**INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH,**

**NEW DELHI**

# CERTIFICATE BY SCHOLAR

This is to certify that the dissertation "**To Study the Awareness, Knowledge, Behavior, Attitude, Towards Electronic Medical Records and Current Practices Followed among Ophthalmologist**" and submitted by Dr. Kirti Thakur Enrollment No. PG14/026 under the supervision of Ms. Anandhi Ramachandran for award of Postgraduate Diploma in Hospital and Health Management of the Institute carried out during the period from 1st February 2016 to 30th April 2016 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Signature

# FEEDBACK FORM

**Name of the student:** KIRTI THAKUR

**Dissertation Organization:** ELI INDIA

**Area of Dissertation:** To study the awareness, knowledge, behavior, attitude towards EHR and current practices followed among ophthalmologists.

**Attendance:** 100%

**Objectives achieved:**
1) EHR Responsiveness among ophthalmologists.
2) EHR Pros & Cons
3) Understanding charting constraints

**Deliverables:**
1) Market study - EHR
2) Upcoming Trends - EHR & meaningful use

**Strength:** Kirti is a very quick learner
Inquisitive & hard working.

**Suggestions for Improvement:** Needs improvement on Documentation side,

**Signature of the officer in charge/Organization Mentor (Dissertation)**

**Date:** 5/16/2016

**Place:** faridabad

## Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Kirti Thakur**, 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 titled **"To Study the Awareness, Knowledge, Behavior, Attitude, Towards Electronic Medical Records and Current Practices Followed among Ophthalmologist"** at **ELI India** 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.

Dr. Anandhi Ramachandran

**Associate Professor**

International Institute of Hospital & Health Management, New Delhi

Mr. Sandeep Sharma

**Director Healthcare**

Eli India, Faridabad

ACHAL GOGIA
(FOR SANDEEP SHARMA)

# Certificate of Approval

The following dissertation titled "**To Study the Awareness, Knowledge, Behavior, Attitude, Towards Electronic Medical Records and Current Practices Followed among Ophthalmologist**" at **ELI India** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily 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 necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

| **Name** | **Signature** |
| --- | --- |
| Dr. Anandhi Ramachandar | |
| Dr. Nishikant Bele | |
| Dr. Oommen John | |

The certificate is awarded to

**Dr. Kirti Thakur**

In recognition of having successfully completed her

Training in the department of

**Product Management**

And has successfully completed her Project on

**To Study the Awareness, Knowledge, Behavior, Attitude, Towards Electronic Medical Records and Current Practices Followed among Ophthalmologist**

Date: 30th April 2016

ELI India

She comes across as a committed, sincere & diligent person who has a

Strong drive & zeal for learning

We wish her all the best for future endeavors

Human Resources

Director healthcare

ACHAL GOGIA
(FOR SANDEEP SHARMA)

# TO WHOMSOEVER IT MAY CONCERN

This is to certify that Kirti Thakur student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from International Institute of Health Management Research, New Delhi has undergone internship training at ELI India from 1st February 2016 to 30th April 2016.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.

Dr. A.K. Agarwal

**Dean Academics and Student Affairs**
**Affairs IIHMR, New Delhi**

Anandhi Ramachandran

**Associate Professor**
**IIHMR, New Delhi**

**DISSERTATION**

On

"To Study the Awareness, Knowledge, Behavior, Attitude, Towards Electronic Medical Records and Current Practices Followed Among Ophthalmologist"

SUBMITTED BY

KIRTI THAKUR

PG/14/026

UNDER THE GUIDANCE OF

DR. ANANDHI RAMACHANDRAN


INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT & RESEARCH

**INTERNSHIP TRAINING**

At

ELI RESEARCH INDIA PVT. LTD.

"To Study the Awareness, Knowledge, Behavior, Attitude, Towards Electronic Medical Records and Current Practices Followed Among Ophthalmologist"

By

KIRTI THAKUR

PG/14/026

Post Graduate Diploma in Hospital and Health Management

2014-16


International Institute of Health Management Research

New Delhi

**ABSTRACT:**

Healthcare has become one of India's largest sectors - both in terms of revenue and employment. Healthcare comprises hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance and medical equipment. The Indian health care sector is growing at a brisk pace due to its strengthening coverage, services and increasing expenditure by public as well private players.

Indian healthcare delivery system is categorized into two major components - public and private. The Government, i.e. public healthcare system comprises limited secondary and tertiary care institutions in key cities and focuses on providing basic healthcare facilities in the form of primary healthcare centers (PHCs) in rural areas. The private sector provides majority of secondary, tertiary and quaternary care institutions with a major concentration in metros, tier I and tier II cities.

India's competitive advantage lies in its large pool of well-trained medical professionals. India is also cost competitive compared to its peers in Asia and Western countries. The cost of surgery in India is about one-tenth of that in the US or Western Europe.

The overall Indian healthcare market today is worth US$ 100 billion and is expected to grow to US$ 280 billion by 2020, a Compound Annual Growth Rate (CAGR) of 22.9 per cent. Healthcare delivery, which includes hospitals, nursing homes and diagnostics centers, and pharmaceuticals, constitutes 65 per cent of the overall market.

Deloitte Touché Tohmatsu India has predicted that with increased digital adoption, the Indian healthcare market, which is worth US$ 100 billion, will likely to grow at a CAGR of 23 per cent to US$ 280 billion by 2020.

There is a significant scope for enhancing healthcare services considering that healthcare spending as a percentage of Gross Domestic Product (GDP) is rising.

Though major focus has been laid on introduction of electronic records in the field of general medicine, ophthalmology has been not found to come out into the framework of electronic records.

Henceforth a study was carried out to analyze the introduction of technology in the field of medical records, an Electronic Medical Record is a specialized medical record created in an organization that delivers care, such as a hospital or an ophthalmology clinic. Electronic Medical Record (EMR) provides clinical charting for ophthalmologist and eliminates paper charts. The major function of a medical record is to document the patient's medical history and treatment, which in turn ensures of better patient safety & care.

The study was aimed towards analyzing the knowledge, attitude and behavior of the practicing ophthalmologist and interns towards use of electronic records in ophthalmology. The following results were obtained from the respondents; out of the 50 ophthalmologist, 46% of the survey populations were lying in the age group of 21-30 years. 54% never heard of the hospital or clinic management system. This study also shows that despite of having good attitude towards the use of IT applications, amongst the young ophthalmologist the knowledge of this group was inadequate & no practice was followed for the use of IT in Clinical Practice.

The field of ophthalmology has a number of unique features, compared to other medical and surgical specialties, with regard to clinical work-flow and data management. This has important implications for the design of electronic health record (EHR) systems that can be used intuitively and efficiently by ophthalmologists, and which can promote improved quality of care. Ophthalmologists often complain about the absence of these specialty-specific features in EHRs, particularly in systems that were originally developed for primary care physicians or other medical specialists. Good system design will improve access to relevant information at the point of care between the ophthalmologist and the patient, enhance timely communications between primary care providers and ophthalmologists, mitigate risk, and ultimately improve the ability of physicians to deliver the highest-quality medical care.

**ACKNOWLEDGEMENT**

I am using this opportunity to express my gratitude to everyone who supported me throughout the course of this project. I am thankful for their aspiring guidance, invaluably constructive criticism and friendly advice during the project work. I am sincerely grateful to them for sharing their truthful and illuminating views on a number of issues related to the project.

I express my warm thanks to Mr. Sandeep Sharma (Director MDOffice) and Mr. Achal Gogia (senior business analyst) for their support and guidance at ELI India Pvt. Ltd.

I would also like to thank my project guide Mrs.Anandhi Ramchandran from the IIHMR who provided me with all the guidance required and conductive conditions for my project.

Thank you,

D. Kirti Thakur

PGDHHM,

IIHMR, New Delhi

## Contents

## LIST OF FIGURES



## ABBREVIATIONS

EHR: Electronic Health Records

MPI: Master Patient Index

CHR: Clinical Health Record

PHR: Personal Health Record

PMS: Practice Management Software

SRS: Software Requirement Specifications

GUI: Graphical User Interface

CAGR: Compounded Annual Growth Rate

EPR: Electronic Patient Record

EMR: Electronic Medical Record

PACS: Picture Archival & Communication Systems

ICT: Information & Communication Technology

SPSS: Statistical Package for Social Sciences

**INTERNSHIP REPORT**:

Eli India is part ELI Global-a globally diversified information and financial services group founded in 1991.Today ELI have more than 40 business units in diverse verticals across three continents.

Eli started its India operations in 2007 as a Research and Publications organization and our current business spans across diverse verticals including Healthcare, Market Research Reports, Collections & Recovery, Certifications, Online Reputation Management, Collectibles, Insurance and Annuities, Media & Publications and more. . It offers a much sought-after work environment for people at different stages in their careers. They are agile towards our targets and they attract employees who are similar to us. They offer an enviable workplace with not just the tangible measures of remuneration, flexibility with working arrangements; it is also the less tangible measures of maintaining a strong company culture, work environment and support which make the real difference.

ELI's one of the business unit is MDOffice and they have Electronic Health Record (EHR),Practice Management, Revenue Cycle Management and Patient Engagement product which empower and enables ophthalmologist practices to provide effective and integrated care delivery.MDOffice delivers the next generation of electronic medical records and practice management solutions built upon best-of-breed and best-in-class healthcare software. The MDOffice solution creates a foundation for heterogeneous communication amongst healthcare providers throughout the ophthalmology sector as well as all caregivers within the Hospital Network.

MDoffice has been offering Electronic Medical Records and Practice Management systems since 1984.Regardless of the specialty or the number of locations and size of your practice, MD office's unified EMR and PM software will manage the flow of your patients from check-in to check-out smoothly.
MDoffice understand that speed and agility are keys to success in competitive times.
At MDoffice, products are designed to help medical practices increase productivity, reduce account receivables, and increase cash flow. Healthcare providers know the powerful benefits of Md office's unified solution: improved

efficiency, increased revenue, fewer medical errors, and more personal freedom for you.MDOffice lets you tailor your own easy-to-use charts, whether you work in one office

Or are a physician linked to a clinic. Md office's flexible and customizable medical records, you can write your own problem-specific forms and use personal phrases to detail encounters. You can quickly and easily organize notes and records of lab findings, prescribed medication, allergies, vitals, and images; you can also draw and annotate directly on stock drawings, or insert drawings and images into your notes and patient charts; you can make graphs to chart the trends of vitals, test and lab results; and you also get access to medical databases MDoffice takes the hassle out of managing medical records.

**MDoffice list of products:**

MDoffice desktop version (emr+practice management)

Cloud (emr+practice management)

Mobile (emr+practice management)

Patient portal.

E-prescription.

Ambulatory surgical care.

Revenue cycle management.

**In the MDoffice Cloud application, all the data is maintained in multiple tabs called modules:**

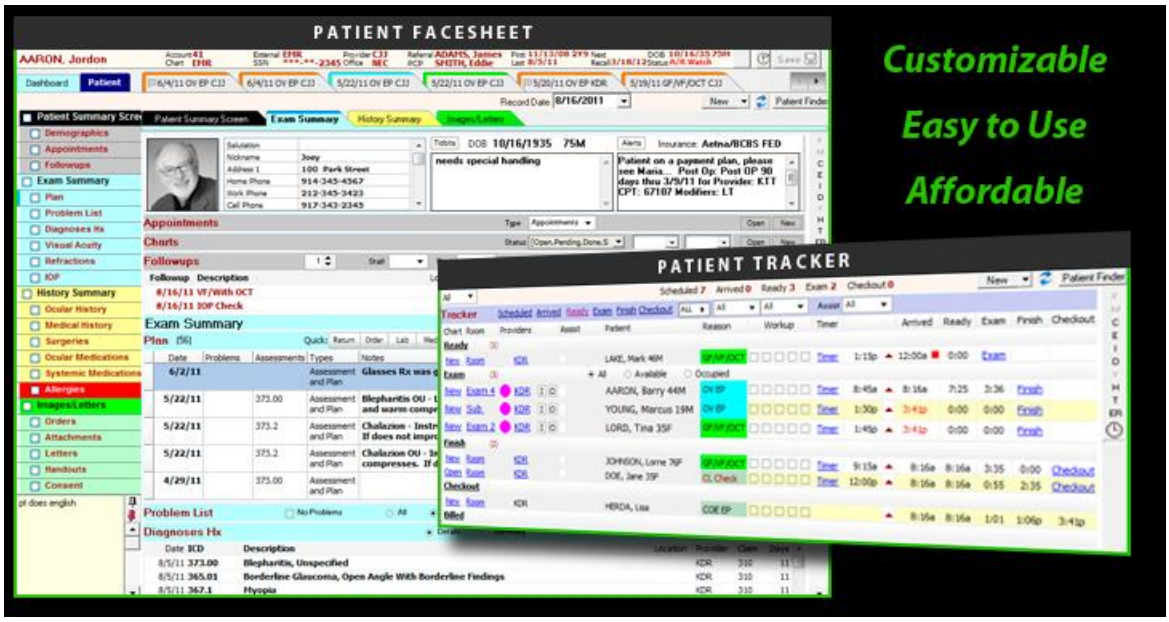
Ticklers

Patients

Schedules

Billing

Deposits




Ticklers:

Ticklers act as an in-house communication tool for a practice with single or multiple locations. The tickler messages can be patient messages or general messages for staff. You can also set event reminders for yourself or any other staff member using ticklers

Patients:

You have to access the Registration module either to register a new patient or access an existing patient's details like patient demographics, contacts, insurance coverage, and claims. You can also store medical and accounting alerts to warn your staff about special patient conditions, needs, drug allergies, payment schedules, and overdue balances. You can create custom fields to print on letters, statements, and insurance forms.

Schedules:

You can check the encounters and appointment details of a patient from the Schedules accordion without going through the Schedule module. In this Schedules page of a patient, you will see the list of all appointments (encounters/old and future appointments) and recalls for that patient

Billing:

The Billing module covers the complete cycle of validating claims, billing, and entering payments, posting collections and payments, and tracking receivables. It allows you to save time, monitor accounts more accurately, and improve collections.

Deposits:

All money coming in from any source must be entered in the Deposit module as New Deposit and then applied (posted) to open (unpaid) claims. Amounts when posting payments:

Allowed: The maximum amount an insurance company will pay for a particular service or procedure.

Payment: The actual amount paid by the source.

Adjustment: The amount adjusted as per your practice/provider's discretion.

Write-off: The difference between your charged amount and the amount covered or allowed by an insurance company.

During my internship, I was involved in giving support to the queries raised by the clients if they have any issue handling with the software. I was also part of the product enhancement team where you have to keep upgrading the software for better outcome and also to be upbeat with the other software in the market. I also did research on other ophthalmology software and there features as well as the share of each software in the US market. I also did Visio diagrams on the various eye diseases and learned about CDSS, HL- 7 Integration. I also did market research on the machine learning and predictive analysis and its use in ophthalmology software. System Design Specification with the data fields & characteristics were documented.

## Learning from the Internship Period

The Internship Period gave me the hands-on experience with the product development life cycle in the healthcare industry. The major learning gathered from this period are as follows:

SRS Documentation

Design Specifications according to the User Interface

HL7 Data Model

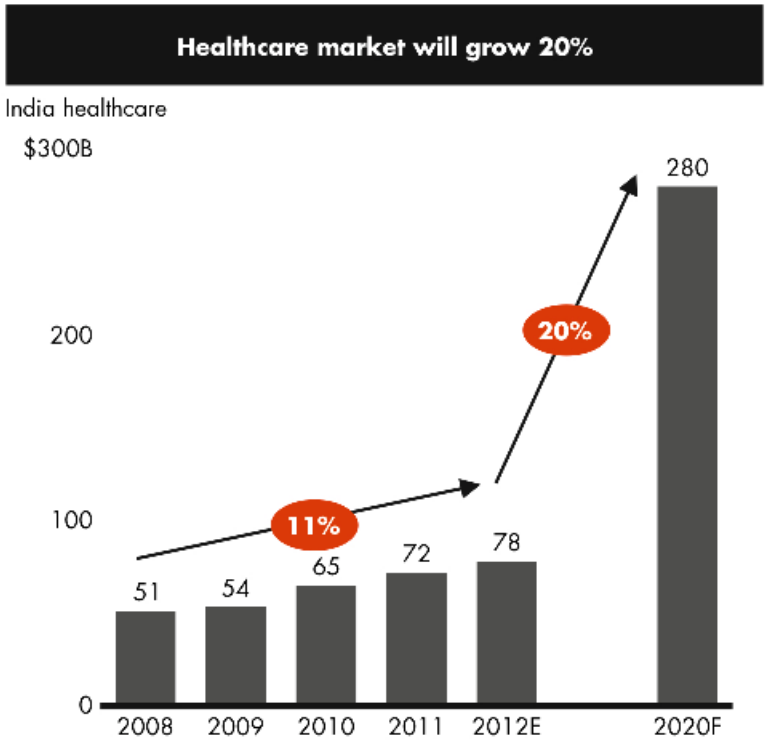
Interaction with the various clients involved with the software and giving support to the software.

## INTRODUCTION TO THE STUDY:

The country's healthcare sector is poised to grow to $280 billion by 2020 while it is expected to be a leader in e-health by 2019.

The CII-KPMG 'The Indian services sector: Poised for global ascendancy' report launched at the second edition of Global Exhibition on Services (GES) said that healthcare sector is forecast to reach $160 billion in 2017, accounting for about 4.2% of GDP.
With the launch of 'Digital India' initiative, the government is stepping towards digital empowerment. India is expected to be a leader in IT use in healthcare (e-health) by 2019," it said.

It is said Indian telemedicine, though in its nascent stage, is showing robust growth at approximately 20 per cent and is projected to grow from $8 million in 2012 to approximately $19 million by 2017.
The report highlighted that in the year 2014-15, the services sector contributed about 61 percent to India's GDP, growing strongly at approximately 10 per cent per annum, making India the second fastest growing services economy in the world.




Sources: India Brand Equity Foundation; Worldbank

## OPTHALMOLOGY IN INDIA:

Ophthalmology is the branch of medicine that deals with the anatomy, physiology and diseases of the eye. An ophthalmologist is a specialist in medical and surgical eye problems. Since ophthalmologists perform operations on eyes, they are both surgical and medical specialists. A multitude of diseases and conditions can be diagnosed from the eye

Optometrists.

Optometrists are healthcare professionals who provide primary vision care ranging from sight testing and correction to the diagnosis, treatment, and management of vision changes. An optometrist is not a medical doctor. An optometrist receives a doctor of optometry (OD) degree after completing four years of optometry school, preceded by three years or more years of college. They are licensed to practice optometry, which primarily involves performing eye exams and vision tests, prescribing and dispensing corrective lenses, detecting certain eye abnormalities, and prescribing medications for certain eye diseases.

Optician

Opticians are technicians trained to design, verify and fit eyeglass lenses and frames, contact lenses, and other devices to correct eyesight. They use prescriptions supplied by ophthalmologists, who are medical doctors and surgeons or optometrists, but do not test vision or write prescriptions for visual correction. Opticians are not permitted to diagnose or treat eye diseases.

Ophthalmic Medical Assistant

These technicians work in the ophthalmologist's office and are trained to perform a variety of tests and help the physician with examining and treating patients.

Ophthalmic Technicians/Technologists

These are highly trained or experienced medical assistants who assist the physician with more complicated or technical medical tests and minor office surgery.

Ophthalmic Registered Nurse

These clinicians have undergone special nursing training and may have additional training in ophthalmic nursing. They may assist the physician in more technical tasks, such as injecting medications or assisting with hospital or office surgery. Some ophthalmic registered nurses also serve as clinic or hospital administrators

## Electronic medical Record

An electronic medical record (EMR) is a specialized medical record created in an organization that delivers care, such as a hospital or an ophthalmology clinic. EMR is a part of the health information system that allows storage, retrieval and modification of records. Electronic Medical Record (EMR) provides clinical charting for ophthalmologist and eliminates paper charts. The major function of a medical record is to document the patient’s eye disease and treatment, which in turn ensures of better patient safety & care. A record that fulfills the above mentioned requirements provides the patient record in clear and understandable language. Apart from the record management, the EMR can also be used in research, epidemiology/public health, statistics, education, legal cases (used as evidence) and healthcare policy development.

## Core functions of EMR

Patient medical & ophthalmology clinical profiles – This allows having immediate access to key information - such as patient's diagnosis, allergies, lab test results, and medications, as it would improve caregiver's ability to make sound clinical decisions in a timely manner.

- Order management – The ability to enter and store orders for prescriptions, tests, and other services in a computer-based system should enhance legibility, reduce duplication, and improve the speed with which orders are executed.
- Clinical Decision support – Using reminders, prompts, and alerts, computerized decision-support systems would help improve compliance with best clinical practices, ensuring regular screenings and other preventive practices.
- Administrative processes – Computerized administrative tools, such as scheduling systems, would greatly improve hospital and clinic's efficiency and provide more timely service to patients.
- Electronic Data Interchange – Electronic data storage that employs uniform data standards will enable health care organizations to respond more quickly to federal, state, and private reporting requirements, including those that support patient safety and disease surveillance.

Features of an adequate EMR

- Appointment Scheduling – The system schedules appointments for all kinds of patients. This enables the staff to manage multiple patient appointments and streamline patient queue.
- Registration – The patient's demographic information such as Name, date of birth, age, gender, address, and telephone number are captured into system.
- Medical Record – This transforms the regular paper based record into an electronically based record. This begins with taking the Medical history, Patient Vitals, Allergies, Clinical eye examination to include an accurate

charting, Diagnosis, Treatment plan, Documentation of informed consent, Medical history, Physical and emotional tolerance for procedures.

- Prescription Generation – An electronic prescription is generated using the fields filled during the eye examination record process.
- Staff Management – Define privileged access for staff – appointment, registration & billing.
- Clinical Charting – A smart charting feature of patient's dental findings. It allows easy representation and understanding of patient problems, examination & helps in prognosis, by comparing with the older visits.
- Easy Payment & Billing – An integrated & customizable medical billing template for all treatments.

Benefits of EMR

- Improved Record Control - helps in creating single, sharable, up to date & accurate patient health record. An EMR helps in rapid retrieval of patient's data including the demographics as well as the clinical data.
- Streamlines Clinical Workflow – electronic record helps in automating, structuring and streamlining clinical workflow.
- Integrated Healthcare Entities – provides for integrated entities which help in monitoring, electronic prescribing, electronic referrals radiology, laboratory ordering and results display.
- Public Health Reporting – electronic records maintain data and information trail that it is readily analyzed for medical audit, research, epidemiological monitoring & disease surveillance.
- Provides functionality for Clinical Decision Support.
- Provides means for avoiding potential drug and allergy interactions, thereby increasing the patient safety.
- Continued Medical Education – supports for continuing medical education & helps the provider in keeping updated with the latest development in the field of medicine. The healthcare industry including education, research,

administration and patient care has become flooded with advances in information technology over the last decade. Of all the healthcare information technology (IT) in current use, the electronic medical record (EMR) has the most wide-ranging capabilities and thus the greatest potential for improving quality of patient care. With the increase in the number of Electronic Medical Records adoption, specialized Electronic Patient Records; such as EPR for Cardiology, Pediatrics or ophthalmology is the next focus of advancement.

The Indian healthcare industry is seen to be growing at a rapid pace and is expected to become a US$280 billion industry by 2020. According to the investment commission of India; Healthcare sector has experienced phenomenal growth of 12 % per annum in the last four years. Rising income level and growing elderly population are all factors that are driving this growth.

Paper-based records have been in existence for centuries and their gradual replacement by computer-based records has been slowly undertaken.

Information Technology has not achieved the same degree of penetration in healthcare as that seen in other sectors such as Finance, Transport, Banking and the Manufacturing and Retail Sectors. Also the deployment varies greatly from country to country and from specialty to specialty. It is essential for the ophthalmology fraternity to be a computer literate. The role of information technologies-including use of electronic medical records, retrieving computer-based knowledge resources, and understanding the basics of the Internet-is crucial for physicians.

The Indian government is one of the early adopters of healthcare IT among developing countries with the launching of "Development of Telemedicine Technology" project in 1997. Despite of being an early adopter, India is not completely utilizing the benefits of IT in healthcare. The key IT applications that are being implemented in the private healthcare sector include Hospital Information System (HIS), Picture Archival and Communication System (PACS), Telemedicine projects & now the advent of EMRs or EHRs.

Electronic health records in ophthalmology should accommodate special needs and requirements of ophthalmologists' work flow and practice patterns to facilitate efficient delivery of quality eye care.

Advances in information technology have dramatically transformed the industrialized world within the past several decades. Electronic health records (EHRs) have the potential to apply these same technologies toward improving the delivery, quality, and efficiency of health care. Despite these trends, EHR adoption by ophthalmologists, and by other physicians, has been slow. In 2006, the Academy performed a survey of its members and found that the adoption rate was 12%.This compares to an overall adoption rate of 17% for basic or complete EHR systems among physicians in different specialties across the country. To promote adoption of EHRs by physicians and hospitals, the federal Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 is allocating $27 billion in incentives.

The federal government is relying on these incentives to help drive the adoption rate to 85% among physicians by the year 2014.Although recent follow-up surveys indicate that there are slow increases in EHR adoption related to these incentives, the low adoption rates suggest that ophthalmologists continue to be hesitant. The Institute of Medicine has described key capabilities of EHR systems related to health care delivery, and the Centers for Medicare and Medicaid Services (CMS) has defined specific "meaningful use" criteria for EHRs. These basic functions are required of all EHR systems, and include recording of problem lists and active diagnoses, electronic prescribing, computer-based provider order entry, and drug-drug interaction checks. Beyond these general functions, EHRs must meet additional special requirements to be useful to address the unique needs of ophthalmologists. These stem from the field's constellation of medical and surgical care, heavy reliance on interpretation of diagnostic imaging, high-volume clinical practices with complex workflows, and documentation requirements involving a combination of numerical, text-based, and image-based data elements. By recognizing and accounting for these special requirements, EHR systems will be better able to help ophthalmologists provide higher-quality care, with improved safety and efficiency We recognize that there are many EHR selection criteria, and that the weighting of these criteria will vary across practices. Important factors that should be considered include ease of 6 use, practice sub-specialty mix, patient

volume, workflow, clinical needs, number of office locations, data security and backup features, data exchange needs with health care organizations and other clinicians, image management needs, integration with image management systems, and integration of practice management software. Therefore, each practice must approach EHR selection independently, with due diligence in carefully defining and comparing their needs to the feature sets of the various EHR products available. We hope that this paper will help vendors recognize and incorporate

## UNIQUE CHARACTERISTICS OF OPHTHALMOLOGY

There are several characteristics of an ophthalmology practice that impact clinical work-flow and data management requirements, all of which affect the optimal design of EHR systems.

First, ophthalmology is both a medical and surgical specialty. Surgical procedures generally occur either in the office or in operating rooms and preoperative evaluations, if performed, are usually done by non-ophthalmologists. Thus, EHRs must support documentation in, and transitions between, the office and operating room. They must be able to incorporate data from other healthcare providers who may not be part of the ophthalmology practice.

Second, ophthalmology is a visually-intensive specialty, often incorporating sketches or formal imaging studies into the assessment of patients' problems. As a result, ophthalmologists who trained before the era of the EHR frequently document clinical findings using hand-drawn sketches. Because of this, traditional paper-based ophthalmology examination forms often include anatomical drawing templates that are annotated by the physician. For this reason, many ophthalmologists are frustrated by current EHRs that rely primarily on keyboard-based or mouse-based data entry, without a useful mechanism for drawing or annotation.

Third, the use of traditional vital signs (e.g., blood pressure, height, weight) varies among different ophthalmic sub-specialists, and these tests are generally performed infrequently for ophthalmic decision-making and management. Instead, ophthalmologists rely on visual acuity and intra-ocular pressure (IOP) as routinely-collected data that serve as the "vital signs of the eye." To promote best-practices,

EHRs for ophthalmology must incorporate features to capture, track, and display these ophthalmic vital signs.

Future meaningful use criteria that incorporate specialty-specific practice patterns and requirements would further encourage development and adoption of EHRs tailored to ophthalmologist needs.

Fourth, the range of traditional laboratory and radio logical studies that are routinely performed by different ophthalmologists can vary widely. Sub-specialists in uveitis or neuro ophthalmology may perform or order these studies frequently. However, most other 8 ophthalmologists only infrequently perform typical systemic disease diagnostics, and instead rely on ophthalmology-specific evaluation and testing.

Therefore, ophthalmology EHRs should support general ancillary testing, have the ability to generate orders for and collect data from laboratory systems and Picture Archiving and Communication Systems (PACS), and also meet specific ophthalmology evaluation and testing needs.

Fifth, ophthalmologists frequently perform studies using ancillary ophthalmic measurement and imaging devices. These studies are performed by technicians or photographers, often during the course of clinical evaluation by an ophthalmologist. Outputs from these devices include graphical displays of measurement data (e.g., visual field testing, electroretinography), numerical data (e.g., auto-refraction, keratometry, biometry), and ophthalmic image data that are reviewed and interpreted directly by ophthalmologists (e.g., fundus photography, optical coherence tomography).

Efficient access to the measurements, images, and findings from these ancillary studies is essential to support clinical diagnosis, track disease progression, and plan surgery. Because of specialized patient care work-flow and device interface requirements, these data and images are often stored on the acquisition devices in proprietary databases, and sometimes even in proprietary file formats. Some EHRs are able to store graphical reports using their own image management system, whereas other EHRs build interfaces with other ophthalmology-specific PACS. However, many ophthalmology-specific PACS allow only limited interoperability with institution-wide PACS developed by radiology vendors, in part because of

incomplete implementation of the Digital Imaging and Communication in Medicine (DICOM) standard. To support these requirements, ophthalmology EHRs must facilitate the rapid, accurate storage and retrieval of structured data from these ancillary measurement and imaging devices.

Finally, ophthalmology is a high-volume ambulatory specialty in which patients are seen and evaluated at a rapid pace. Although many practices include physician extenders such as technicians and orthoptists, the key portions of the examination, assessment, and plan are performed and documented directly by ophthalmologists. This means that EHRs must support all of the above special requirements in a practice environment which demands ease of use by ancillary staff and fast-paced, accurate clinical documentation by ophthalmologists.

## REVIEW OF LITERATURE:

Study 1: A case study of an EMR system at a large hospital in India: Challenges and strategies for successful adoption

Abstract:

This paper presents an ethnographically inspired interpretive case study of the Electronic Medical Record (EMR) system at Sankara Nethralaya hospital in India. It presents challenges related to the adoption of the system and methods and strategies that were utilized in order to overcome these challenges and help the system be adopted successfully. One of the more notable challenges at the hospital was a user base that included skeptical users, those lacking computing skills, and that had a history of rejecting designs. Despite these barriers the hospital was able to adopt the EMR system successfully. Notable issues related to the success of the system include the design strategy that was eventually used, and critical technical and social features of the system intended to support skeptical users and those lacking IT skills. The study contributes to overall understanding of the environment at large hospitals in developing countries as it relates to the adoption of EMR systems, and helps inform on methods that can be used to improve the adoption of EMR systems in similar contexts in both developed and developing countries.

INTRODUCTION:

Ethnographically inspired interpretive case study was conducted at Sankara Nethralaya (SN) eye hospital in the Indian metropolitan city, Chennai, in the state of Tamil Nadu. The study was conducted in order to investigate a hospital in a developing country where an EMR system had been adopted. It was conducted by an Indian medical doctor with the intent of informing the Indian medical community on issues that may aid in the adoption of EMR systems in similar settings. Some of the specific topics of interest before the study was conducted were the expectations for the system from various actors in the hospital, challenges the hospital faced during its adoption, and strategies that the hospital used to overcome these challenges.SN was selected for the study because it is a large hospital with a strong reputation, and because they were in the process of implementing the EMR system when contacted about the study, and thus was still using paper and electronic records. This provided the opportunity to allow knowledge about the EMR system, and also about the ongoing implementation process, and issues related to the transition between the two systems, to be obtained.

Results

This section is organized around the four themes, organizational environment, design history and strategy, critical technical system features and critical social system features. The organizational environment subsection informs on the general environment at the hospital in order to ground the overall study in the understanding of this environment. It also provides insight into some of the key challenges that the environment presented with respect to the EMR system, including varying expectations for the system from different actors and a challenging user base. The design history and strategy subsection is related to both the challenges the hospital faced in adopting the system, and in strategies that helped overcome these challenges. This is because identifying the correct design strategy proved to be a great challenge for the hospital, and the eventual utilization of the correct design strategy was a key to success. Finally, the critical system features subsection describes specific aspects of the EMR system that helped meet the needs of users identified in the earlier subsections. This includes both social and technical aspects of the system.

Study 2: Electronic Medical Records: The Time to Convert Is Now

Fear of change and fear of the unknown are two major intimidating obstacles preventing most physicians from converting to EMR. From a psychological standpoint, change does not come easy. Though most physicians have been comfortable using tried-and-true paper charts for a very long time, they're not without some disadvantages. First, paper charts take up valuable office space. Second, they require constant handling and are frequently misplaced. A lost chart causes aggravation in addition to wasting valuable time and effort in locating it. Third, many paper charts contain substandard documentation; many are simply illegible. Poorly documented, illegible charts will compromise your practice should your records ever be audited or reviewed by an insurance company or a lawyer. Lastly, the remote possibility exists that paper medical records may be destroyed by fire or water. I personally know of two doctors who have lost all of their patients' paper medical records in devastating fires.

IMPLEMENTATION:

once a decision has been made on which system to purchase, the next step is to carefully plan its implementation. All the doctors and upper-level managers in a practice need to realize the tremendous potential benefits and present it to the office staff in an enthusiastic manner. They need to be mentally and professionally ready to accept the challenge.

Initially, the conversion to EMR will not be easy. Nothing in life ever goes completely as planned, and you will almost surely deal unexpected glitches. The office staff in general will follow the lead of the doctors and managers. Everyone should remain focused and positive. Working through these problems will ultimately give you a deeper understanding of how the system works. This is no different from adjusting to challenges presented when learning a new surgical technique.

RECOMMENDATION:

If your practice has multiple doctors and/ or multiple locations, the most computer-savvy ophthalmologist with his or her technicians should be the first set of people converting to EMR. This doctor can then make appropriate modifications to the EMR as he learns the system. Once this doctor is comfortable using EMR, he can help teach the other doctors. This will shorten the learning curve for everyone involved. Transition from paper to EMR should take place one doctor or one location at a time. Further, regardless of the kind of practice you have, I would

advise following this simple strategy:

• First, make all patients new to the practice electronic while keeping established patients on paper.

• Once this is mastered, convert straightforward established patients to the EMR format.

• Last, convert the complex established patients to the EMR format. Converting these established patients with complicated past medical and ocular histories will consume the most time

STUDY 3: Time requirements for ophthalmology documentation with electronic health records (EHRs):

a time-motion and big data study Sarah Read-Brown, Michelle R. Hribar, Jessica Wallace, Leah G. Reznick, Thomas Yackel, Michael F. Chiang. Oregon Health & Science University, Portland, OR. Purpose: Ophthalmologists have raised concerns that EHRs increase the time required for documentation and interfere with the patient doctor interaction. Little published work has studied this issue.

This study examines time demands for ophthalmology documentation in five subspecialties using an institution-wide EHR (Epic Care; Verona, WI)

.Methods:

Five ophthalmology providers from different subspecialties (pediatrics, glaucoma, comprehensive, retina, and cornea) were observed for a total of 407 patient visits. Rules were defined to categorize provider activities with patients: examining, talking, and documenting. Observers recorded times for all provider activities using mobile device software developed by the authors. EHR audit logs were processed to identify time required for all clinical documentation during 1 year (14,184 patient visits).

Results:

During the patient exam the Mean SD time spent by the provider was 11.5±6.8 minutes/patient (3.5±2.6 minutes (32%) examining, 4.9±4.3 minutes (39%) talking, 3.2±2.5 minutes (29%) documenting). EHR documentation required a total of

5.9±3.6 minutes/patient (3.1±2.2 minutes [52%] during patient exams, 2.1±2.4 minutes [35%] during business hours but outside patient exams, and 0.7±1.4 minutes [13%] outside business hours) as calculated from the EHR audit logs. Providers mean total documentation time varied by subspecialty ranging from 5.4-7.8 minutes/patient.

Conclusions:

Based on study findings, EHR documentation would require 177 minutes/day, in a typical 30-patient day. The average in exam observed documentation time of 3.2 minutes/patient closely reflects the in exam documentation time calculated from the EHR audit log data of 3.1 minutes/patient. EHR documentation time requirements are significant, and occupy a large proportion of the overall ophthalmology patient encounter across various subspecialties. Studies toward improving EHR interfaces and integrating EHRs into the patient encounter are warranted

## Rationale of the Study

Professional, ethical and legal responsibilities dictate that a complete chart and record documenting all aspects of each patient's eye care must be maintained. Good records facilitate the provision of effective clinical care and ensure the continuity and comprehensiveness of eye health services.

According to a study, it is repeatedly stated that a graduate ophthalmology, regardless of his priorities in research, public health, teaching or clinical care must be able to use ICT for the benefit of his personal and professional development.

An ophthalmology record should incorporate details of the patient's general health & eye status. It should also include any of the patient's requests. It should include the proposed treatment plan and the treatment performed, as well as all the supporting documentation, such as any lab result in chronic cases or consent from a physician. Outcome of treatment should be documented and any deviations from expected outcomes should also be recorded on the patient chart, as this would help in better prognosis of the patient.

Though the paper based records include all the above mentioned criteria, but because of the constraints of this record system, the electronic records are much more reliable & accurate. The constraints of paper-based records include:

- Used by one person at a time.
- Data may be illegible or misinterpreted due to different handwriting of dental professionals.
- Most of the times, the previous records are either lost or misplaced by the patient or the provider.
- The records are not well structured in terms of clinical data.
- Sharing of records is a big question when it comes to paper-based records.
- Medical doctors comply with stringent record keeping regulations, even on paper, because if data is improperly recorded and something goes wrong, a life is lost. By mandating compliance for the ophthalmology community, we can improve the quality of care in the following ways:
- Improved treatment standards and quality of treatment.
- Complete records supporting better point-of-care decision-making.
- Smoother processing and filing of medical claims, which would lead to clear communication between doctor/patient/insurance providers.
- Reduction of administrative costs drastically.
- Improved security.
- Improved data access.
- Improved detection of data patterns & study outcomes.

While several researches have explored the use of computers and information technology by ophthalmologist and medical doctors few of such studies are currently available in India.

The aim of this study is to assess the computer literacy, current practices, knowledge, attitude & behavior amongst practicing ophthalmologist towards EMR.

**Objective of the Study:**

General objective:

- To Study the Basic Awareness amongst Practicing Ophthalmologist.

Specific objective:

- To study the current practices followed amongst Practicing Ophthalmologist.
- To study the Knowledge, Behavior & Attitude towards EMR amongst Practicing Ophthalmologist.
- To study the perception of the doctors for the digital records and their benefits

**Methodology:**

- Sample design: Observational and Descriptive cross sectional study
- Sampling method: Convenient random sampling
- Sample size: 50
- Sampling area: Gurgaon & Faridabad region
- Duration of study: 3 months (1st February 2016 – 30th April 2016)

**Data Collection Tools and Techniques:**

**Primary data collection**

- Raw data (also known as primary data) is a term for data collected from a source. Raw data has not been subjected to processing or any other manipulation, and are also referred to as primary data.
- Primary data is a type of information that is obtained directly from first-hand sources.
- Primary data collection is observed and recorded directly from respondents. The information collected is directly related to the specific research problem identified. All the questions that one asks the respondents must be totally unbiased and formulated so that all the different respondents understand it.

**Secondary data collection**

Secondary data is data collected by someone other than the user. Common sources of secondary data for social science include censuses, organizational records and data collected through qualitative methodologies or qualitative research. Primary data, by contrast, are collected by the investigator conducting the research.

In this project, all the information has been gathered through telephonic interview and secondary sources that is internet.

**Limitations of Study:**

- Gathering response from a large number of ophthalmologist under time constraints was difficult. Therefore, small sample size was one of the limitations for this study.
- Involving ophthalmologist from all the age group would have given a clearer picture & accurate analysis. But, this was not possible due to time constraints.
- Involving ophthalmologist from other parts of the country would have given a more meaningful and accurate analysis. But, this was not possible due to time constraints. This was another limitation of this study.

**Results & Findings:**

Age Group Distribution of the Respondents:

| Age Group Distribution | | | |
|---|---|---|---|
| | | Frequency | Percent |
| | 21-30 Years | 23 | 46% |
| | 31-40 Years | 16 | 32% |
| | 41-50 Years | 11 | 22% |
| | Total | 50 | 100.0 |

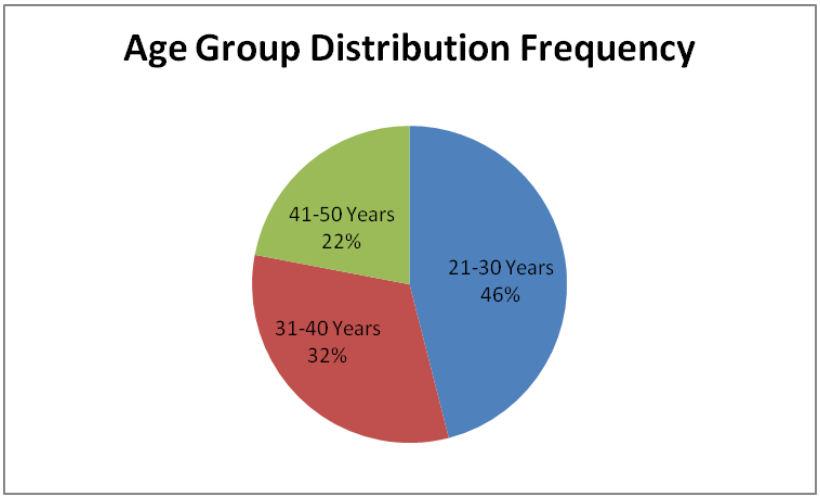
Interpretation:
Out of the 50 respondents, 23 were in the age group of 21-30 years, making it as 46% of the survey population.

The pie-diagram is drawn in which the

Blue represents 46% of the population coming in the age group 21-30 years

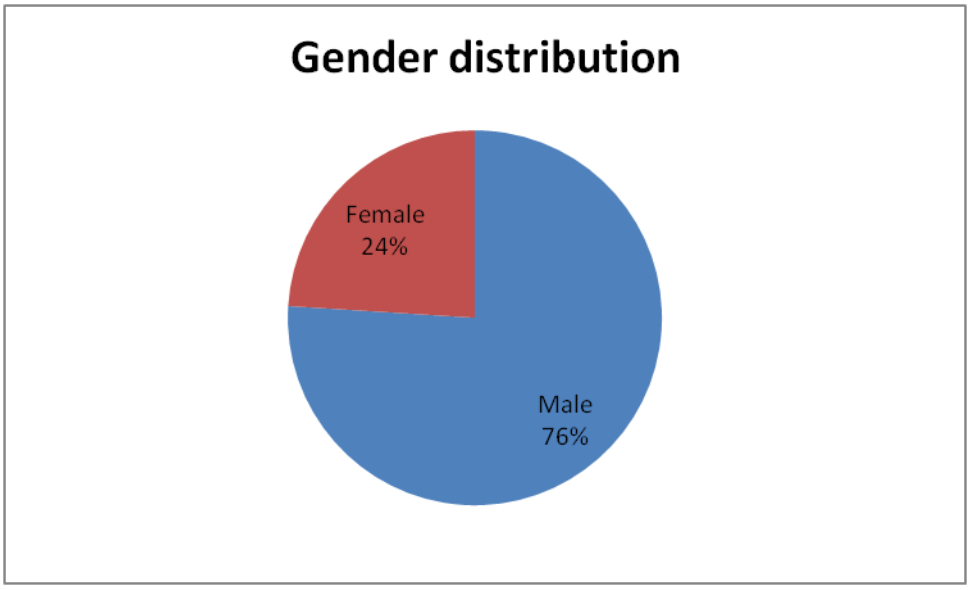
Orange represents 32% of the population coming in the age group 31-40 years

Grey represents 22% of the population coming in the age group 41-50 years.



Gender Distribution of the Respondents

| Gender distribution | | Frequency | Percentage |
|---|---|---|---|
| | Male | 38 | 76% |
| | Female | 12 | 24% |
| | Total | 50 | 100 |

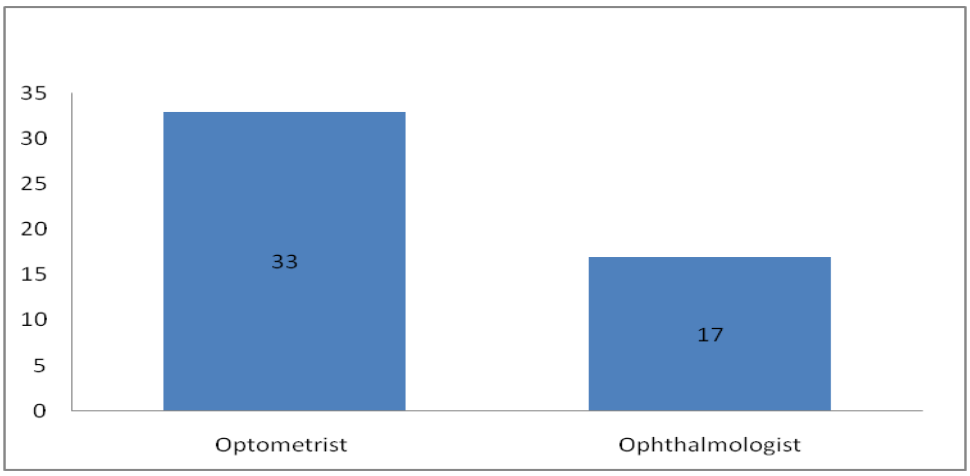



INTERPRETATION:

In the above diagram out of 50 ophthalmologist and optometrist survey list 24%female doctors were there and 76%male doctors were present.

Qualification Distribution of the Respondents

| Qualification | Frequency | percentage |
|---|---|---|
| Optometrist | 33 | 66% |
| Ophthalmologist | 17 | 34% |
| Total | 50 | 100 |




In the above bar-graph

In the above diagram 33 out of 50 are the optometrist and the rest of them are the ophthalmologist.

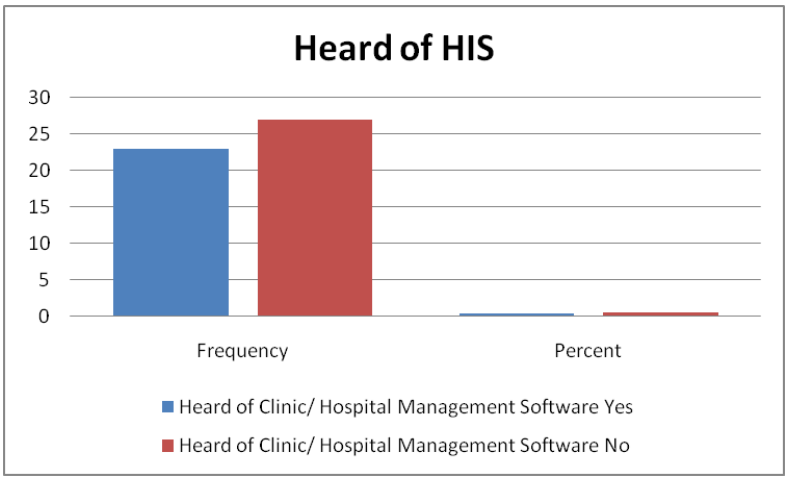
Optometrists are healthcare professionals who provide primary vision care ranging from sight testing and correction to the diagnosis, treatment, and management of vision changes. An optometrist is not a medical doctor. An optometrist receives a doctor of optometry (OD) degree after completing four years of optometry school, preceded by three years or more years of college. They are licensed to practice optometry, which primarily involves performing eye exams and vision tests, prescribing and dispensing corrective lenses, detecting certain eye abnormalities,

and prescribing medications for certain eye diseases. And ophthalmologist are the specialized eye care doctors who performs major surgeries and the final diagnosis of the disease, there are various specialist care like cataract specialist, retinal specialist, corneal specialist.

60 to 70% of patients' information entered into medical records is done by optometrists. After these the required test are conducted by the optometrist and then the patient is send to the ophthalmologist

Have you heard about Clinic/Hospital Management Software?

| Heard of Clinic/ Hospital Management Software | | | |
|---|---|---|---|
| | | Frequency | Percent |
| | Yes | 23 | 46% |
| | No | 27 | 54% |
| | Total | 50 | 100.0 |

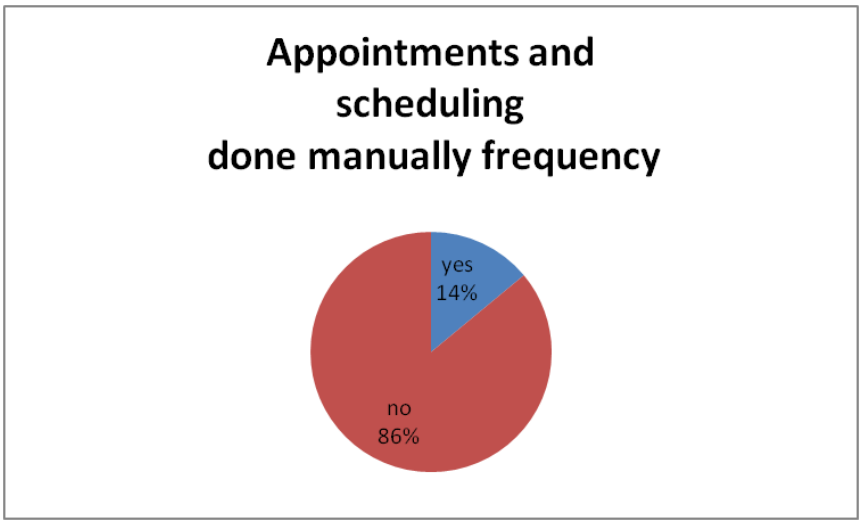



The above bar diagram represents that 46% were aware of the hospital management software and 54% were not aware of the hospital management software.

Current Practices followed

Appointments & Scheduling done manually?

| Appointments and scheduling done manually | | |
|---|---|---|
| | frequency | percent |
| yes | 7 | 14% |
| no | 43 | 86% |
| total | 50 | 100 |

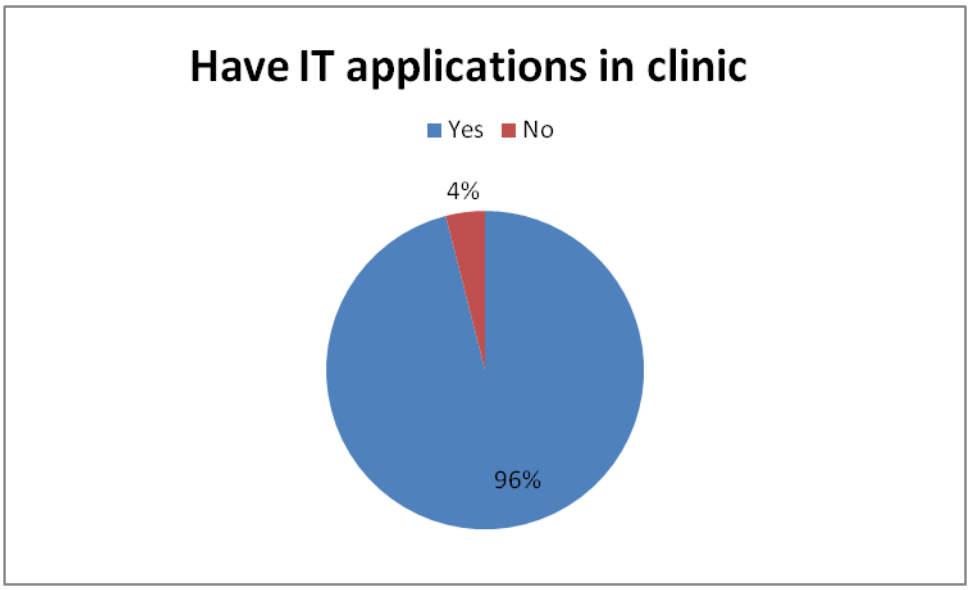



When asked about the current practices followed in the clinic or hospital than the only IT-application they are aware of the scheduling the patient and giving the appointment as per the required time and collecting the basic information related to the demographics of the patient for their future marketing purposes.

This means a large amount of the surveyed population is using IT-application as a part of their daily routine.

Any IT applications in Clinical Practice?

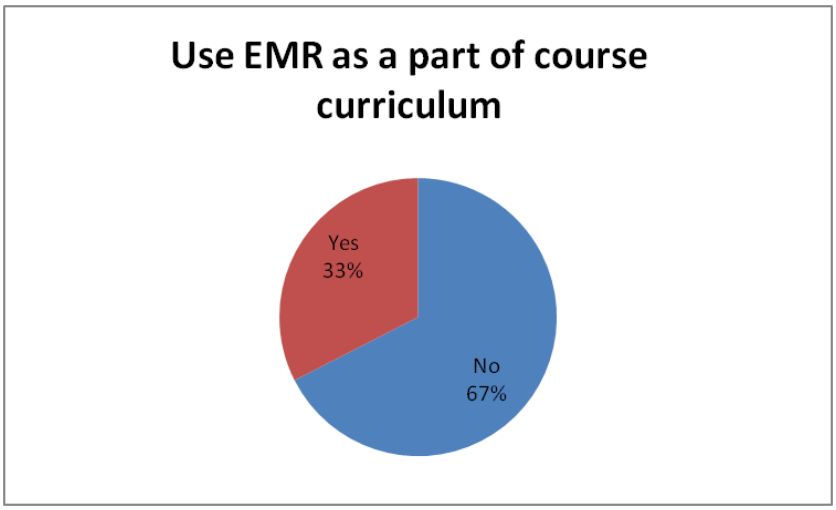
| Have IT applications in Clinic | | | |
|---|---|---|---|
| | | Frequency | Percent |
| | Yes | 48 | 96% |
| | No | 2 | 4% |
| | Total | 50 | 100 |




Yes, they do use IT Applications in their clinical practice but for the basic work-flow but not to document patient medical history. The above bar diagram represents that out of 50, 96% practices are using it applications in the clinical practice as a daily routine.As the are well aware about the role of IT in their clinical practice they use to to document the basic demographic details in the word document or they have some software like practo to have an edge over other clinics to beat the market.

Knowledge about Electronic medical Records?

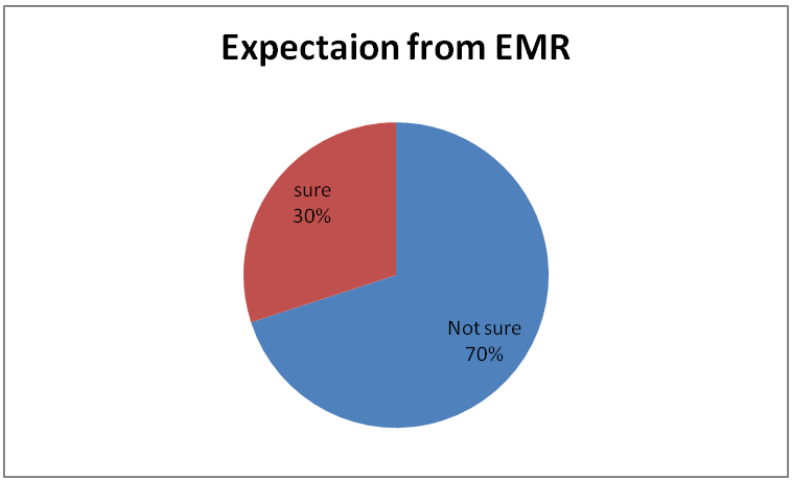
| Use EMR as a part of Course Curriculum | | | |
|---|---|---|---|
| | | Frequency | Percent |
| | No | 27 | 67 |
| | Yes | 13 | 33 |
| | Total | 50 | 100 |




67% of the ophthalmologist and optometrist were not aware, that is they had no knowledge about EMR as it was never used as a part of their course curriculum. And also they were not sure whether this EMR will bring any productivity in their clinical flow or the continuum of care they want to give to their patients to make their practice best.

Expectations form the electronic medical record?

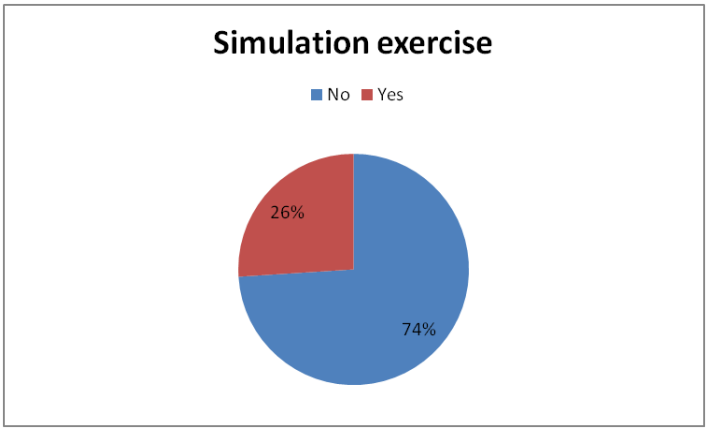
| Expectation from EMR | frequency | percentage |
|---|---|---|
| Not sure | 35 | 70% |
| sure | 15 | 30% |
| total | 50 | 100 |




70% of the optometrist was not sure what the design of the EMR should look like, but they wanted all the clinical related stuff should be incorporated with the findings and also it should be integrated with the lab findings for the easy referral. And also ophthalmology is the field where the doctor does lot of drawing so it will be wonderful if emr is incorporated with drawing fields and also it should be interfaced with other lab findings so that data can be stored in the clinical charts which belongs to the patients.

Should you recommend a simulation exercise with the software so that a better understanding about the charting of records is clear amongst the staff members?

| Simulation exercise | Frequency | Percent |
|---|---|---|
| No | 37 | 74% |
| Yes | 13 | 26% |




It was observed that the most of them were reluctant i.e 74% ,to incorporate the simulation exercise in their practice as it might hinder their daily routine of the clinic,but some of them gave the positive comment and were keen in knowing the new technology and how it will help them to increase their productivity and the patient care.

## Interpretation of Result

With the frequency of the practitioner and the optometrist in young population is at a higher range who interact with the patient more than the elder generation so if we motivate them to maintain the records in the digital format and to maintain the quality of the patient care.

The younger generation, despite of having good attitude towards the use of IT applications, the knowledge of this group was inadequate & no practice was followed for the use of IT in Clinical Practice (as proved earlier). The reason for this is mainly because of newer technologies coming into play, & the young generation getting adapt to it. But, as such very few technologies focus on the healthcare aspect, the awareness is not there & also despite of the adoption of EMRs, in various healthcare facilities, it is still not a part of the formal education.

The elder generation, despite of having good knowledge about the IT applications in Clinical Practice, including the EMRs or do not get adapted to the system is because of the attitude & they are reluctance to change.

It also provides insight into some of the key challenges that the environment presented with respect to the EMR system, including varying expectations for the system from different actors and a challenging user base.

EHRs must support documentation in, and transitions between, the office and operating room. They must be able to incorporate data from other healthcare providers who may not be part of the ophthalmology practice.

Ophthalmologists who trained before the era of the EHR frequently document clinical findings using hand-drawn sketches. Because of this, traditional paper-based ophthalmology examination forms often include anatomical drawing templates that are annotated by the physician.

The national push for EHR adoption is accelerating; however, the focus should now be on successful implementation.

The complexity of EHR systems, as well as the healthcare environment, cannot be underestimated. Results from this study highlight the need for strong physician leadership and management support in the EHR selection and implementation process. By assessing the information needs of physicians and other EHR users, HIM practitioners can help develop criteria for evaluating and selecting EHR systems specific to their user needs. This study revealed an overwhelming need for flexible, customizable EHR products. In general, commercial EHR system development is still quite immature, and often healthcare vendors welcome input from the user community.HIM and information technology (IT) practitioners, in conjunction with medical staff leaders, should recommend hardware and software

functionality to developers based upon work-flow requirements and user needs. HIM practitioners can assist physicians in the selection or design of user interfaces to improve ease of use, and can advise developers on the need for diverse modes of data entry and flexible documentation tools. HIM and IT professionals must consistently work in harmony with clinicians and other users in order to promote initial and long-term EHR adoption

## Conclusions

The result of the current study demonstrated that, out of the 50 ophthalmologist, 50% of the survey populations were lying in the age group of 21-30 years. 54% never heard of the hospital or clinic management system.86% ophthalmologist and optometrist today use the software for appointment and scheduling. 34% of the ophthalmologist were not aware of the Electronic Medical Records.

The study revealed that the attitude of the younger generation was much better than those individuals falling in the higher work experience. The study shows that the basic computer awareness is no longer an issue amongst the young generation. Of the 50 ophthalmologist in the age group 21-30, atleast 80% ophthalmologist were technology savvy & faced no hassles with the use of technology.

This study also shows that despite of having good attitude towards the use of IT applications, amongst the young ophthalmologist the knowledge of this group was inadequate & no practice was followed for the use of IT in Clinical Practice. The reason for this is mainly because: -

- Newer technologies are coming into play, & the young generation easily gets adapted to these technologies. There is lack of awareness.
- Despite of the adoption of EMRs, in various healthcare facilities, it is still not a part of the formal education.
- Stressful & traditional practices, leaves no time for exploring the various advancements happening in the field of healthcare.
- The elder generation, despite of having good knowledge about the IT applications in Clinical Practice, including the EMRs, do not get adapted to the system is because of the following reasons: -

- Reluctance to change
- No proper formal education or training is provided.

Some of the learning's during the entire study programmed is as under:

- Practical issues involved in the each age group, regarding the knowledge, attitude & behavior of the individuals, which resulted in deviations depicted in the project.
- The basic work-flow & the practices followed in an ophthalmologist clinic.
- The design of the software should be discussed with the user and the templates should be customized as per the provider and the management need to understand the software better and to make it successful.

**Recommendations**

To achieve the above mentioned benefits, following recommendations should be taken: -

- Instead of designing a standard system for all, the need of the end users should be identified and the EMRs should be customized as per their needs and requirements.
- Proper formal training should be given to both the students & educators.
- Introduce short refresher courses in computer applications & awareness about the IT applications used in Clinical Practice.
- The organization should introduce certain incentives for implementing the Electronic Medical Records in their clinical practice.
- Instead of mandating the use of EMR, the ophthalmologist's perception about EMR should be understood first. This will allow for the development of targeted education to demonstrate the advantage of EMRs and to further improve their perception. This will lead to widespread adoption and successful implementation of EMRs.

With the above mentioned recommendations, the entire ophthalmologist and optometrist fraternity management would gain in the following areas: -

- Better management control
- Standardization of operations and functioning
- Reduce errors
- Better quality of service

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