	98.9
	Other	2	1.1	1.1	100.0
	Total	177	100.0	100.0	

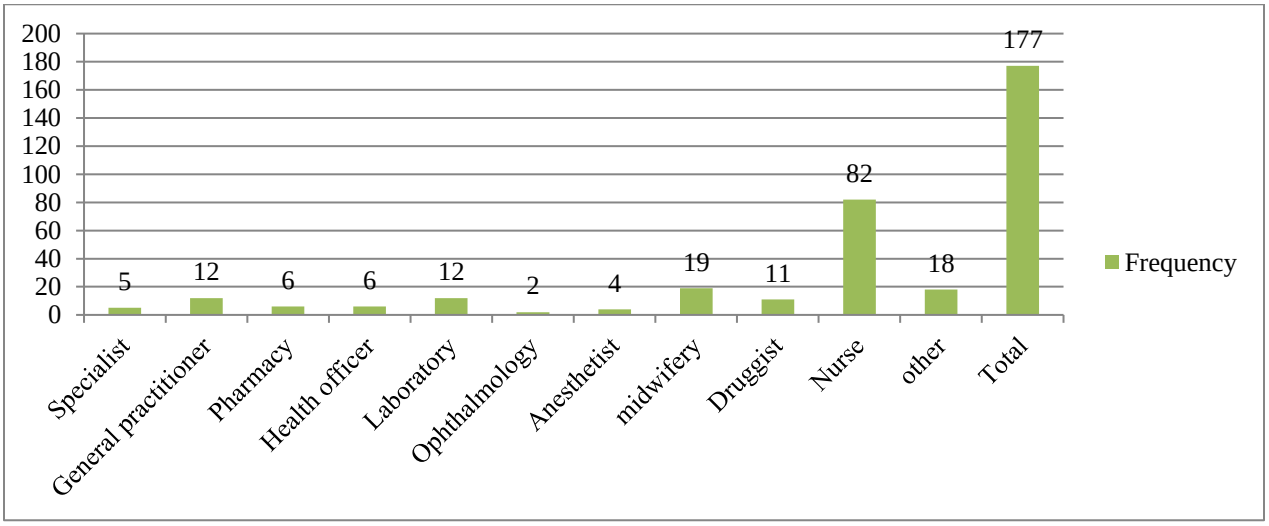

Figure 1: Profession of respondents at Adama Hospital, Adama, Ethiopia, April 2015

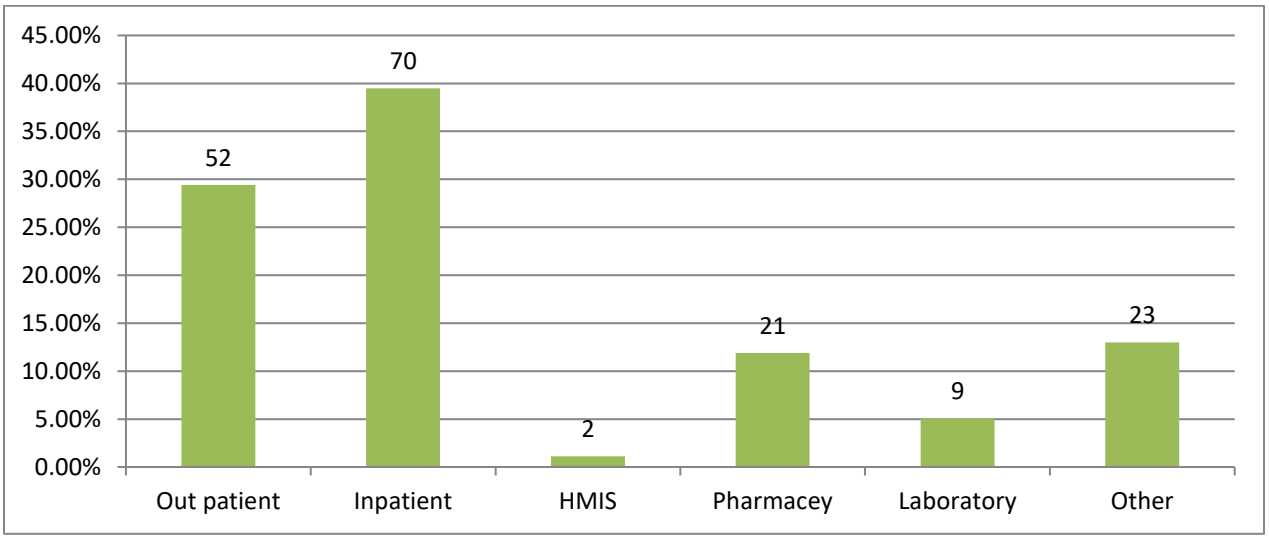

Figure 2: Respondents by departments at Adama Hospital, Adama, Ethiopia, April 2015

4.1.3 Assessment of basic computer skills

Prior to smart care software training only 63.2% of respondents had experience of basic computer usage. The computer illiteracy was indicated as 80 % for less educated respondents and 50.8% for diploma holders. The illiteracy was found 28.8% among degree holders.

Table 2: Cross tabulation on computer skills by educational status of respondent at Adama Hospital, Adama, Ethiopia, April 2015

Educational status	Computer skill				Total Count
	Yes		No		
	Frequency	%	Frequency	%	
Specialist	7	100	0	**0**	7
First degree	74	71.2	30	**28.8**	104
Diploma	30	49.2	31	**50.8**	61
Other	1	20	4	**80**	5
Total	110	62.2	67	37.8	177

4.1.4. Assessment on training and usage of smart care software by the respondents

4.1.4.1. Training on smart care software

The number of training days taken by study participants was slightly varied from a minimum of three days to the maximum of 14 days. However 91.5% of the training days fall between 3 to5 days. More than 50 % of the study participants were disagreed while questioned whether the training was supported by full training material. Actually the training was provided by Ministry of health in collaboration with TUTAPE.

Table 3: Training on electro medical record (smart care software) at Adama Hospital, Adama, Ethiopia, April 2015

Variables	Category	Frequency	Percent	Valid Percent	C.Percent
Training on SC	Agree	177	100.0	100.0	100.0
Training type	Only theoretical	16	9.0	9.0	9.0
	Both theoretical and practical	161	91.0	91.0	100.0
	Total	177	100.0	100.0	
Number of training days	3-5 days	162	**91.5**	91.5	91.5
	6-7days	8	4.5	4.5	96.0
	8-10days	5	2.8	2.8	98.9
	>10days	2	1.1	1.1	100.0
	Total	177	100.0	100.0	
Supported by Full training material	Strongly agree	36	20.3	20.3	20.3
	Agree	41	23.2	23.2	43.5
	Neutral	9	5.1	5.1	48.6
	Disagree	84	**47.5**	47.5	96.0
	Strongly disagree	7	**4.0**	4.0	100.0
	Total	177	100.0	100.0	

4.1.4.2. Smart care Software usage

In this study more than 50% disparity was found between user's expectations for EMR usage and the actual work environment. Around 43 % of the respondents disagreed for adequacy of system elements. Reasons for the inadequacy were lack of nursing standards (39.9%), some diagnosis list (57.9%) and systematic sort out (2.15%).

Table 4: Users expectations and adequacy of system elements for smart care software usage at Adama Hospital, Adama, Ethiopia, April 2015

Variables	Category	Level of experience using Smart care software				
		Less than six month	7 month to 1 year	More than one year	Total	
		Frequency	Frequency	Frequency	Freq	%
Expectations disparity about implementation	Expected	18	22	48	88	49.7
	Not as expected	22	17	50	89	**50.3**
Total		40	39	98	177	100
Adequacy of system elements	Yes	22	22	57	101	57.6
	No	18	17	41	76	42.9
Total		40	39	98	177	100
If No, What lacking in smart care software	Nursing Standards	6	8	16	30	39.9
	Some diagnosis list	10	9	25	44	57.9
	Systematic sort out	2	0	0	2	2.15
Total		18	17	41	76	100

In addition around 108 (61%) of the respondents had difficulties when using the smart care software. In this study, difficult for use (54.6%) was indicated as a major challenge for EMR usage followed by need for in depth knowledge (35.2%) and time consuming (10.2%).

Table 5: Users' difficulties when used smart care software at Adama Hospital, Adama, Ethiopia, April 2015

Variables	Category	Level of experience using Smart care software				
		Less than six month	7 month to 1 year	More than one year	Total	
		Freq.	Freq.	Freq.	Freq	%
Is there difficulty when Used smart care software?	Yes	29	30	49	108	61
	No	11	9	49	69	38.9
Total		40	39	98	177	100
If yes, what Difficulties?	Difficult for use	21	10	28	59	54.6
	More time consume	2	4	5	11	10.2
	Need in depth knowledge	6	16	16	38	35.2
Total		29	30	49	108	100

Around 50% of the study participants recommended the need for intensive training and technical support for proper usage of the smart care software. While the remaining others recommended the need for integrated management (16.9%), incentives (19.8%), and others (12.4%).

Table 6: Users' recommendations for proper EMR usage at Adama Hospital, Adama, Ethiopia, April 2015

Variables	Frequency	**%**
Technical Supportive	39	**21.9**
Training	51	**28.8**
Incentive	35	19.8
Integrated management	30	16.9
Other	22	12.4
Total	177	100

4.1.5 Overall EMR Implementation verses the twelve nationally stated benefits

The overall EMR implementation addresses the system implementation status in relation to the national stated benefits particularly at Adama hospital medical college. According to the investigation made on EMR implementation success or failure based on the twelve nationally stated benefits, Parameters found as success were legibility of record (91.5%), safer data

(77.4%), patient data confidentiality (78.5%), and continuous data processing (57.6%) and always up to date (53.1%).

However the following seven parameters that should have been expected as enefits were found as failures. These include simultaneous remote access to patient data (100%), integration with other information resources (100%), incorporation of electronic data (100%), greater range of data output modalities (100%), flexible data layout (41.8%), assisted search (24.9%) and tailored paper output (24.3%).

Table 7: Smart care software usage nationally stated benefits investigation at Adama Hospital,Adama, Ethiopia, April 2015

Variables	Frequency(n=177)				Success and Failure score status				
	Agree	%	Disagree	%	Failure	Success			
					Fail	Satisfactory	Good	Very good	Excellent
					<50%]	50.1-64.9%	65-74.9%	75-84.9%	[>85%
Simultaneous, remote Access to patient data	0	0	177	100	√				
Legibility of record	162	91.5	15	8.5					√
Safer data	137	77.4	40	22.6				√	
Patient data confidentiality	139	78.5	38	21.5				√	
Flexible data layout	74	41.8	103	58.2	√				
Integration with other information resources	0	0	177	100	√				
Incorporation of electronic data	0	0	177	100	√				
Continuous data processing	102	57.6	75	42.4		√			
Assisted search	44	24.9	133	75.1	√				
Greater range of data output modalities	0	0	177	100	√				
Tailored paper output	43	24.3	134	75.7	√				
Always up to date	94	53.1	83	46.9		√			
All over score					58.3	41.7			

4.1.5.1. Results from multiple regression analysis

Following multiple regression analysis, listed below are important factors found as statistically significant causes for failures of smart care software usage at Adama Hospital. Attitudes of users towards EMR usage (α= .001), variation in number of training days among users (α = .001), exchange of electronic information via networking between departments (α =.010), experience variation on using the smart care software among users (α = .001), disparity of the expectation drown by users during the training period and its contradiction on actual working environment (α = .005).

Table 8: Multiple regression analysis at Adama Hospital,Adama, Ethiopia, April 2015

S.no	Dependent variables	Independent variables	P- value
1	Flexible data layout	Attitude of users	.001
2	Assisted search	Exchange of electronic information via networking between the department	.010
		Variations of training day	.001
3	Tailored paper output	Expectation variation	.005
		Experience variation	.001
4	Safer data	lack of system element	.002
		Variations of training day	.01
		The way of training conducted	.02
5	Patient data confidentiality	Experience variation	.02
6	Continuous data processing	Exchange of electronic information via networking between the department	.009
		Experience variation	.003
		Lack sufficient training for proper use of software	.01
		Expectation variation	.03

4.1.6 Assessment of electro medical record implementation from interview results

Six more experienced smart care software users were interviewed from different discipline. According to the interviewee all departments were interconnected through access point Wi-Fi to the central sever. Managing problems associated with the system was not handled institutionally by ICT and HMIS teams at Adama Hospital rather this mandate was to Tulane university technical team. Lack of full mandate over the smart care software was the major problem the interviewee mentioned.

Interviewee explained the following importance's for data management. It helps to know number of patients who got the service, to get variety form of data with short period of time, to monitor and evaluate what was done in service areas, reduce redundancy of MRN, good input to generate quality report, to manage report timely without any burden, easily to access patent history and data using his MRN, save resource and to order different prescription. Even if end users did not have the mandate to extract report from the system instead they used registration book as source document. Only HMIS officers had the mandate to access the report module from the system. This is another challenge stated by the interviewee. Furthermore fluctuation in practicing smart care software was another constraint agreed by the interviewee.

In addition, the following challenges were also indicated as importance problems for proper EMR usage. Inadequate skill about IT among users, low speed of users during data encoding, low system acceptability among users, users' resistance to EMR usage and assume as double recording, low management attention, lack of monitoring and evaluation, lack of technical support, insufficient man power, lack of system related resources (printer, audio visual aid) lack of information releasing channel (meeting session, website) and lack of infrastructures (electric, network).

Meanwhile the interviewee recommended means to solve these challenges. Forwarded solutions were capacity building, soft ware upgrading to include X-ray and Radiology departments, solving infrastructure related problems , proper system management, positive attitude toward EMR usage, incentive to encourage EMR users, performance evaluation, sustainable follow up & technical support . The aforementioned critical areas were to the fore to tackle the obstacles.

4.2 DISCUSSION

4.2.1. Smart care software usage

This study aimed to assess electro medical record (EMR) implementation success at Adama hospital since the institution transited from paper based to electronic form. Understanding system functionality in respect of health information technology actually leads to users' readiness to practice and manage a new operating system and preparing staff to major changes.

Literatures revealed that health information technology (HIT) is a key factor in improving health care quality but successful implementation greatly varies among health care systems [12]. According to this study system implementation coverage at Adama Hospital was 97.2% comprising 27 departments networked though local area network access point Wi-Fi to deliver quality services and proper information in the hospital. Similar finding was registered in study conducted in Israel were system coverage was 98 % [18].

This study has shown that x-ray and radiology departments lacked smart care software usage and managed only by paper form. This has its own negative impact on client record sharing vie electronic form and leads to incompleteness of patient information. Study conducted in Saudi Arabia revealed that ministries of health have identified the importance of adopting an information system within hospital and ultimately link all 244 hospitals within in country [19] however in our case EMR usage was not as such understandable and got good attention.

Basic computer skilled peoples easily understand about computer usage than computer illiterate people [17]. Prior to smart care software training only 63.2% of respondents had experience of basic computer usage. In relation with educational status, basic computer skill experience was found increasing as educational level increases. The computer illiteracy was indicated as 80 % for less educated respondents and 50.8% for diploma holders. This result indicates that more emphasis and basic computer skill trainings should be given to low and middle educational level respondents.

Data aggregation is crucial to improve quality of HMIS [3]. In this study, lack of proper knowledge about EMR usage and mandate to extract report from the system were shown as important challenges to implement the smart care software. According to studies conducted considering different areas has shown data lost its quality due to factors like inadequate skills for gathering and analyzing data among health care staffs, unsatisfactory quality of data in the reports and fragmented information [28].

Accessing the right information at the right time to the right person is the main aim stated in Ethiopian ehealth strategy. To achieve this, proper recording and extraction of report from the system is an initial point and accomplishing it without any staff burden is the expected need. However findings in this study are far apart from the ehealth strategy. As a result these would have their own contribution towards the dropping of quality information to be gained from the institution.

Commitment and EMR usage ability are primary issues to successfully use the system. In contrary around 61 % of smart care software users at Adama Hospital could not freely operate the system as the system needs in depth knowledge and it was difficult for use. Similarly, study conducted in Addis Ababa has shown that 34.3% of smart care software users could not comfortably use the system because of system difficulty [10]. However the percentage variation might arise from prior users' exposure and ways of the training conducted at Addis Ababa to smart care software.

In summary, at Adama Hospital the system was initially implemented in twenty seven service areas. However gradually the implementation was limited only to six departments and in the mean time new software (international laboratory standards software) was introduced to the laboratory department at the hospital. This new software introduction lacks interoperability with the former smart care software. Currently the system was functional only in two departments namely registration and HMIS through wired connection as the central server has failed. As a result the institution is now returned back to paper based documentation and lost the benefit gained from electronic based recording system.

4.2.2. Investigating of success and failure of smart care software usage

Post implementation review addresses issues arising after the implementation electro medical record. This helps to ensure proper use of the system by the users and generating the intended benefits stated nationally from smart care software usage and to measure deliverables as success or failure.

4.2.2.1 Investigation of success

Information in Electro medical record includes medical test reports, demographic information and medication taken documents relating to the past, present and future condition of a patient.

According to the investigation made on EMR implementation success based on the twelve nationally stated benefits, parameters found as success were legibility of record , safer data , patient data confidentiality , continuous data processing and always up to date . In this study the overall EMR usage success rate was found 41.7 %. This indicates that more remained to be done on EMR implementation success at Adama Hospital. Furthermore fluctuation in practicing smart care software from time to time at the hospital was indicated as major constraint. During early period of system implementation, more attention was given by users and managing bodies but attention has gradually become declined. Therefore sustainable concern needs to be given both by the users and management bodies.

Studies conducted in Zambia [20] and USA [26] has shown sustainable EMR benefits. Sustainability of the benefits depends on different factors like good management, capacity building, providing extensive technical support, feedback and monitoring. In addition these studies recommended that when supported by financial incentives, the use of EMR system functionality critically improves effectiveness and efficiency of health care. In my study, similar finding was also indicated.

In addition another study has shown that [1] high functioning EMR system improves information sharing and communication between health care providers allowing access to comprehensive, legible and healthcare records. In my investigation, similar benefits were actually observed but lack sustainability.

4.2.2.2. Electro medical record (smart care software) usage failure

In this study the overall failure rate was found 58.3%. This is mainly because of the following seven parameters that should have been expected as benefits but found as failures at Adama Hospital. Parameters found as failures were simultaneous remote access to patient data, integration with other information resources, incorporation of electronic data, greater range of data output modalities, flexible data layout, assisted search, and tailored paper output. Similar findings were indicated by a study conducted in Arab countries [23] where lack of financial resources, poor management, bureaucracy and poor staff information technology competency were pointed out as challenges to EMR implementation.

Following multiple regression analysis, attitudes of users towards EMR usage (α= .001) and experience variation on using the smart care software among users (α = .001) were found as statistically significant factors for failures of EMR usage at Adama Hospital. Likewise, a study conducted in Malaysia has shown similar findings. Attitude problems, lack of computer skills, and human factors were indicated as main causes of the low adoption of the system in Malaysia [27].

Furthermore, variation in number of training days among users (α = .001) , disparity of the expectation drown by users during the training period and its contradiction on actual working environment (α = .005) were also found as statistically significant factors for failures of smart care software usage at Adama Hospital. Similar findings were indicated by another study [29] in relation to challenges for EMR.

These include lack of enough training for the implementation process of EMR, staffs resistance to EMR usage, and early gain of horror history about the technology. In addition, exchange of electronic information via networking between departments (α = .010) was also found as statistically significant cause for failures of smart care software usage at Adama Hospital. This is mainly due to the interruption of patient medical record exchange among departments.

On top of that, according to the result found from interview made at Adama Hospital with highly experienced on EMR usage, the following challenges were indicated as importance problems. Inadequate skill about IT among users, low system acceptability among users, users' resistance to EMR usage and assume as double recording, low management attention, lack of monitoring and evaluation, and lack of technical support.

4.2.3 EMR (smart care software) guiding framework

Establishing a common health information system framework is the main objective for development of core health information systems in Ethiopia. Besides, it increases the availability and use of timely and accurate health information in the country [40]. The following guiding framework is proposed based on the major study findings like user involvement, perceived easy for use, and interoperability made at Adama hospital. This framework has three phases namely pre implementation, implementation and post implementation phases.

The pre implementation phase constitutes the causal conditions and intervening inputs. The causal conditions are adopted sourcing the Ethiopian FMOH [40] whereas System quality, user involvement and human resources are inputs from the study findings at Adama hospital.

The implementation phase comprises end users' level, institutional level and intervening inputs. At this phase, inputs from the study findings are integration, capacity building, perceived usefulness, incentive, perceived easy for use, technical support, monitoring and evaluation, user promotion, interoperability, innovative leadership, and website.

At post implementation phase, the twelve nationally stated benefits expected from EMR usage are adopted in the framework and the source is FMOH. Success indicators incorporated in the model are intended to measure the end deliverables of EMR though the indicators are stated in all phases [3]. Symbols in the model are based on the principles linked to data flow diagram.

The guiding framework is designed based on basic assumption and principles of integrated success model [33]. Boundary of the model is HMN framework of the country. This framework has six components of HIS: data management, HIS resources, dissemination and use, data sources, indicators and information products. The proposed model is expected to solve problems related to EMR (smart care software) at Adama Hospital. Benefits derived from the framework are vital to encourage users and all concerned bodies to think a head about the outcomes and consequences EMR implementation. Moreover it further helps to convince decision makers in order to invest on information system.

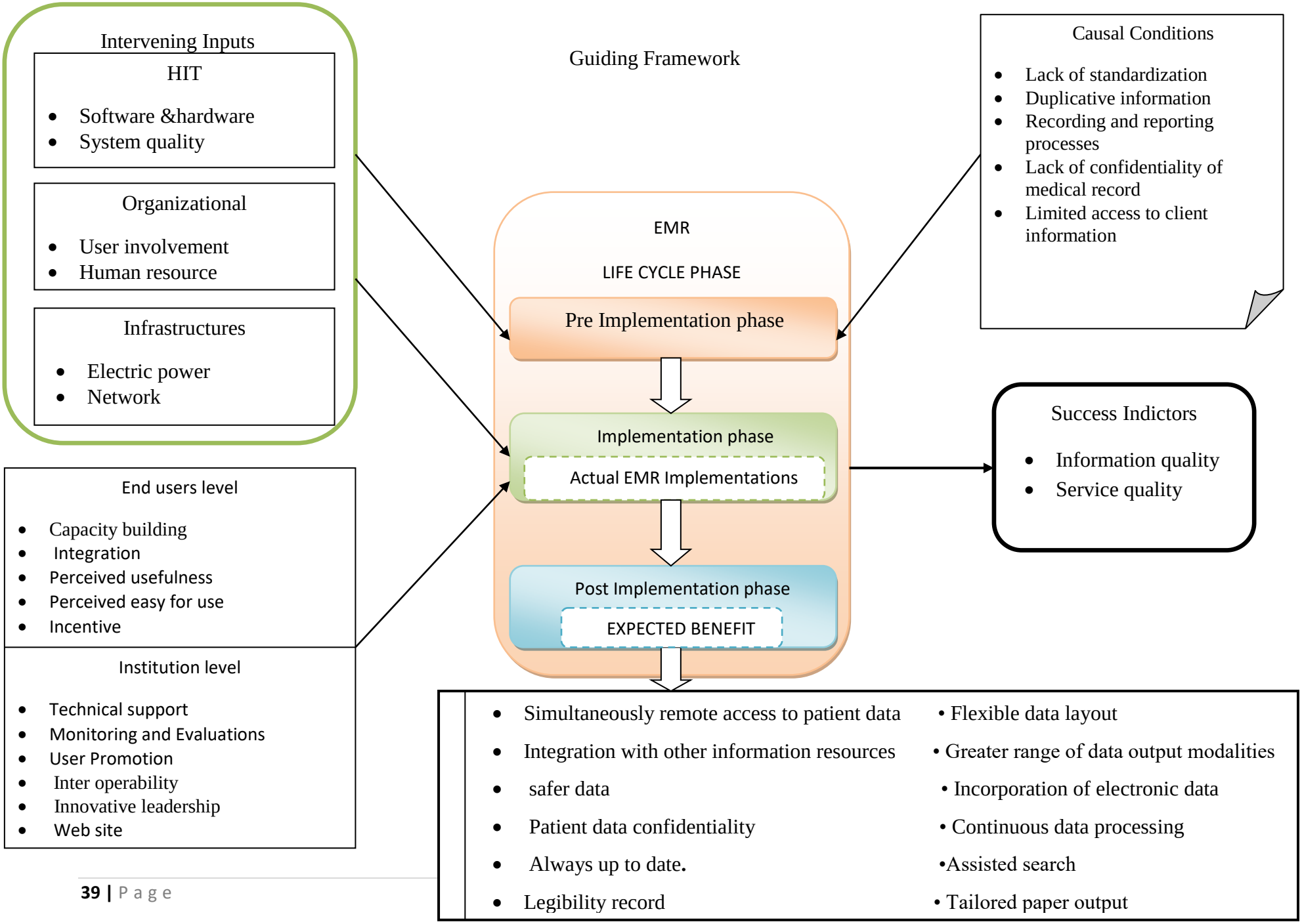

Figure 3: Guiding framework models for Adama hospital, Adama, Ethiopia,April 2015

Table 9 : Descriptions of smart care software guiding framework at Adama Hospital, Adama, Ethiopia, April 2015

Pre-implementation phase	
Variables	Descriptions
Pre EMR implementation	The assessment phase of causal conditions and system selection and preparation for implementation.
Lack of standardization	Lack of common definitions of indicators, data collection instruments, data processing and analysis procedures form.
Duplicative information	Using different recording and reporting formats for same indictors or data element.
Recording &reporting processes	Complexity of recording formats of medical information and unclear procedures of reporting.
Lack of confidentiality of MR	Medical record access cannot restrict and different users access patient data without any specific level.
Limited access to client information	Clients medical records were dispersed in different paper based format with different MRN and not well organized.
Health information technology	The electronic methods for managing information about the health and medical care of individuals or groups of patient and improve quality of health care.
Software	Consists of a series of instructions that tells the hardware of a computer what to do or how to do it.
Hardware	The physical, tangible pieces and touch parts of computers (printer, webcam and audio visual aid).
System quality	Desirable quality of HIT. Like user friendly, system flexibility, system reliability, system help & ease of learning.
User Involvement	The involvements of end user indifferent phase of system development.
Electric power supply	Continuous supply of power without any disconnection 24 hours a day.
Network	Interconnection of computer for sharing of EMR data.
Human Resources	Assign Health professionals, administrative staffs and ICT experts which can continual work on the system and support the system.

Implementation phase	
Variables	Descriptions
Actual EMR implementation	The work of EMR activation begins and it's the true test of an system implementation preparations made in the pre-implementation.
Technical support	Smart care software based continuous and sustainable support to user in working area during usage.
Monitoring	Is an ongoing, continuous process of collecting data at multiple points during the implementation Process to ascertain whether set implementation milestones (benefit) are met or not.
Evaluation	Measures how well the EMR implementation changes in information and service quality have been met.
User promotion	Promote proper EMR user in relation with their performance.
Interoperability	The ability to different information technology system and software applications communicate to exchange data accurately, effectively and consistently and to use the information that has been changed .
Innovative leadership	Management approval and continuous leading not only during the EMR implementation but also throughout the operational phase of the EMR.
Hospital website	Application run on the internet that made of summary form of HI document about the institution.
Professional/user	EMR (smart care software) user for managing patients' data.
Integration	The principle requires integrating data from different programs into a shared channel from which all Stakeholders derive their information.
Incentive /financial support	Financial supports to EMR user to more motivate and used the EMR system.
Capacity building	Build the capacity of EMR users based on institutional structure requirement as to gain appropriate skills to perform their tasks at each level.
Perceived usefulness	Positive perception of EMR user's about implemented EMR as it will lead to service and information quality.
Perceived easy for use	The degree of EMR user believes learning to adopt Implemented Software requires little effort.

Post Implementation	
Variables	Descriptions
Post EMR implementation	The phase of overall success of an EMR implementation observable and out came measurable.
Simultaneously remote access to patient data	Multiple clinicians can access a patient's record simultaneously from many locations anywhere in the world.
Legibility record	Replacing handwritten medical record on screen (electronic) or printed text.
Safer data	Well designed computer based tested backup scheme and disaster recovery system is much more reliable and less prone to data loss than conventional paper form and lost data due to system malfunctions.
Integration with other information resources	Once in electronic form a patient's data can be linked to reference information Stored and maintained via the internet on a computer half way around the world
Patient data confidentiality	Record access can be restricted and monitored automatically and each user can have specific levels to access.
Flexible data layout	Users can have a separate data display and data entry screen recall data in any order.
Incorporation of electronic Data	Physiologic data can be captured automatically from bedside monitors, laboratory analyzers, and Imaging devices located throughout the healthcare enterprise.
Continuous data processing	Provided that data are structured and coded in an unambiguous fashion, programs can continuously Check and filter the data for errors summarize and interpret data.
Assisted search	Search free text as well as structured data to find a specific data value in computer with in a small fraction of the time.
Greater range of data output modalities	Data can be presented to users via computer generated voice, two way pagers, or email.
Tailored paper output	Data can be printed using a variety of fonts, colors & sizes to help focus the clinician's attention on the most importan data.
Always up to date	Electronic record is integrated then all data is immediately available to all practitioners

Success indictors in EMR lifecycle	
Variables	Descriptions
Information quality	The factor for the adoption of services fit and standardized with eHMIS. Information quality elements are: Completeness, understandability, security, availability and accuracy.
Service quality	Service quality is a measure of how well the service level delivered matches client expectations. Service quality elements are: Availability, reliability, integrity, functionality, effectiveness and efficiency.

4.2.4. Evaluating guiding framework

The proposed guiding framework was evaluated and communicated with EMR expertise. They were selected from Adama Hospital, Adama town health office, Zonal health office, Regional health bureau and federal ministry of health which are six in number. The experts are directly implementer and technical persons of EMR system in governmental institutions and they have exposure for both IT and health working environment. The evaluation method was based on the most popular and common method in usability engineering which is expert based.

Based on the descriptive statistical result 100 % of the evaluators agreed on clarity of descriptions of EMR users' and organizational duties. Besides, 100 % the evaluators (50% of strongly agree and 50% agree) agree that the proposed model was perfect, comprehensive and easy to implement. Furthermore the framework was found well noticed (100%).All the evaluators agreed on the applicability of the connection system.

The proposed electro medical record (smart care software) implementation guiding framework was validated based on the response of evaluators and then using statistical analysis methods: standard deviation and mean [34]. Studies show that [34] if the standard division for each question is less than one, it is taken as acceptable. Regarding the mean calculation; if the mean score of completed questionnaires is greater than the questionnaire's average score the opinion of EMR experts is desirable. The value of standard division for each questionnaire was between 0.40- 0.55 and the mean result fall between 1.16 - 1.67 as shown in the table below.

Table 10: Guiding framework evaluation result at Adama Hospital, Adama, Ethiopia, may 2015.

Questions	**SD**	**Mean**	**Frequency**
The perfection and comprehensive of framework	0.55	1.50	6
The description of EMR user's duties in this model is obvious and clear?	0.41	1.16	6
The description of organizational level EMR implementer duties in this model is obvious and clear?	0.41	1.16	6
The proposed EMR frame work model is well noticed?	0.52	1.33	6
The proposed EMR frame work model is applicable?	0.41	1.16	6
The proposed EMR frame work model design techniques are applicable?	0.40	1.17	6
The proposed EMR frame work model connection system is applicable?	0.51	1.33	6
The applicability of this model is easy?	0.54	1.50	6
The proposed framework model is flexible?	0.40	1.67	6

The result of standard division for each of the questions answered by the respondent is less than one. This indicates that the proposed model is well applicable. Besides the mean score of the six completed questionnaires is 1.99 and questionnaire's average score is 1.33. This shows the proposed model is desirable as the mean of completed questionnaires is greater than the questionnaire's average score (34).

Chapter Five

Conclusion and Recommendation

5.1 Conclusion

The major objective of this study is to assess EMR implementation success and design a guiding framework to Adama hospital (figure 3).An overall assessment of EMR usage at Adama hospital shows a gradual decline in the usage and generally faced failure of the system by 58.3% from the perspective of the twelve nationally stated benefits.

In this study, Success was indicated at the hospital for parameters namely legibility of record, safer data, patient data confidentiality, continuous data processing and always up to date. However the remaining seven parameters found as failures specifically simultaneous remote access to patient data, integration with other information resources, incorporation of electronic data, greater range of data output modalities, flexible data layout, assisted search and tailored paper output.

According to this study, decline in EMR usage is associated with the following factors. Number of training days was short (91.5% of the training days fall between 3 to5 days), difficulties when using the smart care software (61%), and lack of basic computer skills particularly among less educated groups (80%). Lack of supportive training materials (this is supported by more than 50 % of the study participants), and disparity between user's expectations for EMR usage and the actual work environment (more than 50%).

In support of this the multiple regression analysis made indicates attitudes of users towards EMR usage ($\beta = .248$, $\alpha = .001$), variation in number of training days among users ($\alpha = .001$) , exchange of electronic information via networking between departments ($\alpha = .010$), experience variation on using the smart care software among users ($\alpha = .001$), disparity of the expectation drown by users during the training period and its contradiction on actual working environment ($\alpha = .005$),as statistically significant causes for failures EMR usage at Adama hospital.

Therefore, based on major study findings made at Adama hospital, guiding framework is proposed. In this framework inputs introduced from the study findings are system quality, user involvement, human resources, integration, capacity building, perceived usefulness, incentive, perceived easy for use, technical support, monitoring and evaluation, user promotion, interoperability, innovative leadership, and website. Overall this model is expected to bridge the existing gap in EMR usage at Adama hospital for effective use of the smart care software.

5.2 Recommendation

In line with the finding of the research project, the following recommendations are reasonable in order to attain high quality EMR implementation and to rise above obstacle.

- In order to achieve the benefits of EMR usage, sustainable and adequate training both on smart care software and basic computer skills need to be given particularly for low and middle educated professionals.
- EMR users' attitudes and expectations need to be positively shaped towards usefulness and effectiveness of EMR usage.
- Effort to be made to minimize an interruption of electronic data exchange and making strong networking between departments.
- In order to make electro medical record fully functional, the hospital need to address problems associated with technical support, attention by management bodies, interoperability, and allocation of adequate resources.
- Incentives and users promotion needs attention as well.
- Mandate over the system need to be decentralized and owned by the hospital and the hospital need to have its own website.
- The proposed implementation framework is thought to solve EMR related problems in the hospital. Overall this model is expected to bridge the existing gap in EMR usage at Adama hospital for effective use of the smart care software.
- This study might serve as an input for further electro medical record (smart care software) related research.

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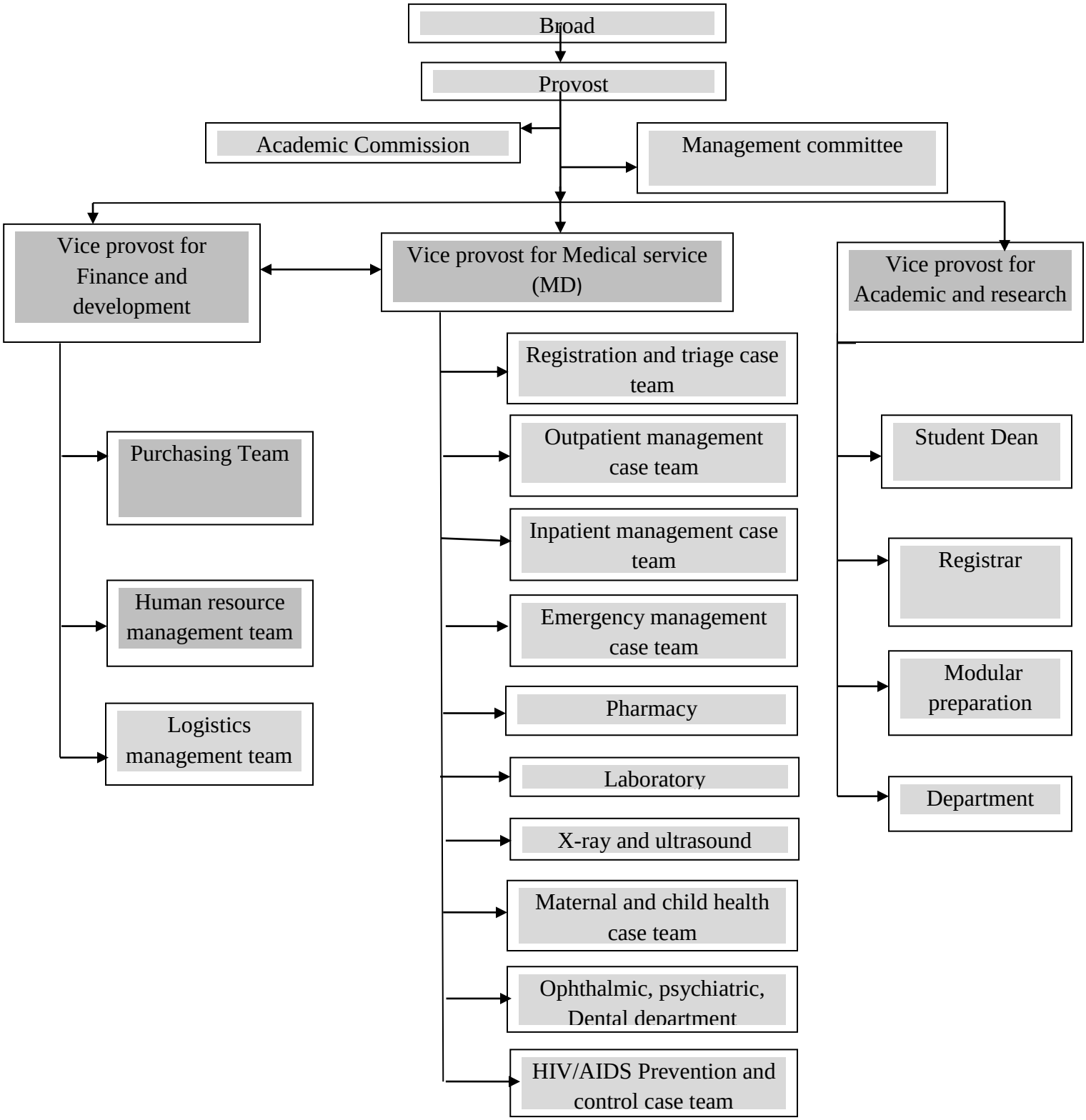
Annex one : Adama Hospital Medical college organizational Structure



Source: Adama hospital and medical college 2007 plan.

Annex two: Consent form

Addis Ababa University

School of Information Science and School of public health,

Health Informatics program

The objective of this project Observations chick list/questionnaire/interview question is to investigate success of Electro Medical Record implementation and propose guiding framework for Adama Hospital and medical College.

Greeting

Hello; my name _____.I would like to ask you a questions about Electro medical record (smart care software) and you have a full write to answer or not any question in the questionnaire; however your patience to answer the question leads the project success.

Verbal Consent and Confidentiality

All the information that you will provide kept confidential. The information you give for this interview will never be used in connection with other information. I appreciate your mutual aid in responding to this study. Are you willing to participate? If yes join. If no, thank you and stop here.

Name of interviewer _____

Date of interview_____

Annex three: Observations chick list

Part one - Assessment and Observations chick list of EMR status at Adama hospital.

S.no	Departments	Question and observation about EMR usage				
		Number of computer	Number of computer with smart care software for EMR only	Are used the smart care Software knows?		If no what is the problem
				Yes	No	
1	Registration & Triage					
2	Adult OPD					
3	Under five OPD					
4	Emergency OPD					
5	Medical Referral OPD					
6	Surgical Referral OPD					
7	Dental clinic					
8	Dermatology clinic					
9	Psychiatric clinic					
10	Ophthalmic clinic					
11	ANC/PNC					
12	Family planning					
13	EPI					
14	TB clinic					
15	ART clinic					
16	VCT					
17	Laboratory					
18	X-ray					
19	Radiology					
20	Pharmacy					
21	Operation room					
22	Obstetrics and gyn.					
23	Medical ward					
24	Surgical ward					
25	Pediatric ward					
26	P/therapy					
27	HMIS					
28	Liaison (Referral)					
29	Finance					

Annex four: Questionnaire

Part one- Socio demographic data

1	**Respondent Profession (Make "X "in Front of his/her profession)**				
01	Specialist		07	Ophthalmology	
02	General practitioner		08	Anesthetist	
03	Radiology		09	Midwifery	
04	Pharmacy		10	Druggist	
05	Health Officer		11	Nurse	
06	Laboratory		12	Other	

2	**Name of the department (Make "X "in Front of his/her department)**				
01	Out patient		04	Pharmacy	
02	Inpatient		05	Laboratory	
03	HMIS		06	Other	

3	**Educational status (Make "X "in Front of his/her Educational status)**				
01	Graduated		03	Diploma	
02	First degree		04	Other	
4	**Gender (Make "X "in Front of his/her gender)**				
01	Male		02	Female	
5	**Age (Make "X "in Front of his/her age)**				
01	20-24		04	45-54	
02	25-34		05	>55	
03	35-44				

6	**Religion (Make "X "in Front of his/her Religion)**													
01	Orthodox		02	Muslim		03	Catholic		04	Protestant		05	other	
7	**Marital Status (Make "X "in front of his/her religion)**													
01	Single		02	Married		03	divorced		04	widowed		05	other	

Part two: Question about computer literacy and Electro medical record (SCSW) usage

2.1	**Have experience about computer usage?**						
A-Agree			B-Disagree				
2.2	**Are you trained on EMR smart care soft ware application?**						
A-Agree			B-Disagree				
2.3	**For how many days training on smart care soft ware were made?**						
A.3-5 days		B.6-7 days		c.8-10 days		D.>10 days	
2.4	**In which form was the training taken?**						
A. Only theoretical		B. Both theoretical and Practical				C. Other	

	Questions	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
2.5	Do you agree that the training was supported by full training material?					
2.6	Do you believe that the training was sufficient for proper use of smart care soft ware?					
2.7	Do you agree the implementation o SCSW leads to quality service?					

2.8	**Have experience on use of smart care soft ware?**						
A-Agree			B-Disagree				
2.9	**If agree to question 2.8 for how long?**						
A.< 6 month		B.7 month – one year			C.> one year		
2.10	**What was the shortage in the training?**						
A. Computer		B. User manual		C. Time		D. Other	

	Questions	**Agree**	**Disagree**
2.11	Is the smart care soft ware networked with other department?		
2.12	Is there any difficulty when use smart care soft ware?		
2.13	If agree to question 2.12 specify		
2.14	Are all things available in smart care soft ware that enables you to do what you want for your patient?		
2.15	If disagree to question 2.14 what lacks?		
2.16	Do you think that smart care used as expected?		

Part three: EMR (smart care soft ware) output evaluation (benefits) related question

S.no	Questions		Response of the respondent	
			Agree	Disagree
3.1	Is multiple clinicians can access a patient's record simultaneously?			
				Why?
3.2	By what method patient data recorded?	A. Computer only		
		B. Paper only		
		C. Both A&B		
3.3	Are you comfortable with smart care software implementation?			
				Why?
3.4	Is smart care soft ware has other tasted storage area if your patient data in computer lost due to different problem?			
	3.5- If agree where?			
3.6	Access of patient data is restricted in each department to monitor automatically?			
3.7	EMR users in the hospital have a separate display screen for searching patient data in any order?			
				Why?
3.8	Is there integrated information available via internet based after patient's data linked to other reference information stored and maintained?			
	3.9 If agree how?			
3.10	Is bedside patent data captured using imaging			

	(camera) devices?		
3.11	Are you process continuously patient data (eg. Record, Summarize and interpret) in your department?		
			Why?
3.12	Is soft ware assisted search both free text and structured data to find whether a particular item has ever been recorded?		
			Why?
3.13	Is data can be presented to client via computer Generated voice or email?		
			Why?
3.14	Is most important data can be printed with a variety of fonts and colors to help focus the Clinician's attention?		
			Why?
3.15	Is all data is immediately after recording available to all Practitioners		

3.16-What you recommend for proper usage of EMR smart care sw?

A. ----------

B. ----------

C. ----------

Thank you

Annex five: Interview question

Interview questions for physicians and Health management information system focal persons interview about EMR at Adama hospital.

1. Are all departments net worked?
2. Do you have a power or right to make adjust if problem happen in smart care soft ware?
3. Who consult if the problem happen were over your capacity?
4. How to support the smart care user (health professionals)?
5. What is the benefit of Smart care soft ware?
6. Is the practice Smart care soft ware is as expected?
7. What helps smart care soft ware for continues data processing?
8. How do you collect the report from EMR smart care soft ware?
9. How your eHMIS applications extract data from EMR database?
10. What challenge in Smart care soft ware related to your daily business activity?
11. Do you have any point mention on smart care soft ware to more improve patient care service?

Thank you

Annex six: Proposed framework evaluation questions

Personal characteristics

1. Hospital HMIS officer
2. Zonal HMIS officer
3. Town HMIS officer
4. Regional HMIS officer
5. Federal Ministry of health HMIS officer

S.no	Questions	Response Options				
		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	The model is perfect and comprehensive?					
2	The description of EMR user's duties in this model is obvious and clear?					
3	The description of organizational level EMR implementer duties in this model is obvious and clear?					
4	The proposed EMR frame work model is well noticed?					
5	The proposed EMR frame work model is applicable?					
6	The proposed EMR frame work model design techniques are applicable?					
7	The proposed EMR frame work model connection system is applicable?					`
8	The applicability of this model is easy?					
9	The proposed framework model is flexible?					

Thank you

Annex seven: Declaration

Declaration

I declare that this research project is my original work and has not been presented for a degree in this or any other university.

Name: Dilarg Alemayehu

Signature: _____

Place: Health Informatics Program, School of Information Science and School of Public Health
Addis Ababa University

Date: June, 2015

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

Name	Title	Signature	Date
Dr. Tibebe Beshah	Advisor	_____	_____
Dr. Mesfin Addisse	Advisor	_____	_____