Appendix 2

The feasibility study of implementing electronic medical record system in a tertiary care hospital

A dissertation submitted in partial fulfillment of the requirements for the award of

Post-Graduate Diploma in Health and Hospital Management

By

Dr. Dayalaxmi Maimom (PT)

International Institute of Health Management Research

New Delhi-110075

April, 2012

Appendix 3

The feasibility study of implementing electronic medical record system in a tertiary care hospital

A dissertation submitted in partial fulfillment of the requirements for the award of

Post-Graduate Diploma in Health and Hospital Management

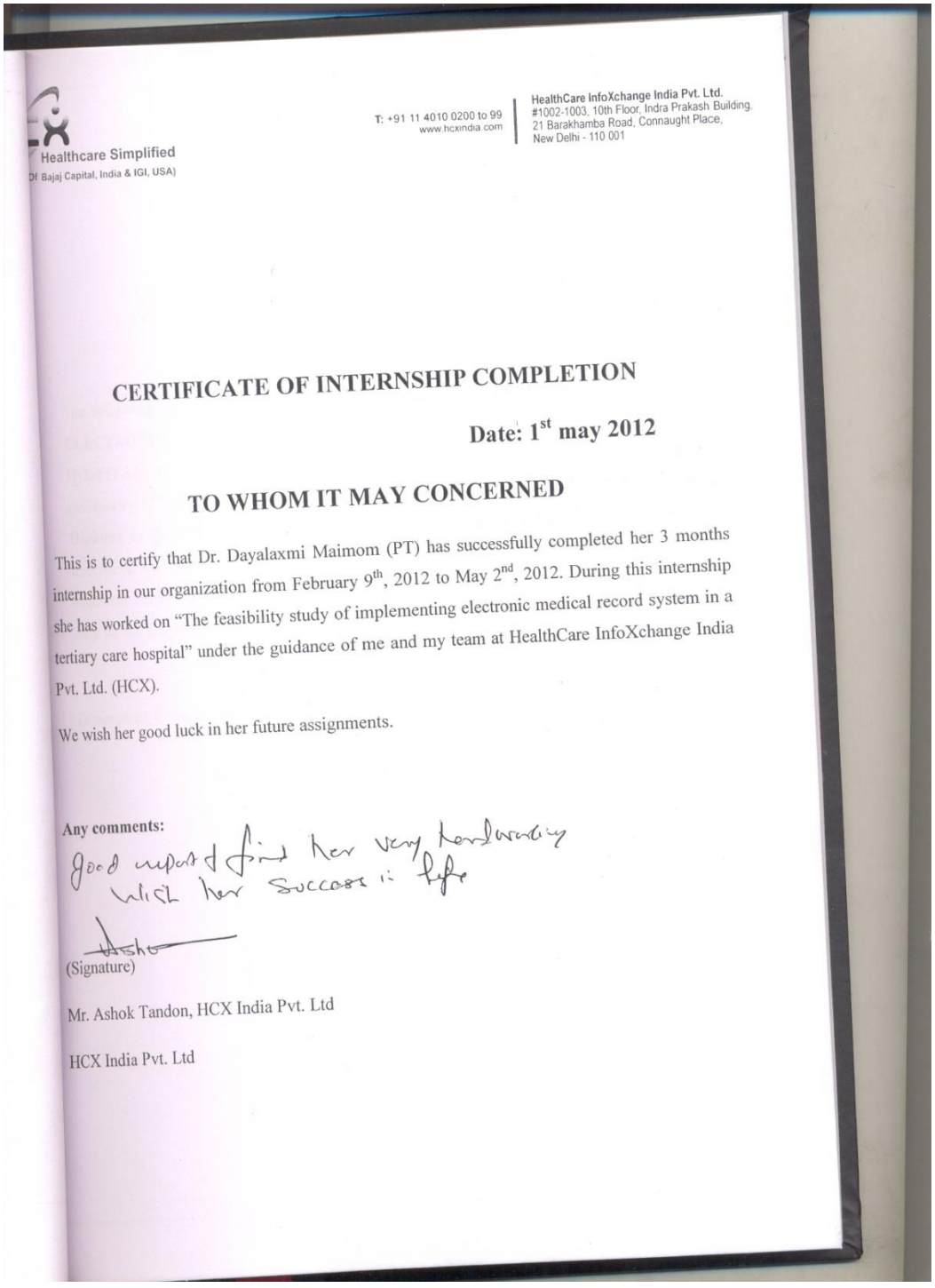
By

Dayalaxmi Maimom

International Institute of Health Management Research

New Delhi-110075

April, 2012



Healthcare Simplified
Of Bajaj Capital, India & IGI, USA)

T: +91 11 4010 0200 to 99
www.hcxindia.com

HealthCare InfoXchange India Pvt. Ltd.
#1002-1003, 10th Floor, Indra Prakash Building,
21 Barakhamba Road, Connaught Place,
New Delhi - 110 001

CERTIFICATE OF INTERNSHIP COMPLETION

Date: 1st may 2012

TO WHOM IT MAY CONCERNED

This is to certify that Dr. Dayalaxmi Maimom (PT) has successfully completed her 3 months internship in our organization from February 9th, 2012 to May 2nd, 2012. During this internship she has worked on "The feasibility study of implementing electronic medical record system in a tertiary care hospital" under the guidance of me and my team at HealthCare InfoXchange India Pvt. Ltd. (HCX).

We wish her good luck in her future assignments.

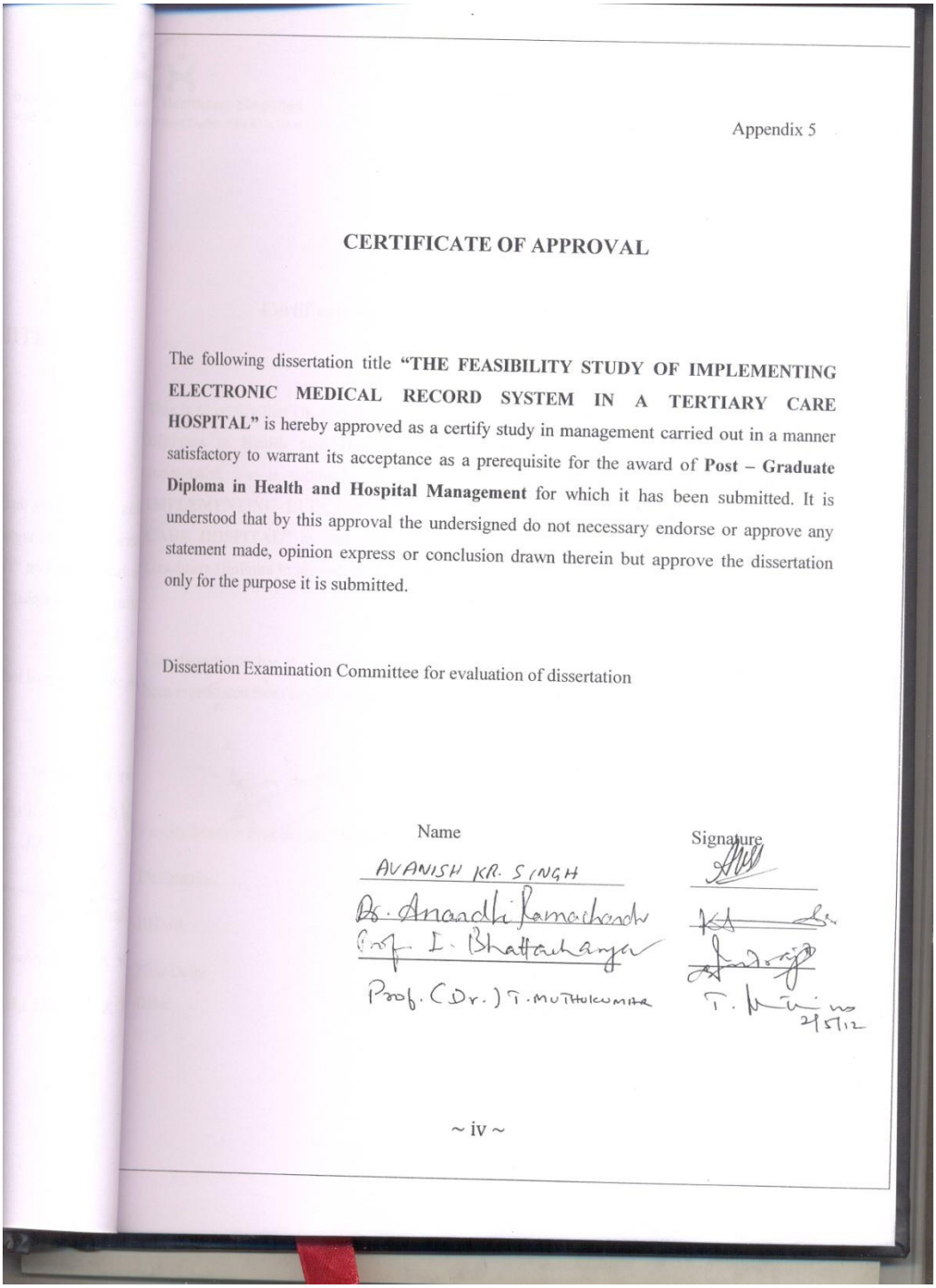
Any comments:

Good report & find her very hardworking
Wish her success in life

(Signature)

Mr. Ashok Tandon, HCX India Pvt. Ltd

HCX India Pvt. Ltd



Appendix 5

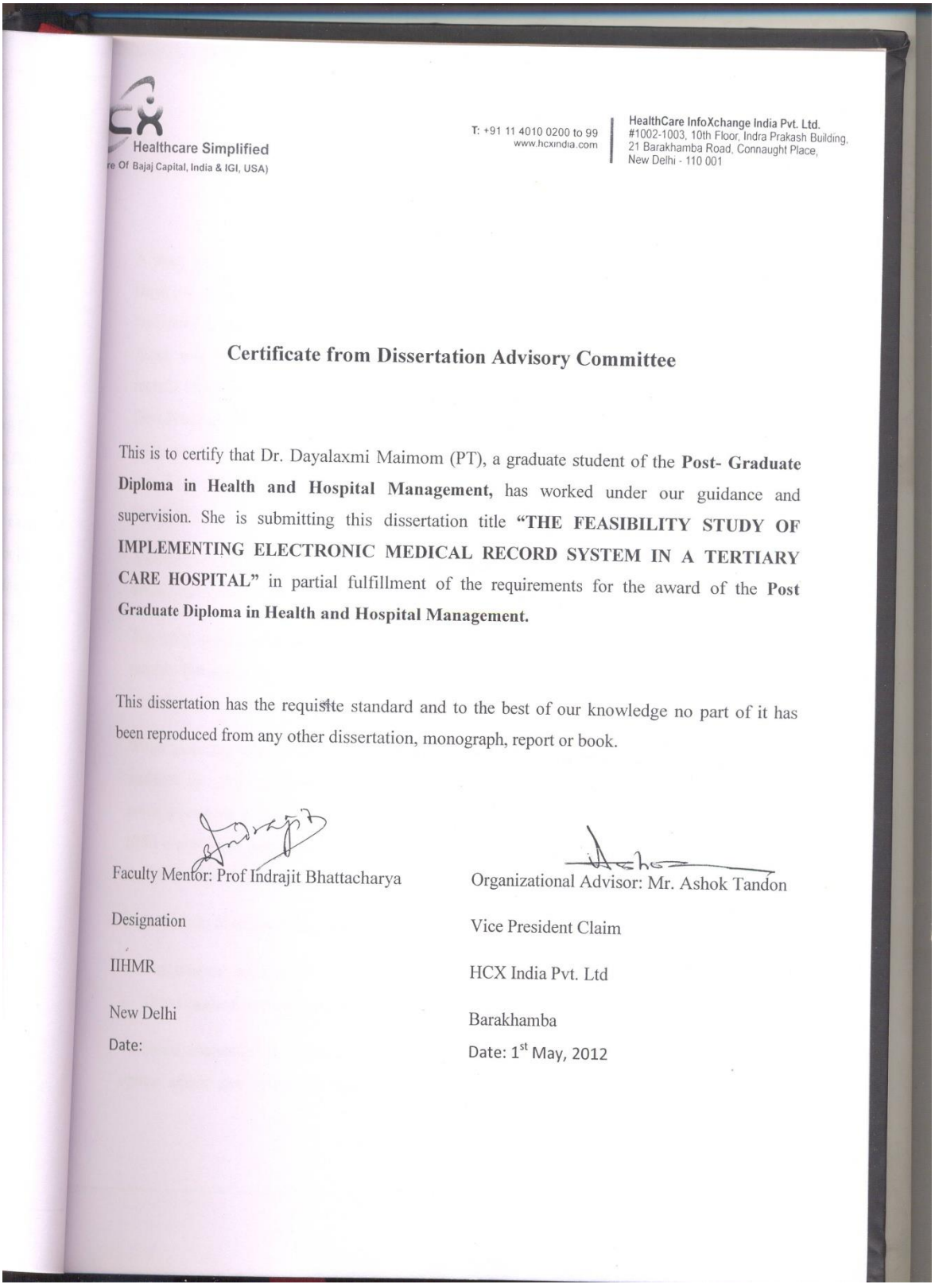
CERTIFICATE OF APPROVAL

The following dissertation title **"THE FEASIBILITY STUDY OF IMPLEMENTING ELECTRONIC MEDICAL RECORD SYSTEM IN A TERTIARY CARE HOSPITAL"** is hereby approved as a certify study in management carried out in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post – Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessary endorse or approve any statement made, opinion express or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

Name	Signature
AVANISH KR. SINGH	
Dr. Anandhi Ramachandra	
Prof. I. Bhattacharya	
Prof. (Dr.) T. MUTHULAKSHMI	21/5/12

~ iv ~



Healthcare Simplified
re Of Bajaj Capital, India & IGI, USA)

T: +91 11 4010 0200 to 99
www.hcxindia.com

HealthCare InfoXchange India Pvt. Ltd.
#1002-1003, 10th Floor, Indra Prakash Building,
21 Barakhamba Road, Connaught Place,
New Delhi - 110 001

Certificate from Dissertation Advisory Committee

This is to certify that Dr. Dayalaxmi Maimom (PT), a graduate student of the **Post- Graduate Diploma in Health and Hospital Management,** has worked under our guidance and supervision. She is submitting this dissertation title **"THE FEASIBILITY STUDY OF IMPLEMENTING ELECTRONIC MEDICAL RECORD SYSTEM IN A TERTIARY CARE HOSPITAL"** in partial fulfillment of the requirements for the award of the **Post Graduate Diploma in Health and Hospital Management.**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Faculty Mentor: Prof Indrajit Bhattacharya

Designation

IIHMR

New Delhi

Date:

Organizational Advisor: Mr. Ashok Tandon

Vice President Claim

HCX India Pvt. Ltd

Barakhamba

Date: 1st May, 2012

ABSTRACT

A study was conducted at Mata Chanan Devi Hospital with an objective to evaluate feasibility of implementing electronic medical record (EMR) system. The feasibility study was based on the current trends in medical record practice and other tertiary care hospitals. Along with this, feasibility of users, technical and financial aspects of electronic medical records was also considered for this study. Hospitals chosen for study were, Mata Chanan Devi Hospital, ESI Hospital. Reason for choosing these hospitals is that all that they are from different generations and have established brand names. The research question put forward was "Is it feasible to implement electronic medical record system in Mata Chanan Devi Hospital?"

A research based questionnaire was prepared and distributed among the patients, doctors and administrative staff (50 each) and their views on electronic medical records were sought.

The trend analysis shows that the trend is changing towards digitalization of the medical records. Integration of all patient- related records can be made available to the end user just on a click of button.

While assessing the perception of common questions to all types of respondents it was analyzed that there is significance difference in the perception of three groups i.e. patient group awareness is very less compared to other two groups. But response to acceptance of EMR is positively significant in all the three groups. The perception about improvement due to EMR is also significant.

Digitalization of medical records is possible in two ways

- Scanning the documents
- Direct medical record entry in hospital management system (HMS).

Technical evaluation for both the above options is favorable. Scanning would be suitable option which can reduce manual retrieval of case files which is laborious and time consuming and can also be useful in decreasing overheads such as manpower, inventory etc.

Observation for medical module in HMS reveals that in house development of medical record module and integration of other patient data is also possible.

Financial feasibility was evaluated by comparing the expenses required currently with proposed system and result suggests that it is financially feasible to implement electronic medical record system.

Appendix 8

ACKNOLEDGEMENT

I am highly indebted to **Mr. Ashok Tandon, Vice-President Networking and Claim (Healthcare Infoxchnage India Pvt. Ltd)** for his guidance and constant supervision as well as for providing necessary information regarding the project & also for his support in completing the project.

My deepest thanks to **Prof. Indrajit Bhattacharya (IIHMR New Delhi)**, my mentor of the project for expertise input and guidance and adding further refinements.

My deep sense of gratitude to **Colonel Kumar Kant, Vice-President Human resources (Healthcare Infoxchnage India Pvt. Ltd)** for his support and encouragement.

Thanks and appreciation to the helpful people at **ESI Hospital and Mata Chanan Devi Hospital** for their support and the Medical Superintendent of these hospital for giving me permission to complete the task successfully.

I would also thank my Institution and my faculty members without whom this project would have been a distant reality. I also extend my heartfelt thanks to my family and well wishers.

Thank You

Dr. Dayalaxmi Maimom (PT)

PGDHHM

IHMR, New Delhi

Batch C

Appendix 9

TABLE OF CONTENTS

Table of contents

PART 1

PART 2

CHAPTER 1

CHAPTER-2

Appendix 10

LIST OF FIGURES

Appendix 11

LIST OF TABLES

Appendix 12

LIST OF APPENDICES

Appendix 13

ABBREVATIONS

HCX	Healthcare Information Exchange
PHR	Personal health records
TPA	Third Party Administration
MRD	Medical Record Department
OPD	Out Patient Department
EHCR	Classification of Electronic Healthcare Record
CMR	Computerized Medical Record
EMR	Electronic Medical Record
EPR	Electronic Patient Record
EHR	Electronic Health Record
HIPPA	Health Insurance Accountability and Portability Act
HL7	Health Level 7
DSS	decision support systems
GDP	Gross Domestic Product
CRM	Customer Relationship Management
HMIS	Hospital Management Information System
RIO	Return On Investment
DICOM	Digital Imaging and Communication in Medicines
PDA	Portable Digital Assistant
ICD	International Classification of Disease
CAO	Central Admission Office

PART 1

ORGANISATION PROFILE

Healthcare Information Exchange Company India

HealthCare InfoXchange India Pvt. Ltd. (HCX) is a healthcare company that aims at simplifying processes related to healthcare in India .To achieve this goal HCX is taking steps towards introducing web enabled platforms in health industry. These web platforms help simplify cumbersome healthcare transactions existing in this country. HCX started its unprecedented journey on the 3rd of October 2009 with strength of 10 employees. Growing since, it has been able to come up with a series of four healthcare products aimed at redefining the current healthcare structure. The products offered by HCX are:

- Personal health records (PHR)
- Online claims data exchange.

HCX is the joint venture of Bajaj Capital, India and IGI, USA. Bajaj Capital is one of India's premier Investment Advisory and Financial Planning companies. It is also SEBI approved category I Merchant Bankers. It offers personalized Investment Advisory and Financial Planning Service to individual investors, corporate houses, institutional investors, Non Resident Indians and High Net worth clients.

IGI's roots go back to 1992 when it was known as Med-Link Technologies, Inc. Med-Link was a pioneer is creating a completely web enabled platform for healthcare transaction processing.

Offshore processing and development was an innovative, forward looking initiative well ahead of the industry in 1992. By 1997, the company had grown to processing 2 million EDI transactions per month. There were over 10,000 providers and 120 payers in the healthcare domain. Nobody in the industry matched this achievement at that time.

SERVICES BY HCX IN PRIVATE AND GOVERNMENT HOSPITALS

Personal Health Record (PHR)

Maintaining of personal health records is important but more often than not proves cumbersome. With files of reports, prescriptions, test results, and other data, it's easy for paper to fray, be misplaced or get lost and not easily accessible anywhere, with storage of the same also proving to be quite a task.

HCXs Personal Health Record simplifies maintenance, access and reference of our medical history. PHRs of individuals or families can be maintained online. The PHR is a vast repository of information comprising of patients personal details and medical history that includes information regarding previous surgeries or medical conditions, medication history, treatment, emergency contact details, hospitalisation history, allergies, blood group and so on. The PHR also acts as personal assistant by sending SMS and email alerts on doctor's appointments, or any lab tests are due or even a booster dose of vaccination that children need to be given.

HCXs web-based PHR is safe, trustworthy and can be accessed only by the user who creates the account. The ease of use and convenience of PHR while simplifying the maintenance of important and confidential medical information of the user can also be used, in extreme emergencies, by a trusted and known person affiliated to the user. There may be instances when the user would be unable to access account. However, if the user has consented to give

access of PHR to a trusted confidante and known relative/friend or family, this PHR could be shared by the healthcare facility or physician treating the patient.

The PHR product is the optimum solution for achieving a uniform system which makes all appropriate health information and medical records available and accessible to patients and to their selected healthcare professionals.

PHR is a proprietary, comprehensive, web based solution which securely connects healthcare trading partners regardless of legacy systems or the data formats in use. Modular in design, PHR is composed of intelligent, interlocking rules and translation engines that facilitate the transfer of data across multiple layers and between associated trading partners.

The following are a few features available in PHR

- Consumer Information - Consumer demographic information including name, address, multiple email address and multiple phone numbers are just some of the key consumer attributes that are maintained.
- Manage conditions, surgical history and hospitalisations
- Helps track health related activities like blood pressure, weight, blood glucose, calories etc.
- Share health information with doctors, family members, hospitals and insurance company with patient consent
- Helps track and update immunisation records
- Medical Information- in addition to physician information, other key medical related information includes doctors' visits, surgery, hospitalisations, immunisations, allergies, weight, blood pressure and cholesterol
- Insurance Information- insurance type, provider, co-pay information are some of the approximately 40 data attributes associated with consumer insurance that are maintained.
- Get SMS and email reminders about regular checkups or recurring treatments
- Visual display of charts for better tracking of health

- Security- HCX has implemented a variety of best practices including password expiration, strong password education, multiple security questions and their application during the password reset process, firewall

My Smart Health

Rise in the cost of medical treatment has affected our pocket not only in case of hospitalisation but also for our OPD needs. Invariably, we ignore expenses incurred in physician consultations, diagnostic tests, health check-ups, medicines etc. but on average a healthy family spends about 40K per annum for such needs.

Very often, we ignore the consultation with doctors by tagging health problem as small. If we give a thought to the chain of symptoms then it could lead to situation causing hospitalisation. Hospitalisation would mean ambulance charges, doctors' fees, room rent, medicines, diagnostic tests, surgery charges and so on. Therefore, we believe a consultation with doctor at the right time is the way out to avoid huge medical expenses.

HCX My Smart Health is a blend of OPD needs such as doctor's consultations, medicines, diagnostic tests. This product is designed to give consultations with esteemed doctors at well establishes hospitals and clinics around Delhi/NCR

The following are the features of My Smart Health

- Consultations with Specialist Doctor for illness require special consultation such as ENT, paediatric, orthopaedic consultations etc.
- Consultations with physicians
- Ease in taking consultation as we have wide spread doctors network available at your nearest hospital
- Full body health check-ups- Health check-up help us knowing status of health. Health check-ups would help to take precautions at the right time

- Fixing Appointments- HCX provide full support to its customers for providing appointments with the doctors for consultation and diagnostic labs for tests to avoid waiting in long queues
- Maintaining health records on online platform for having access around the globe by using HCX solution PHR (Personal Health Record)

Clearing House

Health Care Clearinghouse is an entity that facilitates the processing of health care information between health care providers (hospital, doctors, labs etc.) and payer (Insurance companies) by

- Standardizing the health information (like billing processing, claims processing) from nonstandard data formats to standard formats and vice versa.
- Replacing a paper-based claims process with an automated, electronic solution that adjudicates claims, adjusts the coding to the insurance companies standards, and provides physicians with real-time access to their claims processing.

Clearing houses work as an intermediary between Providers and Payers.

Benefits of clearing house

The main benefits of using a electronic claims clearinghouse - in a nut shell. Using an electronic clearinghouse to send claims:

- Allows you to catch and fix errors in minutes rather than days or weeks
- Results in significantly higher claim success --fewer rejected claims.
- Rapid claims processing: Submitting claims electronically can reduce your reimbursement times to less than ten days.
- Eliminates the need to prepare claims and manually re-key transaction data over and over for each payer.

- Submit all your electronic claims in batch all at once, rather than submitting separately to each individual payer.
- It provides a single location to manage all your electronic claims
- Avoid long hours of being on-hold with Medicare and Blue Cross inquiring about claim errors.
- Vastly improve vender relationships with insurance carriers.
- If you subscribe to a good clearinghouse, you'll be speaking with a knowledgeable support person within just a few rings.
- Shorter payment cycles lead to more accurate revenue forecasts.
- Reduce or eliminate need for paper forms, envelopes and stamps
- Plain and simple, using a clearing-house will greatly simplify your claims processing.

The best clearinghouses offer added features that provide a whole new level of claim intelligence for **revenue cycle management** that makes their services extremely compelling from a financial perspective, and as well, highly desirable from an office-staff efficiency point of view.

Here are some highlights on what Providers and Payers look for in a clearinghouse

- **Eligibility Verification** - Determine coverage before treatment
- **Electronic Remittance** - Have your accounting automatically updated
- **Claim Status Reports** - Know the status of a claim at all times
- **Rejection Analysis** - Have error codes displayed in plain English
- **Online Access** - Edit and correct claims day or night online
- **Printed Claims** - Have non-par claims automatically dropped to paper but still be able to track them electronically.
- **Real Support** - The best clearing houses offer 1-on-1 personal training and support provided by billing experts.

Affordability - When you take into consideration the purchasing of forms, printing, envelopes, and postage; a clearinghouse ends up costing about the same as sending paper claims.

Scope of Work during Internship

At HCX Pvt. Ltd., I was placed as a Project Trainee during Internship period of 3 months that is from 9th of February to 1st of May. This period so far has allowed me to gain an insight about different services of HCX mentioned above.

Learning and Experiences at HCX:

The experience of working in HCX was an enriching experience. I had a chance to learn and gain exposure to the entire limit possible. Organizational culture helped me to grow and enrich my knowledge. Apart from the research methods and procedures, I got an opportunity to work with other professionals of Insurance and IT sectors. Such an experience helped me to enhance my skills in the work related to health IT sector and insurance sector as well. Thus, I could develop more competencies and enrich my skills of working in collaboration and cooperation with other professionals while being in a team. Also it was the first time experience that learner got involved in developing of interview schedules (questionnaires) and understood the various aspects required in doing so i.e. client demands, sensitivity of the issues, and problems or challenges related to the hospital set up.

The expectations which I had from the organization in terms of supervision, coordination, and cooperation etc. went surpassed. Organizational culture and working environment was friendly and gave so much scope for me to learn maximum while in the organization and beyond. At the end I realized that it was a new learning and new experience ever since the day one till the end of internship at HCX Pvt. Ltd.

PART- 2

CHAPTER 1

1.1: INTRODUCTION

The Medical Record Department maintains records and documents relating to the patient care. Among a host of activities, its main functions are filling, indexing and retrieving of medical records. The primary purpose of establishing a Medical Record Department is to render service to patient, medical staff and hospital administration in support of good patient care.

Medical record is defined as an orderly written document encompassing the patient's identification data, health history, physical examination finding, laboratory reports, diagnosis, treatment and surgical procedures and hospital course. Thus medical record is a clinical, scientific, administrative and legal document relating to patient care in which sufficient data written in the sequence of events to justify diagnosis and warrant treatment and end results are recorded.[1]

Three main basic principles of medical records are:

- They must be accurately written
- Properly filed
- Easily accessible

The need for appropriate written documentation of facts related to patients' treatment in the hospital cannot be brushed aside because failure to maintain records means failure of duty towards the patient.

Medical records through which hospital statistics are generated serve as eyes and ears to the hospital administrator. Medical records are of importance to the hospital for evaluation of its services and better patient care. They also serve as resource for education and training for physicians and others, also being the basis for clinical research. Research to be effective requires scientifically recorded observations as reflected in the medical record. The

[1] *Wikipedia, the free encyclopedia, Electronic Medical Record.*

importance of accurate records for legal purpose is well established.[2] In short, the necessity for maintaining proper medical records by a hospital can be broadly grouped as follows:

Patient's Needs:

It serves as a story of patient's passage through hospital, maintaining continuity in that story. From this is extracted the information required by the patient. E.g. medical certificates of patient's hospital stay, diagnosis, birth certificate and so on.

Physician's Needs:

- Practice of scientific medicine based on recorded facts.
- Continuity of medical care.
- Evaluation of his or her own capabilities and shortcomings.
- Medico legal concerns
- Effective communication for the medical term, and
- Study and research

Health Care Institution's Needs:

- Generating hospital statistics
- Teaching and Research
- Administrative control over functional activities
- Planning of services and preparing operative budgets.
- Evaluating and improving quality of care safeguard in tort suits.

Health Authorities' Needs:

The records are important to the public health authorities as they contain reliable information regarding morbidity and mortality patterns of dependent population. The state and national governments constantly require reports like births and deaths, infectious diseases, noticeable diseases, statistics regarding incidence of diseases and types and number of family planning procedures. This helps in

[2] Medical records department policy

- Allocate budget, staff and equipment
- Plan and construct hospital and health centers in required locations.
- Determine type of health services required.
- Monitoring of all hospital and health institutions.
- Collaborate with international organizations.

International Healthy Organizations:

- Provide assistance to needy nations.
- Exchange experts and specialists.
- Need reliable information from all countries to achieve global healthier living.
- Main challenge faced by hospital industry is sheer volume of data on daily basis.
- Need of the hour is to make this data available across countries within and outside the hospital as well as to store such data for number of years to meet the statutory requirements.

Information technology has the potential to bring enhanced care to patients by seamless integration within various departments of hospital and connectivity between various healthcare providers, professionals and other organizations such as insurance companies, TPAS[3] etc.

Information technology has made a significant impact on the healthcare sector in the last decade. India is the hub of software development activity but Indian healthcare industry though late is realizing the advantages of information technology now.

Indian hospitals though late have started adopting newer technologies to manage hospitals effectively and efficiently. Today Hospital Information System and electronic medical records (EMR) have become the minimum prerequisites for delivering quality healthcare. The revolution brought by information technology has completely transformed the way data is recorded.

[3] *Accessing Medical Records and the HIPAA Privacy Regulation*

1.1.1: Electronic Medical Records

Electronic medical record is a type of computer based documentation of physician-patient encounters that consists of patient's personal details, clinical findings, investigations, diagnosis, and line of treatment and follow ups. Terminologies like Computer- Based patient records or computerized patient record and electronic medical record can be used interchangeably. Healthcare related information is maintained in electronic medical records (EMR) and is available for online on a real time basis. EMR enables professionals to give online Tele health consultations to his patients. Incorporation of laboratory information, radiology reports, images, CT scans, ECGs, MRIs enable patients to access their health records at the press of a button.

As healthcare becomes even more complex, integrated, fast paced and quality demanding, electronic medical records (EMRs) are becoming standard equipment. Potential advantages over current paper-base medical record include faster, portable and more reliable access to charts, instantaneous access to decision support from the simple (drug interaction flags) to complex (patient specific messages, e-prescribing), ability to rapidly formulate patient summaries for referrals and letters, integration of laboratory and pharmacy data directly into the patient record, ability to query the practice population to support preventive health maneuvers or research and tighter security.

Electronic medical record technology meets providers' needs for the real time data access evaluation in medical care and also provides the mechanism for longitudinal data storage. Computerization of medical record means the need to keep the hard copy in terms of tones of paper record is taken away. Computerization will reduce space requirements for patient chart storage.

The EMR has the most wide-ranging capabilities and thus the greatest potential for improving quality in terms of documentation, viewing, prescription, investigation, care management, reminders and messaging.

The technologies and practices of patient medical records have been changed dramatically over last decades. Although patient charts filled with doctor notes and lab reports are still the

most common form of medical records, an increasing number of companies and medical organizations are switching to using advanced medical records software, electronic medical records and other technologies.

These advances in medical records improve doctor's ability to address a patient's health concerns, especially if the need arises to visit a doctor while away from home or overseas. Thus it helps to transfer information about past history and treatment at the click of a button.

These advances in the electronic medical records are beneficial for patients, doctors, medical organizations for research and legal purpose and insurance companies, TPAs. The medical records are cumbersome, bulky to use and difficult to manage. On the other hand digital records are much easier to handle, reduce paperwork, reduce chances of error, speedy delivery of important medical information and reduce cost and overheads and improve workflow efficiency by integrating various tasks.

Complete computer based patient management system helps doctors and nurses to minimize the written work, offers timely accurate information required to make fast and intelligent decision and diagnosis. It facilitates easy access to patient records which is time consuming and laborious process in most of the hospitals. Electronic records are kept as an integral part of care planning and delivery process, their data quality is normally very high and almost all administrative requirements for data can be provided as a byproduct of these records. The added benefit is that healthcare providers can generate summaries of encounters and use them for internal quality assurance audit as well as for review and personal study.

Incorporating electronic medical records in a tertiary care hospital will help integration of all information relating to history, clinical features, investigations, diagnosis and treatment by just clicking a button. It will also help in sound decision making , act as effective channel of internal control, facilitate evaluation of corporate performance, promote efficiency of operations, fulfills statutory requirements and also to take necessary futuristic approach.

The healthcare industry in India is also trying to adopt newer technology as per medical needs. The study under consideration is step towards digitalization of medical records in a tertiary care hospital. Though the process of automation had started in Mata Chanan Devi

Hospital a few years back, computerization of medical records was not much thought of. This particular study is about assessment of awareness, acceptability and utility perception of EMR among end users, study of present MRD of the hospital under study as well as other and also various feature of EMR. This study is necessary for effectively implementation of this system in the system.

1.2: STATEMENT OF THE PROBLEM

The medical record (complete with clinical data, family history data, past and present health information, information on allergies, occupational health data, family planning data, immunization data, special therapies data, alternative medical treatment, treatment in foreign countries etc.) is the basic element necessary in medical profession, be it a simple OPD consultation or a surgery or a telemedicine consultation in emergency, or an emergency treatment in foreign country, every doctor needs complete and accurate medical record of past illnesses for quick and accurate diagnosis and proper treatment.

World Health Organization (WHO) estimates that one in 10 patients world-wide fall prey to medical errors[4]. Most of the times, these errors are preventable. The errors usually occur due to incomplete medical information about patients' past health records.

Unlike other industries, medicine still operates primarily with paper- based records. Problems faced with paper based medical record system are:

Rapid growth in volume: Due to economic growth and introduction of health insurance there is rapid growth in volume that is number of medical records.

High risk of loss: Paper records are more prone to damage due to fragility of papers. Fire, water, rodents and possibility of theft cannot be denied.

Barriers to accessibility: A patient's vital medical information i.e. past and present is scattered across medical records kept by many different care givers in many locations – and all of patient's medical information is often unavailable a the time of care.

[4] *Express Healthcare*

Retrieving, reusing key data items and decision support systems: The records are stacked on racks and retrieving them is a laborious and time consuming job. This is the reason why precious time is lost in retrieving the previous records and using them to take decision regarding the treatment and it also impedes the continuity and quality of care.

Space constraint: Last but not the least the storage of these medical records occupies lot of space. Since space is scarce as well as expensive in city like Delhi it is difficult and economically not viable to store such vast amount of paper records.

Taking into consideration all the above mentioned factors and newer technological advances in healthcare industry it would be right to think of adopting electronic medical record system to store and manage patient information effectively.

1.3: RESEARCH QUESTION

"Is it possible to implement Electronic Medical Record System in Mata Chanan Devi Hospital?"

Thus hypothesis is

H_O= It is not feasible to implement EMR system in Mata Chanan Devi Hospital**.**

H_1= It is feasible to implement EMR system in Mata Chanan Devi Hospital.

1.4: LITERATURE REVIEW

The main challenge faced by hospital industry is sheer volume of data on daily basis. Need of the hour is to make this data available across various points within and outside the hospital as well as to store such data for a number of years to meet statutory requirement. Information technology has the potential to bring about seamless integration within the various departments of hospital and connectivity between various healthcare providers, professionals and organizations like insurance, TPAs to enhance patient care.

Information Technology and Healthcare industry:

Hospitals are no strangers to the value of technology. Until recently, however, information technology was limited to administrative and financial applications and played a much smaller role in the care of patients. Today, hospitals around the world are undergoing a digital transformation, harnessing cutting edge IT to save lives[5].

Information Technology, Electronic Medical Record and Health Care Industry:

Scenario in Western Countries

Information technology systems have been employed in health care organizations of US for almost three decades. The IT systems currently utilized by health care organizations generally fall into three main areas: transaction processing systems, management information systems and decision support systems (DSSs). In addition, a few organizations have begun to use the internet as an avenue for communication in both research and health care marketing.

Most hospitals and clinics in the 1970s and 1980s implemented hospital information systems for administrative purposes as a way to deal with patient admission and billing processes. In the 1990s, health care organizations started to use information systems for clinical purposes to improve patient care.

The latest data from the National Ambulatory Medical Care Survey (NAMCS) indicate that one quarter of office based physicians report using fully or partially electronic medical record systems (EMR) in 2008, a 31% increase from the 18.2% reported in 2001 survey[6].

IT spending for implementation of electronic patient records in Western Europe is expected to climb up by 2012, as these systems will become the backbone for accurate healthcare service delivery. The goal of NHS is to have 60000000 patients with centralized electronic medical records by the end of 2010. European physicians especially in Sweden, Netherlands, and Denmark lead US in use of EMR[7].

---

[5] *Information Technology impact on the healthcare industry*

[6] *NCHS Data*

[7] *Denmark summary*

Legal Framework

The electronic medical record of patient should comply with the HIPPA (Health Insurance Accountability and Portability Act) regulation. For organizations that deal with the electronic management of healthcare information it is not only vital to protect the electronic maintenance and transmission of this data, but also protect any paper versions or oral discussions pertaining to the information.

Most of the institutes have HL7 which consists of grammar and vocabulary that is standardized so that clinical data can be shared amongst all healthcare systems, and easily understood by all.

Scenario in India

India is emerging as healthcare hub in Asia with many top hospitals receiving patients from countries across the world. There are ample of opportunities in healthcare industry in India and information technology is proving to be maximizing clinical performance and value. India spends 5% of its GDP on healthcare[8].

India has invested heavily on state of art tertiary institutes offering general and specialty services in one tenth the cost to patients with clinical outcomes comparable to many developed countries. India has potential to become global healthcare hub. Studies have predicted that rapid growth in healthcare industry is expected in India over the next decade. Though use of information technology in healthcare is not new, it is predominantly used in administrative and finance related areas. In India, healthcare delivery systems are based on manual record keeping despite a good telecommunication infrastructure.

IT has changed the landscape of patient care in India. With the help of IT, patient care has improved drastically. In IT enabled hospitals, the bed turnaround ratio has increased by as much as 10 % which is a big advantage. Hence, investment towards enabling IT gets recovered in a few months. Enumerated below are the advantages of enabling IT in hospitals:

[8] *Hindustan Times*

- The quality of service has gone up and hospitals have turned more efficient in terms of reach and delivery of service.
- Integrated electronic medical records facilitate research as data is available in structured manner which helps in studying trends, identifying disease outbreaks etc.
- By means of creation of electronic medical records, each patient's blood group, known allergies etc. can be documented and made available hence preventing manual errors.
- It also facilitates remote diagnosis of patients. As a result people in rural areas can also have access to consultation from specialty doctors.
- It has enabled Customer Relationship Management (CRM), as this is a very important facet for specialty hospitals and chain hospitals, in terms of patient loyalty.
- EMR also helps patients move seamlessly across different geographical locations.
- Integration of clinical and administrative data provides accounting framework hence help with entire billing, inventory management, store management, laboratory management etc.

Thus IT helps in minimizing returns on every penny spent.

Sri Sathya Sai Institute OF Higher Medical Sciences at Whitefield, Bangalore is using a HIS from Medicom Solutions. Healthcare related information is maintained in electronic medical record (EMR) and is available online on a real time basis. As part of the HIS, a fully fledged Laboratory Information System (LIS) is implemented with automatic transmission of lab results from the analyzers and this has helped the hospital go paperless and filmless[9]. Sai Institute is contemplating the integration of database of its unit at Puttaparthi in Andhra Pradesh with its own to create a single interface to the IT systems of both the hospitals.

The Directorate of health services, Government of Maharashtra has initiated a drive to install hospital management information system (HMIS) across four major hospitals and 22 district hospitals in the state. The primary aim of this is to monitor National Health Programme and also monitor hospital related activities such as occupancy in tertiary and district hospital. State government is concentrating on an idea of e-connectivity of district hospital with central hub.

[9] *Hospitals turn to HIS for growth, Express computer*

Healthcare industry in India is moving one step ahead of EMR by adaptation of smart health cards. Smart health card allows information access to patient's medical record. It is an enhanced and a secure access to patient health records. Indrapastha Apollo Hospital in Delhi, KMCH in Coimbatore and Ojus Healthcare in Bangalore are already providing smart health cards for their customers. Konkan Railway Corp[10]. Ltd. And Goa Government is also thinking of providing healthcare card to their beneficiaries.

Legal Framework

The Medical Council of India had Indian Medical Council Act 1956 but with the approval of the Central Government, made the following regulations relating to the Professional Conduct, Etiquette and Ethics for registered medical practitioners, a part of which is maintenance of medical records[11].

- Every physician shall maintain medical records pertaining to his/her indoor patients for a period of 3 years from the date of commencement of treatment in a standard Performa laid down by Medical Council of India.
- If any request is made for medical records either by patients/authorized attendant or legal authorities involved, the same may be duly acknowledged and documents shall be issued within the period of 72 hours.
- A registered medical practitioner shall maintain a Register of Medical Certificates giving full details of certificates issued. When issuing a medical certificate he/she shall always enter the identification marks of the patient and keep a copy of the certificate. He/she shall not omit to record the signature and/or thumb impression, address and at least one identification mark of the patient on the medical certificates or reports. The medical certificate shall be prepared as in Appendix 2.
- Efforts shall be made to computerize medical records for quick retrieval.

A study conducted to compare use of EMR among doctors in Norwegian hospital for general tasks revealed that though significant number of doctors used EMR, out of 15 clinical tasks they used EMR for only 2 to 7 tasks. The tasks used were mainly related to patient data. The

[10] *insight into the business of healthcare*
[11] *Medical Council of India, Code of Ethics Regulations*

respondents showed less frequent use of EMR but satisfaction level of EMR application was positive.

The study aimed to evaluate the experiences of patients and physicians in a clinical trial of online electronic medical record. SPPARO (System Providing Patients Access to Records Online) is a secure web interface to three components: the medical record, a guide to heart failure and a messaging system. The medical record component consists of clinical notes, laboratory reports and test results (including radiographic reports and echocardiogram reports). Physicians anticipated that implementing SPPARO might increase their workload and distort their clinical interactions. In post trial interviews, physicians and staff reported no change in their workload and no adverse consequences. All the physicians ultimately supported the concept of giving online access to their clinical notes and test results.

Texas Medical Association has carried out a special survey on EMR implementation and benefits which shows following results: electronic charting (76.4%) followed by good reports and reporting ability(51%), the sharing of information with the practice management system (48%) and electronic prescribing (43%). 27 % of physicians are currently using an electronic medical record (EMR) system. Almost half of all the physicians are planning an EMR implementation. More than a third (36%) physicians who have implemented an EMR are extremely satisfied and another half (48%) are somewhat satisfied[12].

The Medical Records Institute Survey of EMR Trends and Usage in an annual poll of IT usage of healthcare providers of various types and sizes[13]. Their questionnaire includes perceived effect of EMR on patient care, patient safety and efficiency of healthcare delivery which is similar to the study conducted for this particular project. The findings of the survey which are significant for this study are

- Top priorities for strategic decisions in IT
  - The need to improve clinical processes and workflow efficiency.
  - The need to improve quality of care.
- Major factors driving EMR adoption in the hospital segment

[12] *International Journal of Electronic Healthcare*
[13] *Healthcare IT News*

  - Patient safety considerations.
  - Efficiency and convenience.
  - Satisfaction of physicians and clinical employees.
- Major factors driving EMR adoption in the medical practice segment
  - Improved patient documentation.
  - Efficiency convenience.
  - Remote access to patient information.
- Information capture methods mostly in use
  - Free text keyboard entry.
  - Structured data entry with pull down menus.
  - Structured data entry with keyboards/mice
- EMR administrative applications and functions mostly in use
  - Billing and accounts receivable
  - Scheduling
  - Claims processing
  - Patient appointments
- EMR data capture, review and update application mostly in use
  - Patient demographics
  - Allergies and adverse reactions
  - Laboratory results
- Continuity of care record use has increased since 2006.
- Over half of the respondents rate quality of care, patient safety and efficiency of healthcare delivery as improved by EMRs in their organization.
- Over 90% of respondents anticipate that EMRs will bring about improved quality of care, patient safety and efficiency of healthcare delivery 10 years from now.

One of the key barriers to adoption of these systems has been the concerns of healthcare providers that the system will not provide sufficient return on investment (ROI).This study examines the success of one medium sized physician practice with the selection, implementation and ROI of an EMR. This study reveals than an EMR can provide both

tangible (monetary) and intangible (clinical/quality of care) returns for the healthcare provider.

The COMPLETE (Computerization of Medial Practices for the Enhancement of Therapeutic Effectiveness) study is the first comprehensive evaluation of the feasibility and impact of implementing an EMR in community primary care in Canada and includes a randomized trial of computer based interventions to improve prescribing implementation of a full EMR in primary care offices involving 32 physicians and more than 100 staff [14]. It reveals that a major effort o technical, human factor and practice management issues is required in order to go about doing do and 85% success rate to date is present as compared to rates in the literature which is less than 30%. Successful implementation of EMRs in Canada is feasible but requires significant expertise, time and finances.

1.5: CLASSIFICATION OF ELECTRONIC HEALTHCARE RECORD (EHCR)

- The Automated Medical Record which is paper based record with some computer generated documents.
- The Computerized Medical Record (CMR) which makes the documents of level 1 electronically available.
- The Electronic Medical Record (EMR) restructures and optimizes the documents of the previous levels ensuring inter operability of all documentation systems.
- The Electronic Patient Record (EPR) is a patient centered record with information from multiple institutions.
- The Electronic Health Record (EHR) adds general health related information to the EPR that is not necessarily related to the disease.

Purpose of an EMR is to maintain the benefits of paper based medical record while overcoming its limitations. EMR is a single, permanent document featuring the following key characteristics.

- A compact structure in the form of a collection of documents.

[14] *Use and adaptation of computer-based patient records*

- Ability to encompass the variability and complexity of medicines, as well as health information and practices.
- User friendly method of examining the records.
- Portability of all venues.
- Appropriate authorization.

1.5.1: Types of EMR

There are two primary categories of the EMR:

- The "born digital" record
- The scanned/imaged record.

The "born digital" record, which is information captured in direct electronic format i.e. from inception of the information it is entered into database or transcribed from an electronic media. The information is then transferred to a server or other host environment, where it is stored electronically.

The second category is records originally produced in a paper or other hard copy form (x ray film etc.) that have been scanned and converted to digital form. These are called as "digital format records", as their content is not able to be modified or altered as electronic records. Most medical records generated are in this category.

1.5.2: EMR advantages

EMR systems have proven to be a far better approach to documentation than conventional paper based systems[15]. The primary advantages include:

- Increased efficiency:

Patient information is readily available, saving time or efforts. Additionally, much less office space is required to store the records.

- Improved documentation

[15] *Use and adaptation of computer-based patient records*

Eliminates illegible handwriting, links related records electronically, reduces data entry errors and helps eliminate missing/required patient information.

- Improved quality of care

With EMRs, there is less potential for medical errors as well as improved quality and safety in patient care. There is no substitute for having accurate information about a patient's condition and medical history immediately accessible in the office, at patient's bedside and even instantly in the opening room.

- Accessible patient data

Anywhere critical patient information becomes as mobile as patients are with EMRs. Up to date medical information is accessible even when people move to new town, travel for work or vacation or seek treatment from specialists in another corner of the country. With complete and immediate access to patient records, providers are able to provide better and faster health care delivery.

- More time with patients

Physicians and nurses have more time to spend with the patients. EMR create more time for the work we are trained to do. Currently healthcare professional spend as much time performing administrative tasks as caring of patients and valuable time is wasted in searching for, waiting for and correcting information. While there is initial cost in learning and changing to automated system, the long term benefits include more personalized care raising the level of both medical care and personal attention.

- Improved patient communications and collaborations:

Access to patient information in electronic systems has tremendous potential to improve communication and collaborations between patients and their health providers. Giving patients more secure confidential access to their own medical records and pertinent information about their condition and health characteristics can facilitate informed healthcare decisions.

When EMR are made available to patients through a secure portal which some healthcare organizations are doing individuals become empowered to maintain their health more efficiently, effectively and to comply more easily with treatment plans.

- Improved security

Role based security allows only authorized individuals access to medical records. Access logging and auditing provides a history of who accesses and who modified any record. Option of creating and deleting users and groups adds to security of data.

- Reduction in cost and time

Inventory cost: Reduction in charting material like files, folders, paper, printer, printer toner etc. Eliminates need for most of the activities and dramatically reduces the need for paper storage and indexing facilities.

Storage cost: Physical space required for record storage is more significant cost associated with keeping patient files. The cost of office space is always a significant part of overhead costs and not to forget offsite storage cost.

Human resource cost: EMR allows fewer employees to do more work. Cost of salaries of staff is large part of overhead. Cost saving in this area is significant in achieving positive return on investment from implementation of EMR.

- Time saving

Time saving is very crucial and when it comes to healthcare it becomes more crucial and every patient requires immediate response. EMR saves patients valuable time. Thus time wasted in retrieving, arranging and filing medical record can be eliminated and increased efficiency can be obtained.

Lower costs and better management of risks by consolidating information across clinical operations from admission to treatment to labs and beyond, you increase the pace of information flow including service delivery, coding, billing accuracy, better documentation. EMR systems provide for more consistent application of medical protocols. The rapid

availability of information 24x7 contributes significantly in decision making, reduced errors, improved outcomes and lower malpractice risks.

- Likelihood of reduced malpractice insurance premiums

In some cases, malpractice insurance carriers will reduce malpractice premiums when EMR is used. Also in event of malpractice cases, EMR will provide better documentation – more legible, with an audit trail- for presenting a defense.

- Improvement in healthcare economics and quality

The potential benefits of EMR are enormous to all the healthcare providers, patients and ultimately to the economics of healthcare throughout the country.

The secure exchange of patient information can improve the quality and safety of patient care while lowering the cost of care delivery. But the potential costs are also large, demanding both commitment of resources and careful selection of an integrated, fully functional set of solutions. EMR helps in streamlined, efficient and intuitive information sharing with help of healthcare experts and technology experts by ensuring the safety and security of that information.

- Adapt to regulatory changes

Meeting HIPPA and other legislative and regulatory challenges with organized, complete information. Clinical information system allows administrators and management to easily document and conform to changes in the regulatory environment. It also allows auditors and regulators to rapidly assess compliance.

1.5.3: Functionality of an EMR

- Appointment scheduling to deliver healthcare with effective use of available resources.
- Patient information capturing including demographics and payment source information.
- Electronic medical billing.
- Eligibility verification and authorization manager,
- Claims management – Charge capture and claim scrubbing.

- Electronic claims transmission and compliance with standardization norms.
- Expected reimbursement tracking
- Paperless follow up and collections
- Charting
- Messaging and alert system
- Drug interaction: Integration of standard drug interaction database.
- Tasks/Order tracking
- Archiving
- Reporting
- Configuring and providing various master data used in the healthcare, which include physician information, procedure information, facility information, procedure codes etc.
- Interfaces to tablet PC, PDA
- DICOM- Standard for management of images.

1.5.4: EMR facilitates

Digitalization is primarily the process of converting written and printed records into electronic form. The contents could be text, image, audio or combination of all. This electronic document can be hosted on Internet or Intranet. EMR facilitates

- Easy look up of the patient data by clinical staff at any given location.
- Accurate and complete claims processing by insurance companies.
- Building automatic check for drugs and allergic interactions.
- Clinical notes
- Prescriptions
- Scheduling
- Sending and viewing lab investigations.

1.5.5: Importance of Electronic Medical Record

- Lower risks of medical/nursing errors.
- Alliance with visual images and diagnostic results.

- Offers ease of documentation at point of care.
- Provides continuity of case records.
- Improves productivity and quality of care.
- Improves documentation and legibility of clinical service.
- Eliminates inefficiency associated with paper records.
- Streamlines clinical workflow.
- Decision support for drug ordering, allergy warning and drug incompatibility.
- Warning for abnormal laboratory.
- Support for clinical research
- Better management of chronic diseases.

1.6: Requirements

Digitalization necessitates a holistic approach being taken to technology, encompassing not only core healthcare information and ancillary systems but also the full spectrum of medical equipments, communication devices, networks and other systems. For efficient and effective EMR system one should have appropriate

Hardware: That is PCs, digital pads, PDA, scanners, servers etc. Hardware should be high speed and should have required storage capacity. The imaging and diagnostic equipments should be interfaced with the system.

Software: Software is the brain of the system. The software should function efficiently and effectively. It should comply with DICOM, NABL guidelines, ICD-10, current procedural technologies and other standards suitable in Indian requirements.

Technical support: It is required to have support system both for software as well as hardware. In build security of confidential data is of great importance while using such systems. It is also necessary for maintaining present system as well as upgrades the system as per new developments.

1.6.1: Steps to implement an EMR system in hospital

- Study lifecycle of document in the organization.

- Take decision whether to get it developed in house or outsource.
- Analysis of current system.
- Depicting required system
- Identify the gaps
- Committee formation
- Mutual decision regarding process, time frame and functional details.
- Implementation (scheduling and actual use)
- Maintenance/Up gradation

There are always drivers identified for Electronic Medical Record adaptation

1.6.2: Administrative

- Need to share comparable patient data among different sites within hospital or health care delivery system.
- Need to improve clinical documentation to support appropriate billing services.
- Requirement to contain or reduce healthcare documentation cost.
- Need to establish more efficient and effective information infrastructure as competitive advantage.
- Need to meet regulatory and accreditation standards.
- Need to carry out medical audits.

1.6.3: Clinical

- Improve ability to share patient record or information among healthcare practitioners and professionals within the enterprise.
- Improve quality of care.
- Improve clinical processes and workflow efficiency.
- Improve clinical data capture.
- Improve patient safety by reducing medication errors.
- Provide access to patient record at remote locations.
- Facilitate clinical decision support.

- Develop good customer relationship by improving patient satisfaction.
- Improve efficiency via pre visit assessment and post visit education.
- Improve physician as well as employee satisfaction.

Barriers to adaptation of Electronic Medical Record are

- Lack of support from medical staff.
- Achieving end users acceptance.
- Skills and preference of existing support staff.
- Inadequate healthcare information standards.
- Difficulty in having affordable and suitable EMR solutions.
- Difficulty migrating from paper electronic records.
- Time and efforts to make organization accept EMR.
- Difficulty in integrating system.
- Lack of structured medical terminologies.
- Lack of easy way to input data and notes.
- Difficulty to build to strong business case.
- Lack of management support.
- Security concerns

Considering issues involved with electronic medical records some hospitals are choosing the options of hybrid medical records. There are two types of hybrid records:

- A combination of EMR and chart paper
- An EMR with document imaging.

The hybrid record with document imaging eliminates the need for maintaining a paper chart and the storage space and cost issues that go along with it. Computerized medical records is not a new concept but its adaptation is not satisfactory in Indian hospitals due to reasons like cost involved, security of data and most importantly the reluctance of medical/paramedical staff to adopt to newer technology.

There are very few studies related to feasibility of implementation of Electronic Medical Record in a hospital. The literature search on electronic medical record mainly enlightens the benefits, acceptance, pre and post review of EMR system by the users. Few EMR perception studies are done in Western countries and the results of such studies are taken as reference for this particular project.

1.7: OBJECTIVES OF THE STUDY

- To study the existing processes and procedures of medical record department at Mata Chanan Devi Hospital.
- To analyze the awareness, acceptability and perceived utility of electronic medical record (EMR) system among the end users of medical record.
- To access the technical and financial feasibility for implementing electronic medical record (EMR) system in the hospital under study.
- Based on gathered information, observation and analysis give recommendations for implementation of electronic medical record (EMR) system at Mata Chanan Devi Hospital.

CHAPTER-2

2.1: DATA AND METHOD

The medical record department looks after records of the patients admitted in the hospital. If this data is saved in electronic form it can be arranged systematically and will be easy to retrieve and access which will be useful for patients and research, administrative, legal purpose. Thus the study was conducted at Mata Chanan Devi Hospital to find out whether it is feasible to implement an Electronic Medical Record System.

2.1.1: Approach

In this study several steps are taken to reach till analysis. It is analytical in nature.

The primary data is collected by

- Personally visiting other hospital to get information about their medical record system.
- Interviewing and distributing questionnaire which was prepared to access the awareness, acceptability and perceived utility of electronic medical record system.

The secondary data is collected through healthcare related journals, books and research engines.

The sample selection was based on simple random sampling. Sample size for the study was 150 i.e. 50 each from doctors, administration staff and patients.

2.1.2: Data Collection

The response to questionnaire was collected from all the samples and taken into consideration for the study. To study the current trends (specific to medical records) in healthcare market I personally visited other hospitals.

For data analysis SPSS version 15.0 and Ms Excel is used.

2.2: Time Framed

ID	Task Name	Start	Finish	Duration
1	Preparation of data collection	2/9/2012	2/17/2012	7d
2	Approval from organization	2/20/2012	2/20/2012	1d
3	Collection of data from source 1	2/21/2012	3/1/2012	8d
4	Collection of data from source 2	3/5/2012	3/20/2012	12d
5	Data analysis and compilation	3/21/2012	4/9/2012	14d
6	Drafting of project	4/10/2012	4/23/2012	10d
7	Submission of the first draft	4/24/2012	4/24/2012	1d

Table 1: Time Framed of the project

Study of Medical Record Department at Mata Chanan Devi Hospital

Medical records department in the hospital is responsible for maintaining medical records of all the patients admitted in the hospital. The separate department is been established since 1968-1969. Initially registers of different specialties were maintained in which entries were made about patient's demographic details, diagnosis and operations. Then records were filled and arranged in the racks as per patient's indoor case number. The coding system based on "International Classification of Diseases" has been adopted by Medical Records Department (MRD) since 1991.

2.3: Existing Data Flow Diagram of MRD

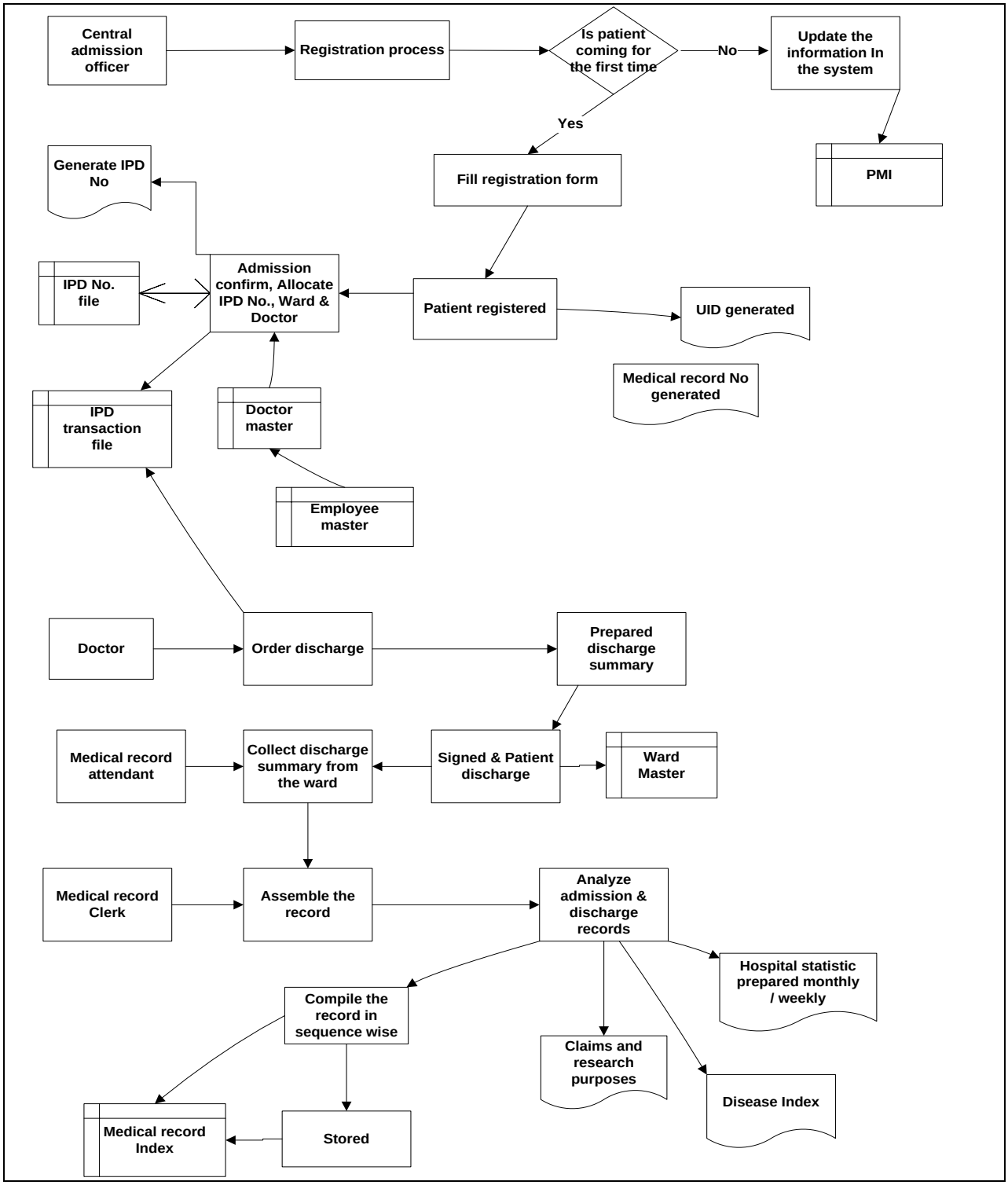


Fig 1: Existing DFD of MRD

2.3.1: Functioning of MRD

- Collection of case files

After the patient is discharged, the billing section keeps the files in the accounts section. The attendant from the medical record collects these files next day.

- Receipt of case files

The admission, discharge lists and admission register are generated in MRD through Central Admission Office (CAO). The clerk of the MRD checks the case files with the discharge list. The clerk then endorses the date of discharge on the admission list.

- Checking the case files

All case files are checked by clerks for any deficiency and put up to MRO who also checks the case files and the deficiency list is prepared. In case the deficiency is not rectified by the unit concerned, the case file is forwarded to the Medical Superintendent. After rectification, the case files are returned to MRD.

- Coding

After the case files are ready, the clerk assisted by the MRO does the coding. The 'disease coding' is done on the basis of "ICD-10" of WHO Volume III and 'surgical procedure' on publication of ICD-9 of St. Anthony Hospital, Washington.

Coding for diseases and operations for each individual file is done with the help of ICD books. This ICD book has the sequence of different names of diseases and operations just like a dictionary system.

- Indexing

After completion of coding, the case files are passed to 'Indexing Clerks' who enter the particulars in the Index Cards. Diagnostic and surgical procedures have separate Index Cards. Every year these cards are bonded in register form and kept for research permanently.

Patient Master Index- The Patient Master Index is created with important identification information for each new patient registered in the central registration area electronically through computer.

- Assembling

After indexing, these files are passed to the attendants who sizes these case files uniformly and tidily. When all the records are assembled in a standard order, these are stapled with the colored strip. The color of the strip is selected different for each year to avoid mixing of the files of other years.

File identification by colors

Year	Color
2001	Light blue
2003	Green
2004	Red
2005	Dark Blue
2006	Yellow
2007	Brown
2008	Green

Table 2: File identification by colors

- Filing

After assembling the case files, the attendant writes IP number on upper corner of back side/ last page of the case files in such a way that it should be clearly visible and can be filed and taken out easily. All case files are filed according to IP number.

A complete file of discharged patient thus constitutes the following records in the order

i) Patient admission form and consent form
ii) History of patient

iii) Physical examination
iv) Summary of case and purpose of reference (issued by consultant)
v) Anesthesia report
vi) Operation record
vii) Case summary and discharge record
viii) Registration cum admission form
ix) Continuation sheet (date wise)
x) Pathology/lab report
xi) Blood bank report
xii) Medication report
xiii) Nurses' daily record
xiv) Diet chart
xv) Blood sugar record
xvi) Discharge summary
xvii) Invasive device chart
xviii) Vital sign record

- Issuing/ Retrieving

These case files are reissued for the following purpose under order of competent authorities i.e. Medical Director, Medical Superintendent and Consultants.

i) Research and study
ii) Medico-legal purposes
iii) Claims of insurance/compensation
iv) Issuing of medical certificates

The case files are retrieved from the racks where they are arranged according to IP number. If the file is not in the rack one has to refer to issue register, list of police case files, list of medico-legal files or admission or discharge registers to find out the whereabouts about the particular file.

The register is maintained to enter the details of file issued. It contains the details of case file, which it has been issued to, date and who has taken the file.

Sl. No	MRD No.	Patient Name	Age & Sex	Dept.	Unit Head	DOD	Receiving Date	Stay in Hospital	Diagn-osis	ICD	Remark

Table 3: Sample of Register in MRD

CHAPTER- 3

3.1: RESULTS AND FINDING

As mentioned in methodology the questionnaire was designed to know the awareness, acceptability and perception of EMR by end users.

Outcome to common questions from the entire three questionnaires is evaluated together.

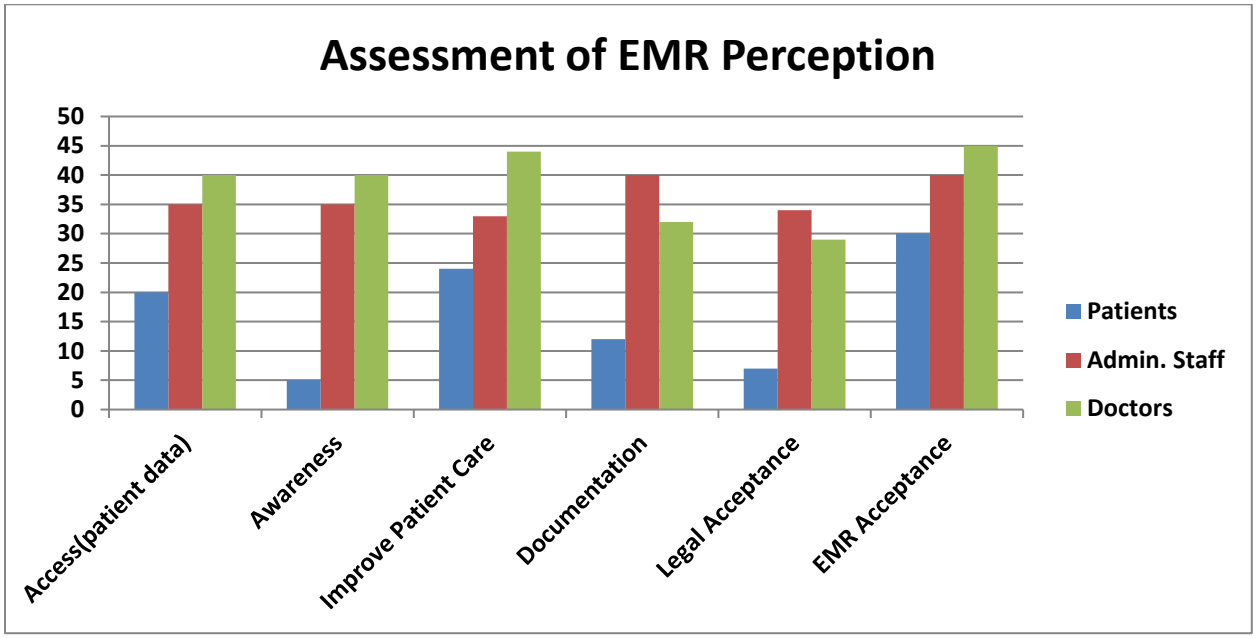
Questions common to questionnaire were

- If respondents are ready to accept EMR practice in their use.
- If they are aware about electronic medical records.
- If EMR can improve patient care.
- If EMR can improve documentation.
- If EMR can give easy access to patient data.
- Should EMR be legally accepted?

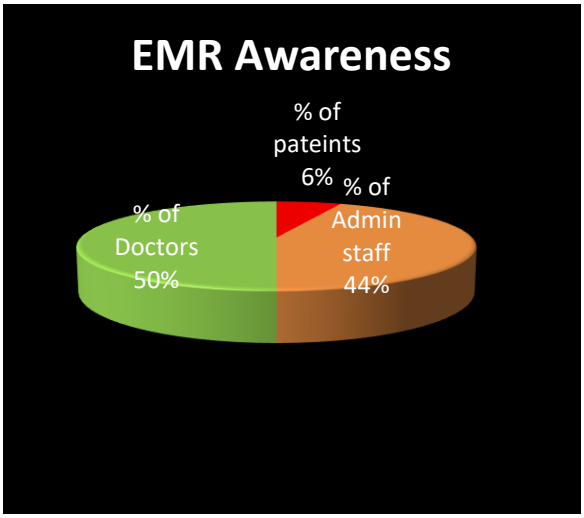
Respondents giving positive response to above questions are taken into consideration for statistical analysis as tabulated below:

	Patients	**% of patients**	**Admin. Staff**	**% of Admin staff**	**Doctors**	**% of Doctors**
Access(patient data)	20	40%	35	70%	40	80%
Awareness	5	**10%**	35	70%	40	80%
Improve Patient Care	24	48%	33	66%	44	88%
Documentation	12	24%	40	80%	32	64%
Legal Acceptance	7	14%	34	68%	29	58%
EMR Acceptance	30	**60%**	40	80%	45	90%

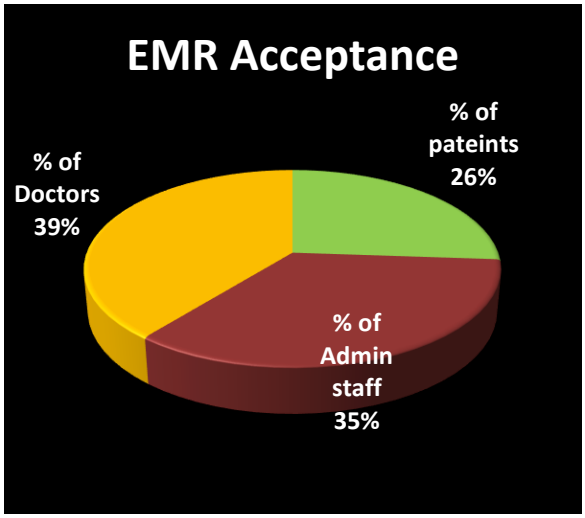
Table 4: Data for assessment of EMR perception



Graph 1: Assessment of EMR Perception



Pie chart 1: EMR Awareness

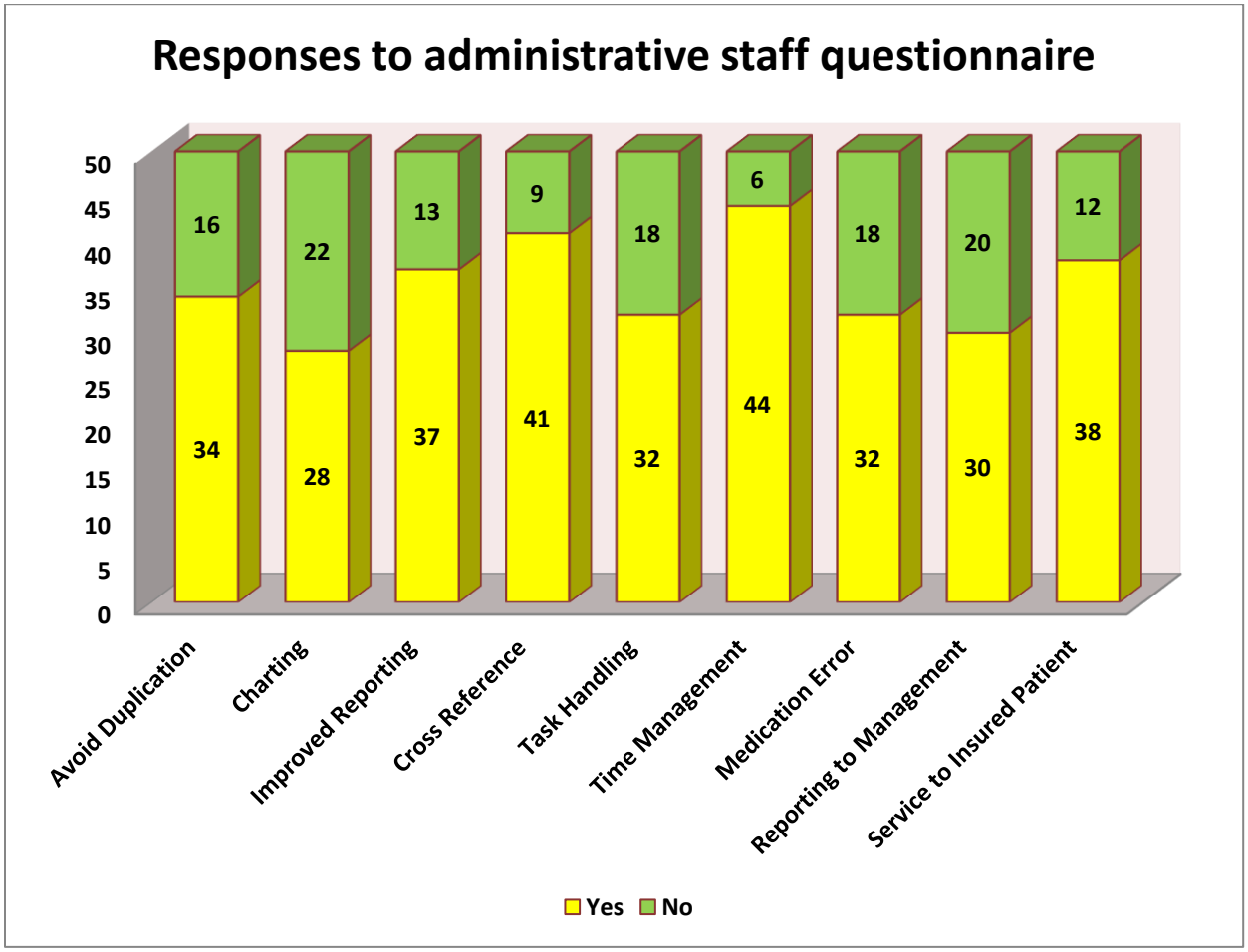


Pie chart 2: EMR Acceptance

From the analysis of the above data regarding the perception of common questions to all the types of respondents. It is observed that there is significant difference in the EMR perception of three groups i.e. patient group awareness about EMR is very less compared to other two groups (10%). But response to acceptance of EMR is significant in all the three groups (>60%).

Response to administrative staff's questionnaire

The response mentioned is perception of administrative staff to possibility of improvement in following parameters.

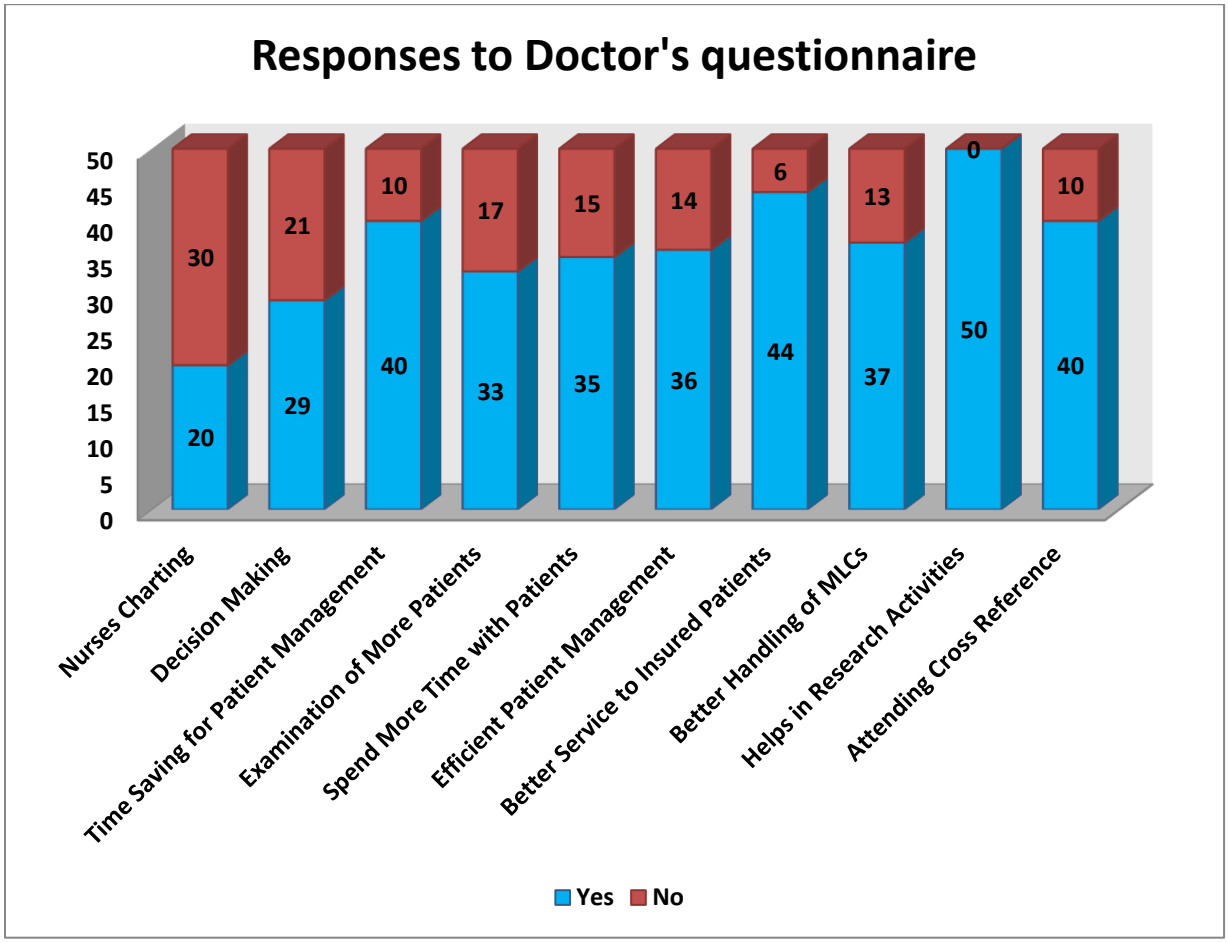


Graph 2: Responses to administrative staff questionnaire

The above data concludes that there would be significant improvement in various activities carried out within the hospital. It is seen from above data that 68% staff think that it would avoid duplication of work, 56% agree to improved charting, 74% agree to improvement in investigation reporting, 82% cross references, 64% better task handling, 88% time management, 64% reduction in medication error, 60% better reporting to management , 76% service to insured patient.

3.1.1: Response to Doctors' questionnaire

The response mentioned is perception of doctor to possibility of improvement in following parameters.

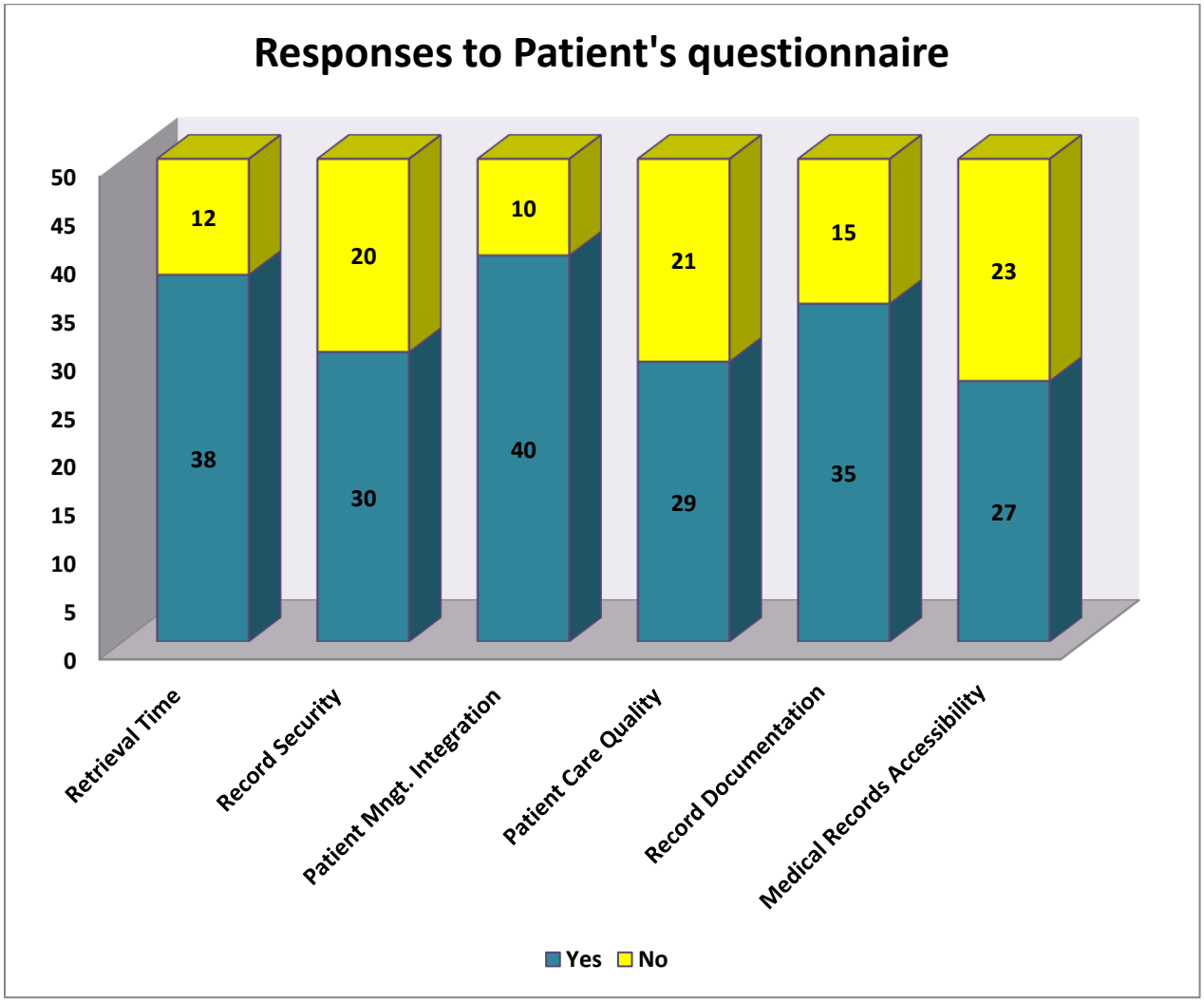


Graph 3: Responses to Doctor's questionnaire

The above data concludes that there would be significant improvement in various activities carried out within the hospital. It is seen from above data only 40 % doctors agree to improved charting, improved decision making (58%), time saved in patient management(80%), examination of more patients(66%), 70% think that they can spend more time with patients, attending cross references (80%), 88% say that better service can be provided to insured patients,74% say that medico legal cases can be handled in better way and 100% agree that it would help research activity.

3.1.2: Response to patient questionnaire

The response mentioned is response of patients to possibility of improvement in following parameters.



Graph 4: Responses to Patient's questionnaire

The response of patient indicate that there would be reduction in time spent on retrieval of records, 60% say that electronic medical record are secure and 80% agree that there should be integration of all patient related data.

CHAPTER- 4

4.1: DISCUSSION

Digitalization of medical records is possible in two ways

- Scanning the documents.
- Direct medical record entry in HMS.

4.1.1: Technical Feasibility

Technical Requirement

For Workload: 75 cases files per day. Each file consists of on an average 35 pages.

Type of documents to be scanned: Indoor case files along with ICU charts

For scanning:

Scanner specification: It should be mainly to scan paper documents. Resolution should be around 600i. Scanning area should be A3 size as it can scan the ICU charts too. The software to convert or copy scanned images to computer hard disc is required. Scanner with page feeder would be ideal for medical records.

If a case file has 35 pages a file after scanning will be of 1MB size, so daily space required on hard disc is 75MB and 2250MB i.e. 2-3GB space required monthly, 432GB per year and in addition to this back up space required to store this data.

Scanned page is stored as image and transferred to computer as image. The software is required to convert these images to file format i.e. indexing etc. Integration of these files or images is possible with HMS.

Appropriate space required for a scanner is 2x2 ft. Now there are scanners along with photocopier, printer, fax and e-mail facility available which would be ideal for medical record department. These types of scanners can scan approx. 15-20 pages per minute.

Observation

- Existing system is compatible with the scanner software.
- Approximate time taken to scan 75 files would be 3 hours.
- System can integrate the scanned files in present HMS.
- There will be training provided to existing staff and no specific skills are needed for scanning.
- The software for indexing, categorizing of document will eliminate need of manual indexing of ICD codes and ICD code entry in HMS.
- The physical files are required only in legal matter as it is mandatory to produce physical/paper files in court of law. There are only 2-3% files retrieved for legal purposes. Approximately 80-90% case files retrieved are of current and previous year i.e. active files which would be easily retrieved from the scanned document.

The indoor case file on an average consists of 6-7 investigation reports. At present the diagnostic and laboratory reports are online till patient is admitted which can be retrieved from the system and can be compiled together as a part of medical record of the patient. By doing so there would be decreased scanning required (approximately 500 pages).

Though scanning depends on paper quality, size, darkness of writing etc. it can be overcome by taking appropriate measures.

Thus scanning would be suitable option which can reduce manual retrieval of case files which is laborious and time consuming and can also be useful in decreasing overheads such as manpower, inventory etc.

For medical record entry in HMS

Development of new software or medical record module in existing system should comply with the standardization norms along with server fail over mechanisms built in order to eliminate information loss. Also the capacity to upgrade the system as per the changing trends.

Hardware requirement such as PCs at each work station, other apparatus like Dictaphones, digital pads etc. depending on mode of data entry. UPS system should be in place to avoid data loss.

Server or high speed storage device of required capacity to store data is required. Interfacing all the diagnostic and imaging equipments to the server and storage device is must.

Observation

- All the work stations are equipped with required hardware so not much investment is required.
- Present system is compatible to interface diagnostic and imaging equipments.
- The capacity of present servers is enough to accommodate the new data which can be fed in.
- At present the diagnostic and laboratory reports are online till patient is admitted which can be retrieved from the system and cab ne compiled together as a part of medical record of the patient. Thus hard copy of the reports need not be kept in the record which in turn reduces the storage space requirement.

Observation reveals that in house development of medical record module and integration of other data is also possible.

4.1.2: Financial feasibility

Present expenditure in medical record department

Storage and office space: Approximately 1035 sq. ft. (100 sq. ft. officer's cabin/ 150 sq. ft. clerical staff area/ 100 sq. ft. attendant area/ 680 sq. ft. storage area)

Property rate: 8870 Rs. Per sq. ft.

Approximate cost is 9,136,100

Manpower : 1 Medical Record Officer

4 Clerical staff

3 Attendants

Staff salaries : Rs. 80,000 per month

Technology : 2 PCs with ribbon printers

Investment Rs. 50,000 but considering depreciation it must be Written off.

Photocopier machine – 1 approx. Rs. 1,000,00.

Depreciation 10% so now Rs. 81,000

Inventory : Racks and stationary approximately Rs. 5,000

Depreciation 10% so now Rs. 4,000.

Stationary per month Rs. 1500

Electricity : 400 units/month i.e. Rs. 2900 (approx)

Miscellaneou : Approx. Rs. 500

For Scanning

For amount of daily workload mentioned above one scanner would be enough.

Cost of scanner: Rs. 1,50,000

Space for office and scanner: 435 sq. ft. (100 sq. ft. officer's cabin/35 sq. ft. clerical staff area/115sq. ft. attendant area/13sq. ft. storage area/50 sq. ft. equipments)

Cost would be Rs. 3,858,450

Manpower: 1 officer/1 clerical staff/3 attendants

Expenditure on salary- Rs. 50,000

AMC per month: Rs. 1500

Inventory: Stationary per month: Rs. 1500

Electricity: 450 units/month i.e. Rs. 3200

Miscellaneous cost; Approx. Rs. 1000

For medical record entry in HMS

Space for office: 400 sq. ft. (100 sq. ft. officer's cabin/35 sq. ft. clerical staff area/60 sq. ft. attendant area/150sq. ft. storage area/50 sq. ft. equipments)

Cost would be 3,636,700

Hardware cost (PCs): Rs. 60,000

Manpower: 1 officer/1 clerical staff/2 attendants

Expenditure on salary- Rs. 40,000

AMC per month: Rs. 1500

Inventory: Stationary per month: Rs. 1500

Electricity: 480 units/month i.e. Rs. 3450

Miscellaneous cost; Approx. Rs. 1000

<table>
<tr><td>Criteria</td><td>Current Scenario</td><td>Scanning</td><td>Medical Record Entry in HMS</td></tr>
<tr><td>Storage and Office Space</td><td>Property Rate: Rs. 8870/sq. ft.
<table><tr><td></td><td>W</td><td>L</td><td>Total</td></tr><tr><td>Room 1</td><td>10</td><td>10</td><td>100</td></tr><tr><td>Room 2</td><td>10</td><td>15</td><td>150</td></tr><tr><td>Room 3</td><td>25</td><td>26</td><td>100</td></tr><tr><td></td><td></td><td></td><td></td></tr></table>Total area: 1035 sq.ft.
Total cost: Rs. 9,189,320</td><td>435 sq. ft. and cost would be 3,858,450</td><td>410 sq. ft. and cost would be Rs. 3,548,000</td></tr>
<tr><td>Manpower</td><td>1 Medical Officer
4 Clerical Staff
3 Attendants</td><td>1 Officer
1 Clerical staff
3 Attendants</td><td>1 Officer
1 Clerical staff
3 Attendants</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

Hardware	PCs: Nil Photocopier Machine: Rs. 81,000	PCs: 1 Rs. 30,000 Scanner:1 Rs. 1,50,000	PCs: 2 Rs. 60,000
Inventory	Racks: Rs. 4000 Stationary per month: Rs. 1500	Stationary per month : Rs. 1000 Racks: Rs. 4000	Stationary per month : Rs. 1000 Racks: Rs. 4000
Electricity	Rs. 2900	Rs. 3200	Rs. 3400
Miscellaneous cost	Rs. 500	Approx. Rs. 1100	Approx. Rs. 1100
Staff Salaries	Rs. 80,000	Rs. 50,000	Rs. 50,000
Total	Rs. 9,361,720	Rs. 4,290,800	Rs. 4,257,500

Thus the above calculations suggest that it is financially feasible to adopt electronic medical record system.

4.2: LIMITATIONS OF THE STUDY

- Patients were interviewed personally after briefing them on EMR so patient's response may be biased.
- Since EMR is newer method of data management in Indian hospitals not much information could be gathered in Indian context.

CHAPTER 5

5.1: CONCLUSION

The evaluation is carried out based on the current trends in medical record in practice, the response of acceptance by end users towards EMR along with technical and financial feasibility.

Trend analysis shows that the hospitals are moving towards digitalization of medical records. The survey done for acceptance by end users indicate that they believe that there would be significant improvement in patient care access to patient data, improved quality of services provided by hospitals and they are ready to accept the new record system.

The evaluation of technical and financial aspect of electronic medical record system with current system reveals that it is favorable to implement new record system.

Thus feasibility study conducted at this particular hospital for implementation of electronic medical records concludes that it is feasible to implement EMR system in the hospital.

5.2: RECOMMENDATIONS

Considering increased involvement of IT in healthcare industry in due course of time EMR usage will be considered prerequisite for efficient delivery of high quality healthcare in hospital.

Looking at observations and analysis of study I would like to recommend implementing electronic medical record system in the hospital.

There are some recommendations I would like to make

- Acceptance of EMR by health professionals is crucial for implementation. The participation of top management, clinicians and administrative managers throughout the process of electronization of medical records is the best strategy,
- Each user group would have their own view points and opinion that must be reconciled to arrive at system to meet everyone's needs.

- Keeping into the view, the technical and financial aspects the implementation strategy can be planned to implement EMR.
- It is mandatory to preserve physical records but implementing EMR hospital can store these records in warehouse away from hospital and utilize that space for other purpose.
- The data stored in these records can be utilized for various policies or management related decisions by generating various metrics and will help in resource allocation.
- EMR can reduce overheads and optimum resource utilization is necessary.
- Adopting EMR will be beneficial for accreditation of hospitals.
- The EMR can provide access to patient information at anytime and anywhere, since medical tourism is picking up in India this would be one of the competitive advantage for the hospitals.
- EMR would improve customer relationship and will help create improved brand image.

REFERENCES

i) Wikipedia, the free encyclopedia, Electronic Medical Record.

ii) Medical Council of India, Code of Ethics Regulations, 2002, published in part III, section IV of the gazette of India on 6th April, 2002.

iii) Health Assistance of Families, USA; April 2003, Patients. Access to Medical Records, The HIPPA privacy regulation.

iv) Express Healthcare Management, Hospitals are going the smart way by Soumya Vishwanathan, Mumbai.

v) http://www.ameinfo.com/155680.html

vi) Electronic Health Record Systems and intent to apply for meaningful use incentives among office based physicians practices: United States, 2001-2011

vii) Harris Interactive Healthcare News 2(16) 2002, European Physician in Sweden, Netherlands and Denmark lead U.S. in use of EMR.

viii) **HT Correspondent, Hindustan Times** New Delhi, November 28, 2011

ix) Express Computer; 24 January 2005, Hospitals turn to HIS for growth by Abhinav Singh.

x) Embracing Technology, Insight Into The Business Of Healthcare Express Healthcare

xi) Medical Council of India, Code of Ethics Regulations, 2002, published in part III, section IV of the gazette of India on 6th April, 2002.

xii) International Journal of Electronic Healthcare (IJEH), Vol. 2, No. 2, 2006, An Examination of the financial feasibility of Electronic Medical Records (EMRs): a case study of tangible and intangible benefits by Steven John Simon, Stuart Jay Simon.

xiii) *Healthcare IT News* and *Healthcare Finance News*, June 2007, Hybrid medical record an option for some hospitals by Richard Pizzi.

xiv) California Healthcare Foundation, Oct. 2003, Use and adaptation of computer-based patient records by David J Brailer, Emi L. Terasawa A.B.D.

xv) California Healthcare Foundation, Oct. 2003, Use and adaptation of computer-based patient records by David J Brailer, Emi L. Terasawa A.B.D.

BIBLIOGRAPHY:

i) The Computer Based Patient Record, An Essential Technology for Healthcare; National Academy Press Washington D.C. 1997
ii) Statistical Methods in Medical Research: Second Edition, P. Armitage, G. Berry, Blackwell Scientific Publication
iii) Management of Hospital: Dr. S.L. Goel, Dr. R. Kumar, Deep and Deep Publications Pvt. Ltd.,2002
iv) Medical Record Procedure in Small Hospitals; Betty Wood McNabb; Physician Record Company, 1958
v) Medical Informatics A Primer; Mohan Bansal, Tata McGraw-Hill Publishing Company Limited, New Delhi
vi) Medical Records Organization and Management; G.D.Mogli, JAYPEE BROTHERS, MEDICAL PUBLISHERS (P) Ltd., New Delhi

APPENDICES

APPENDIX-II

ELECTRONIC MEDICAL RECORDS SURVEY QUESTIONNAIRE (For Patients)

Consent for the Interview: Your participation for the study is voluntary and would be highly appreciated. Few questions will be asked in this regard. The complete interview is scheduled for not more than 5 minutes. Information shared by you will be kept private and confidential.

I would like to get your consent to participate in the survey. You can wish to answer the questions and not to answer any question or all the questions. Your participation will be of great importance.

Name: ……. Age: ……

Education: Under graduate ☐ Graduate ☐ Post Graduate ☐ Others ☐

Admitted: First time ☐ Multiple times ☐

Insured: Yes ☐ No ☐

1. Do you know what an electronic medical record is?	Yes……1 No……2	
2. Have you ever used any form of electronic medical record?	Yes No	
3. What would you prefer paper based or paperless records and why? (Record Verbatim)		
4. Do you think electronic medical record would improve • Accessibility of your medical records • Quality of patient care • Documentation of records • Time spent in retrieval • Security of records		

• Integration of patient information (Record verbatim)		
5. EMR should be legally accepted? (Record Verbatim)		
6. Who should be authorized to access these records?	Patient ……1 Physicians…….2 Nurses…….3 Insurances company…4 Others…..5	
7. Do you think it would also help medical and paramedical staff to pay more attention to patient care rather than writing work?	Yes……..1 No……2	
8. According to you how long these records should be preserved?	5 years…….1 10 years…..2 10 years and more….3 Don't know……4	
9. What other benefits of electronic medical records you think of as patients perspective (Record verbatim)		

Thank You for your Co-operation

Signature of the Interviewer

APPENDIX-I

ELECTRONIC MEDICAL RECORDS SURVEY QUESTIONNAIRE (For Admin Staff)

Consent for the Interview: Your participation for the study is voluntary and would be highly appreciated. Few questions will be asked in this regard. The complete interview is scheduled for not more than 5 minutes. Information shared by you will be kept private and confidential.

I would like to get your consent to participate in the survey. You can wish to answer the questions and not to answer any question or all the questions. Your participation will be of great importance.

Name: ……. Age: ……

Gender: Male ☐ Female ☐

Designation: ……..

1. Are you aware of what an electronic medical record is?	Yes……..1 No……2	
2. Are you accustomed to computer application?	Yes……..1 No……2	
3. Are you ready to accept the change over to EMR?	Yes…….1 No…….2 Don't know…..3	
4. Do you think EMR will		
• Improve patient care	Yes……..1 No……2	
• Avoid duplication of work	Yes…..1 No……2 Can't say……3	

• Improve Charting TPR/BP, medication etc • Improve complaint management at ward level (Record verbatim)	Yes…..1 No……..2	
• Improve reporting (daily patient reports) (Record verbatim)		
• Improve documentation	Yes….1 No…..2	
• Help quicker attending of cross references (by doctors) (Record verbatim)		
• Improve task handling	Yes…..1 No…..2	
• Improve time management (patient care/document retrieval/query handling)	Yes…….1 No….2	
• Avoid skipping or overdose of medicines (Record verbatim)		
• Improve reporting to management	Yes…..1 No….2	

Thank You for your Co-operation

Signature of the Interviewer

APPENDIX-III

ELECTRONIC MEDICAL RECORDS SURVEY QUESTIONNAIRE (For Doctors)

Consent for the Interview: Your participation for the study is voluntary and would be highly appreciated. Few questions will be asked in this regard. The complete interview is scheduled for not more than 5 minutes. Information shared by you will be kept private and confidential.

I would like to get your consent to participate in the survey. You can wish to answer the questions and not to answer any question or all the questions. Your participation will be of great importance.

Name: ……. Age: ……

Specialty:…….

1. Are you aware of what an electronic medical record is?	Yes ……..1 No…….2	
2. Are you accustomed to computer application?	Yes……..1 No……2	
3. Have you used it in your practice?	Yes……..1 No……2	
4. What would you prefer paper based or paperless records and why? (Record verbatim)		
5. Are you ready to accept the change over to EMR? (Record verbatim)		
6. What is your perception of EMR and what all should be integrated in it? (Record verbatim)		
7. Should it be accepted legally	Yes……...1 No…….2	
8. How should it be documented at ward level?	Typed…….1 Scanned…….2 Digital pads……3	

	Others……..4	
9. According to you clinical and administrative data should be integrated?	Yes…….1 No…….2	
10. How many years' data should be stored in EMR?	5 years…….1 10 years…..2 10 years and more….3 Don't know……4	
11. What is your perception about security of EMR and how should it be maintained?		
12. Do you think EMR will	Yes …….1 No…….2	
• Improve quality of patient care		
• Improve accessibility to patient data		
• Improve documentation		
• Get better charting by nursing staff		
• Help in decision making		
• Save time in patient management		
• Reduce time spent on paper work (Record verbatim)		
• Help you see more patients and efficiently		
• Allow you spend more time with the patient		
• Help in medico-legal cases:		
• Help you give better service to insured patients		
• Be of help in research purpose		
13. What other benefits of electronic medical records can you think of? (Record verbatim)		

Thank You for your Co-operation

Signature of the Interviewer