

Current State of EMR Adoption Model in India

By

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*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2014-2016



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Project Name	: Modification of EMRAM Model (HIMSS Model) based on Indian Context and available technology and process (Clinical) improvement to achieve higher levels.
Duration	: 08 February 2016 – 29 April 2016 (3 Months)
Location	: Bangalore
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CERTIFICATE BY SCHOLAR

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TABLE OF CONTENTS

S. No	Contents	Page No.
1	Acknowledgement	3
2	List of Abbreviations	4
3	Introduction	8-9
4	Rationale	11
5	Objectives	11
6	Literature review	12-14
7	Methodology	15
7.1	Study Design	15
7.2	Sampling Design	15
8	Results & Findings	16-20
9	Discussion	21-24
10	Conclusion	25
11	References	27
12	Annexure	29-43

ACKNOWLEDGEMENT

An endeavor over a period of time can only be successful with the advice and support of well-wishers. I take this opportunity to express my gratitude and appreciation for all those who encouraged me to complete this project.

I am deeply indebted to Professor **Seema Mehta** for successful completion of the project.

I extend my sincere thanks to **Ajay Aiyar, Archika Roy, Avishikta Sarkar, Rituraj Choudhury, Venkateshwarrao M.** and the entire EMR team of Dell for without their support and guidance I wouldn't have been able to complete the project and my learning would have not been complete.

I would also like to thank **Dr. Ramandeep Kaur** and **Dr. Shelja Khurana**, who not only gave me valuable insights about the project and help me immensely throughout the project.

Last but not the least; I would like to thank God and my family members for the successful completion of the project.

LIST OF ABBREVIATIONS

CCD	Continuity Of Care Document
CDR	Clinical Data Repository
CDS	Clinical Decision Support
CDSS	Clinical Decision Support System
CMV	Controlled Medical Vocabulary
CPOE	Clinical Provider Order Entry
EHR	Electronic Health Records
eMAR.	Electronic Medical Administration Record
EMR	Electronic Medical Records
EMRAM	EMR Adoption Model
GOe	Global Observatory for e-health
HIE	Health Information Exchange
HIPPA	Health Insurance Portability and Accountability Act

HIS	Health Information System
HIMSS	Healthcare Information and Management Systems Society
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
ICHI	International Classification of Health Interventions
PACS	Picture Archiving Communication System
SNOWMED-CT	Systematized Nomenclature of Medicine-Clinical Terms
WHO	World Health Organization

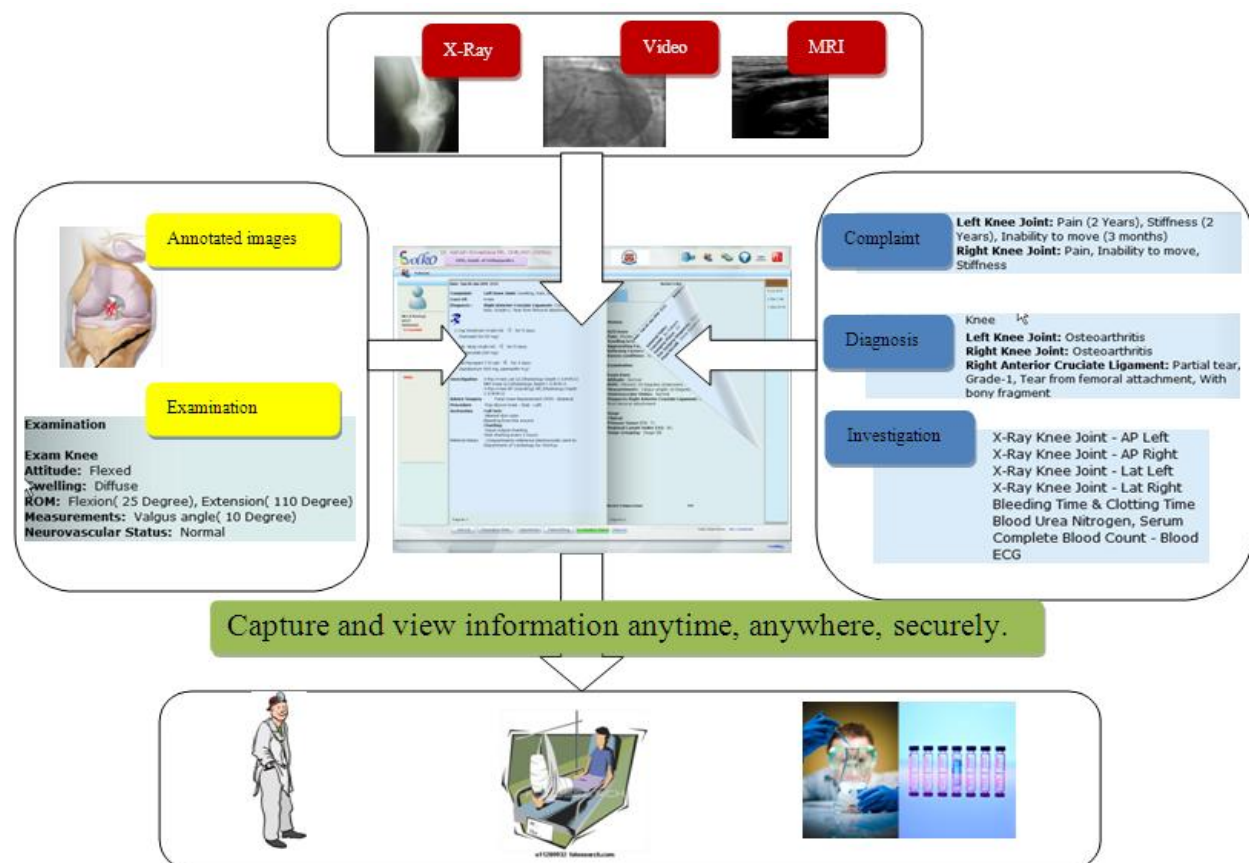
LIST OF FIGURES

Figure no.	Title	Page number
1	Relationship of size of facility with the type of data used	17
2	Relationship of Age group with the Size of the facility	18
3	Stages of EMR in Hospitals	16
4	Challenges in EMR Adoption	19
5	Facilitators of EMR	20

INTRODUCTION

According to the Healthcare Information and Management Systems Society (HIMSS), an EMR is a part of an electronic health record which belongs to the healthcare provider. “The EMR is a set of applications and workflow tools that digitizes the creation, collection, storage and management of patient information within the confines of a single organization. “

Adoption is the process that “involves the multitude of activities, decisions, and evaluations that encompass the broad effort to successfully integrate an innovation into the functional structure of a formal organization”⁽⁸⁾. An adoption model explains the complex process in a simple manner.



HIMMS ADOPTION MODEL

HIMSS Analytics introduced EMR adoption models (EMRAM) in United States and Canada and also Ambulatory EMRs in the United States. The EMRAM has been divided into eight stages and is used to track the healthcare organizations progress in relation to EMR.

The various stages of EMR adoption are:

Stage 0- All Three ancillaries not installed.

Stage 1- All three ancillaries Radiology, Pharmacy and Laboratory Installed

Stage 2- It has **Clinical Data Repository (CDR)** where all data relating to orders and results are stored.

Controlled Medical Vocabulary (CMV) - It is a standardized way of capturing health data. An example can be LOINC.

Clinical Decision Support (CDS) - It helps the physician to take clinical decisions .It provides reminders to physician regarding allergies and drug interactions.

It may have document imaging and it is Health Information Exchange (HIE) capable.

Stage 3- It has **Clinical Decision Support System (CDSS)** - CDS is a part of it. It provides decision support and provides recommendations for care.

Nursing And Clinical Documentation - Nurses can record orders, assessments, vital signs and eMAR (Electronic Medical Administration Record).

Stage 4- It has CPOE with CDS.

Clinical Provider Order Entry (CPOE) - Physicians can directly send orders like laboratory or radiology test or medication orders to pharmacy into the computer

Stage 5- Closed Loop Medical Administration - It consists of unit dose medication, bar code medical administration, full incorporation with CPOE, Pharmacy and eMAR.

Stage 6- Physician documentation, full CDSS (variance & compliance), Closed Loop Medication Administration.

Picture Archiving Communication System (PACS) - It is a system of computers which allows storage of images and provides access to high resolution radiology images. It incorporates these images with patient database.

Stage 7- Full EMR, data continuity is maintained with emergency, ambulatory and operative procedures.

Continuity of Care Document (CCD) transactions – “is an electronic document exchange standard for sharing patient summary information. Summaries include the most commonly needed pertinent information about current and past health status in a form that can be shared by all computer applications, including web browsers, electronic medical record (EMR) and electronic health record (EHR) software system” (Margaret Rouse).

There are many software companies that cater to the Indian market and provide EMR and Hospital Information System (HIS), however, there are only a few health care providers who are interested.

EMR Adoption Model SM	
Stage	Cumulative Capabilities
Stage 7	Complete EMR; CCD transactions to share data; Data warehousing; Data continuity with ED, ambulatory, OP
Stage 6	Physician documentation (structured templates), full CDSS (variance & compliance), Closed Loop Medication Administration
Stage 5	Full complement of Radiology PACS
Stage 4	CPOE, Clinical Decision Support (clinical protocols)
Stage 3	Nursing/clinical documentation (flow sheets), CDSS (error checking), PACS available outside Radiology
Stage 2	CDR, Controlled Medical Vocabulary, CDS, may have Document Imaging; HIE capable
Stage 1	Ancillaries – Lab, Rad, Pharmacy - All Installed
Stage 0	All Three Ancillaries Not Installed

RATIONALE

A majority of the hospitals are using paper based records. However, paper based records have many limitations. The limitations of paper based records are many such as they occupy space .Some hospitals store multiple copies of the same document so more physical space is required. They may have legibility issues associated with it as doctors writing may be incomprehensible and difficult to read. It may also have security issues associated with it as any unauthorized personnel may have access to it if they are not stored properly. Paper based records are more susceptible to damage to disasters like fire etc. On top of it they also have high maintenance cost associated with it. Another limitation is paper records have to be converted to electronic configuration via scanning or emailing before they can be shared with other health care professionals.

In fact, electronic medical records have many advantages. The EMR can robotize and streamline a clinician's work processes, assuring that all clinical data is imparted. It can also avert delays which are responsible for disruption in care. The EMR can bolster the accumulation of data for utilization other than clinical services, such as charging, quality management, result reporting, and public health disease surveillance and reporting.

Other benefits include enhanced immunization rates, improved information collection, increased staff efficiency, enhanced guest satisfaction with services, improved intercommunication, and quality of care, access to information, diminished medical errors, and more productive utilization of staff time.

In spite of these benefits, the adoption of EMR is low. This study aims to know the reason for low adoption of EMR.

OBJECTIVES

- To identify the current scenario of EMR adoption and its stages (EMRAM Model) in hospitals of Bangalore in India.
- To identify the barriers in EMR Implementation and Adoption by the hospitals.
- To identify the ways to overcome these barriers.

LITERATURE REVIEW

An Electronic Medical Record is a real time longitudinal electronic patient health record which helps the clinicians in decision making and treatment. The patient record may contain information such as demographics, medical history, vital signs, examination and progress notes, medications, allergies, immunizations, laboratory test results, radiology reports, living wills of the patient. The EHR automates and streamlines the clinician's workflow. The EMR can also support non clinical functions such as billing, quality management, outcome reporting, and public health disease surveillance and reporting⁽²⁶⁾.

The benefits of EMR implementation are enhanced immunization rates, better data collection, enhanced staff productivity and visitor satisfaction with services, better communication, quality of care, access to data, diminished medical errors, and better utilization of staff time. It also helps in improved utilization of preventive services, improved chronic disease management⁽³⁶⁾

However, the adoption of EMR has been quite slow .A study was performed in the USA, the most common barriers to EMR adoption were inadequate capital for purchase (74%), maintenance costs (44%), resistance on the part of physicians (36%), unclear return on investment (32%), and lack of availability of trained staff (30%).Other barriers mentioned were difficulty in integrating data into the EMR and data storage and preservation in the long run, software problems as customization and codification, hardware problems (interfacing with older technology) and privacy concerns.⁽¹²⁾

The WHO has established Global Observatory for e-health (GOe) to determine the adoption of e-health. The result of the survey showed that there is an increase in adoption of electronic health information in health care facilities .This trend is mostly seen in high income countries but countries like India and China are slowly adopting EMR. In low income countries, the adoption of EMR is low. The reasons for it are lack of financial, technical resources and skilled labour. Clinical models must be synchronized at an international level for data interoperability and international standards must be followed to maintain compatibility between systems. The adoption of standards for interoperability, vocabulary, messaging is of utmost importance as it helps in clear information exchange⁽³⁶⁾

A large number of hospitals in Asian countries like India, Indonesia, and Malaysia are in early stages of EMR adoption. The major barrier in adoption of EMR is lack of awareness and knowledge among health care providers about the advantages of EMR. Reluctance to adopt EMR, high implementation cost, long implementation procedure, lack of appropriate interface, lack of compatible technology with the existing system, reduced efficiency during implementation, lack of knowledge about health care among vendors are the various barriers which are faced while adopting EMR. ^(1, 11)

Other issues with EMR could be a privacy of patient records. There is a chance that these patient records can be misused. ⁽⁸⁾

Challenges in EMR adoption related to resistance by physicians due to lack of IT skills or their different interests could be solved by having effective communication with manager and opinions of all users should be considered. Prototyping along with integration of design and implantation should be used. ⁽¹¹⁾

According to another study, other barriers for EMR adoption are that it negatively affects the patient –physician interaction. The time to plan review order and document care and response time to pharmacy calls has increased. ^(10, 28)

A study by Meinert suggests that low rate of EMR adoption is due to physician resistance. They will influence other healthcare providers such as nurses and administrative staff⁽¹⁹⁾. For successful EMR adoption, participatory approach in prototyping is useful for instance Shankar Netralaya ⁽¹¹⁾ It was suggested to make change champions from amongst the team members to make EMR adoption more acceptable to other members. ^(21, 27)

According to a study by Thomas, one out of three physicians believed that EHR reduced the patient - physician interaction and admitted regular use of EMR. Only thirty –three percent physicians opined that EHR is enhancing quality and safety. ⁽²⁸⁾

Enhanced quality has been seen as a result of following guidelines related to care, Surveillance and monitoring, and diminished medication-related errors, such as incorrect Prescriptions involving the wrong drug, wrong dose or incorrect route of administration. Other advantages have been increased efficiency, reduced costs related to utilization due to decreased laboratory and radiology tests, better drug dosing and decreased adverse reactions related to adverse reactions due to medication. Personal history records are beneficial as it helps in enhancing patient health and in communicating with providers. ⁽²²⁾

For successful implementation of EMR, certain factors are necessary to be considered .These factors are “Acceptance, Organizational Culture, Complexity, Partnership and Collaboration, Effectiveness, Efficiency, Aging, Patient Satisfaction, Profitability, Safety, Quality, Cost, Training, Network of Action, job security, Political Support, Cultivation, Service Attitude and availability, Easy to-integrate, Ease-of-Use, Stability, Acceptance to change, Innovativeness, Attitude, Willingness , Alignment, Participatory prototyping, Trust, Privacy ”.(23)

METHODOLOGY

The study was carried out in 15 health care facilities of Bangalore.

Study Design

Cross sectional descriptive study

Tool for Study

Close ended structured questionnaire

Sampling Technique

Purposive sampling was done.

Sample respondents

The respondents for the questionnaire were doctors, nurses and people from the administrative staff.

Exclusion Criteria

Those hospitals which refused to co-operate and share information.

DATA COLLECTION

Respondents were interviewed only after taking informed consent. Voluntary willingness from the respondents to participate in the study was sought.

Study Method

A close ended questionnaire was used. The participants (n=48) were surveyed on demographic factors, duration, frequency of use, barriers and facilitators of EMR

To preserve anonymity, all findings are presented without ascribing names.

DATA ANALYSIS AND INTERPRETATION

The data from the survey was analyzed using SPSS 17.0 software. Analysis was done with descriptive statistics mode which computed frequencies, crosstabs and graphs.

Limitations of the Study

- Small Sample Size makes the result of this study less generic.
- The design of the questionnaire was modified as per the hospital setups in Bangalore and hence limits the scope of this study to hospitals in Bangalore only.
- Resistance in users to respond to certain questions related to EMR.
- The report has been prepared with a limited knowledge and understanding of the subject, as the researcher is not an expert in the domain.
- Subject selected purposively which could result in Selection bias.

Ethical Considerations

The researcher ensured that the subjects received a full disclosure of the nature of the study, with an extended opportunity to ask questions. Informed verbal consent was taken from the respondents. Confidentiality of the respondents was maintained during the study. Respect and dignity of the respondents were maintained during the study. Information received by the respondents will not be misused in any form.

FINDINGS

Respondents profile:

A total of forty eight respondents participated in the study. Sixty seven percent of the respondents were female. Their age ranges between 26 -56 years with the mean age of 35.63 years. One out of three respondents was a doctor and other third were nurses and rests of them were administrators. The respondents had a mean experience of 9.42 years.

1) Stages of EMR in surveyed hospitals

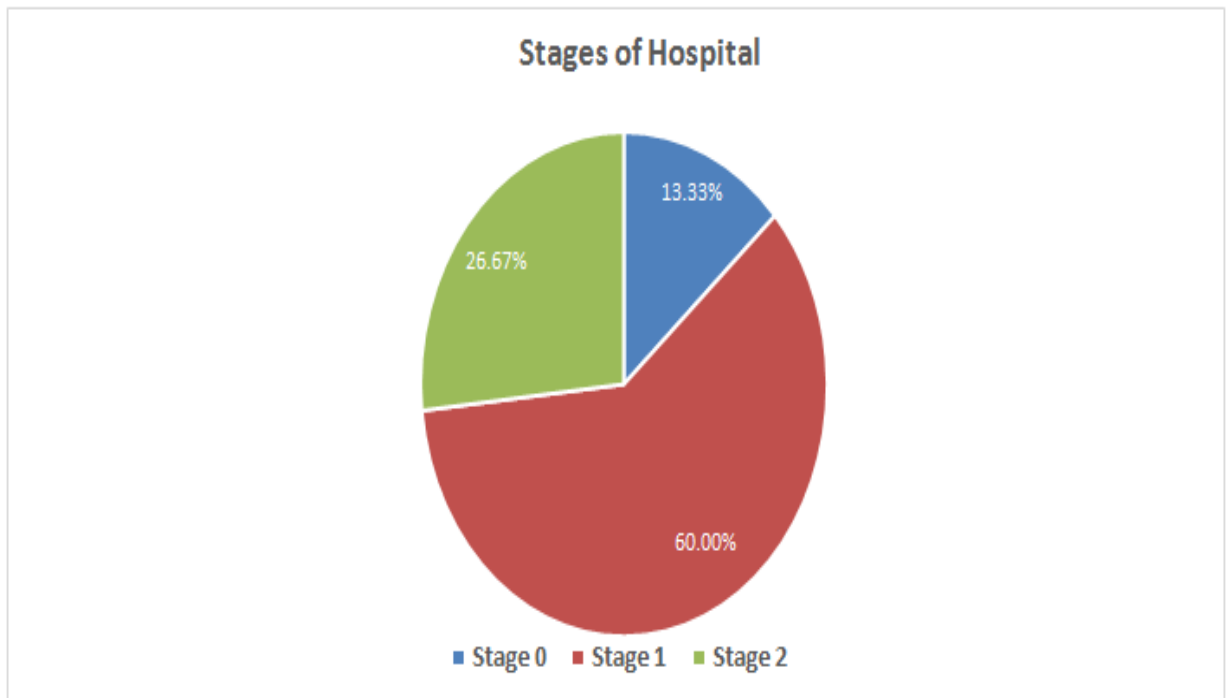


Figure no. 1

- Stage 0 indicates that that laboratory, pharmacy and ancillary haven't been installed yet.
- Stage 1 indicates that laboratory pharmacy and radiology was installed.

- Stage 2 indicates that Clinical data repository, Clinical data support, Controlled medical vocabulary and may have digital imaging.
- Two hospitals were in stage 0.
- The number of hospitals at stage 1 is nine. The large number of hospitals in the stage 1 indicates that new hospitals have started adopting EMR.
- The number of hospitals at stage two is four. These hospitals were transitioning from stage 1 to stage 2 as they had everything except for digital imaging..
- Stage 3 to stage 7 was not seen in any hospitals.

2) Relationship of size of facility with the type of data used.

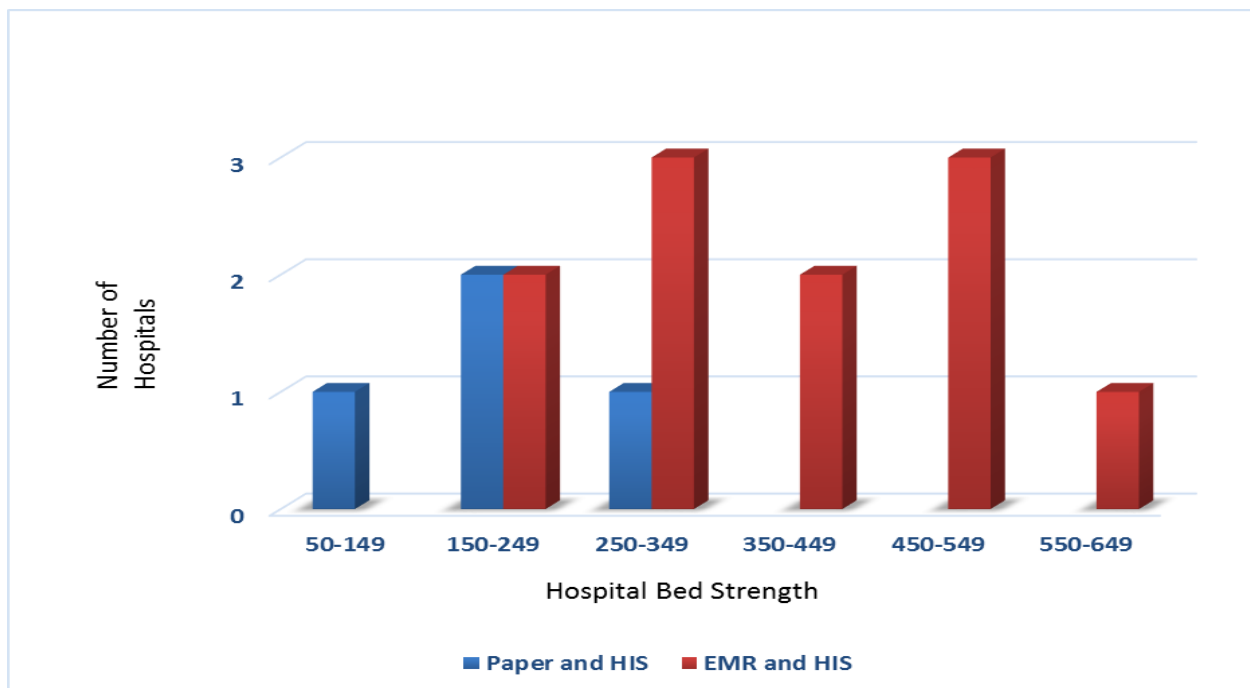


Figure no 2

- There was one hospital in the range (50-149) was found to be using paper for medication consultation, pharmacy purposes. It was using HIS basically for billing and registration.
- For the hospital range of bed strength (150-249) four hospitals were there. Two were using paper and HIS and other two were using EMR and HIS. When doctors in the hospitals using Paper and HIS were asked about the reason for using paper based

records .They were quite reluctant and unwilling to use. They admitted they will use EMR in the near future.

- The bigger hospitals were using EMR AND HIS and were at either stage 1 or stage 2 of adoption. In these hospitals regular training was being held to make the EMR user friendly.

3) Relationship of Age group with the type of data used:

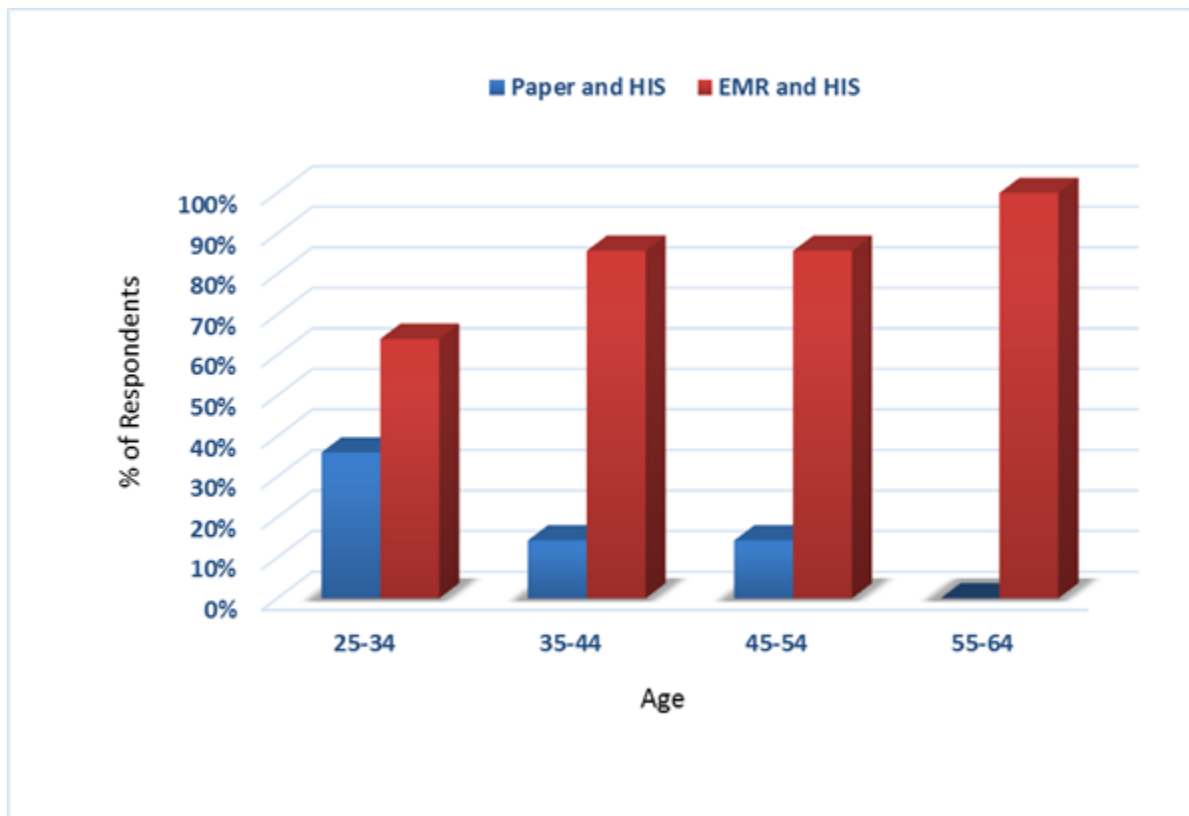


Figure no 3

- The older age group (55-64) was found to be using all the type of methods for data recording. Also the respondents in this age group were very less.

- 4) Challenges in EMR Adoption

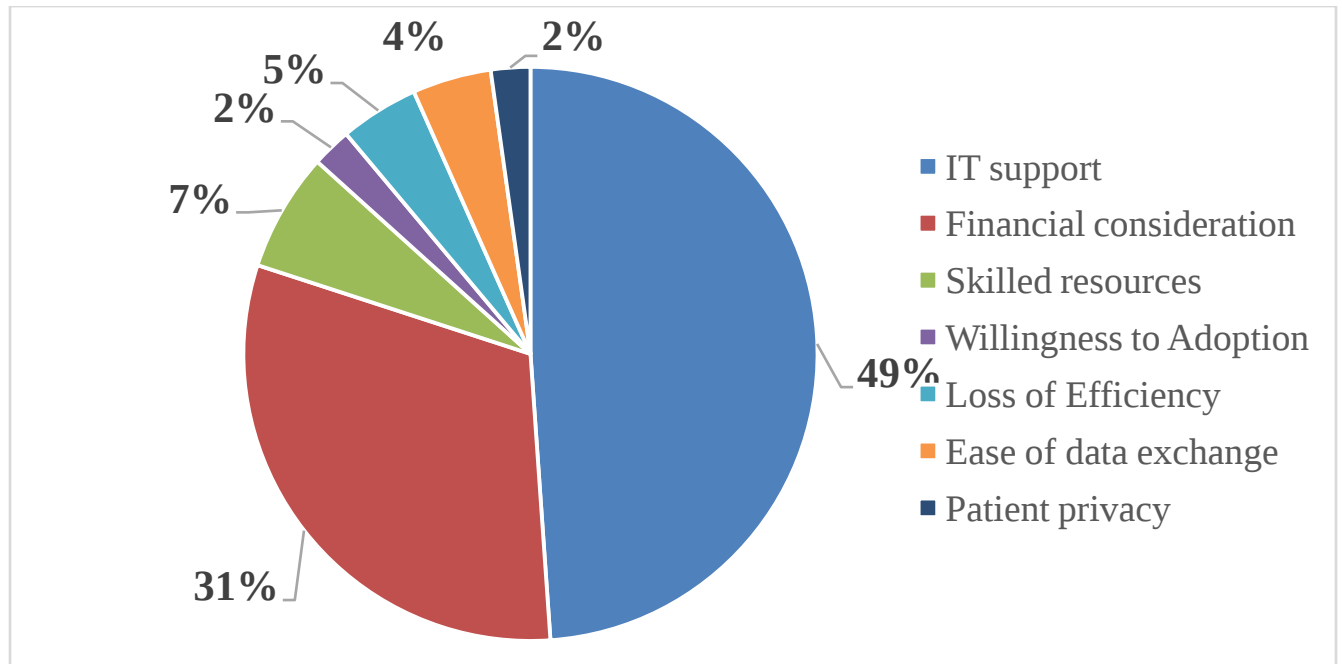


Figure no.4

5) Facilitators of EMR

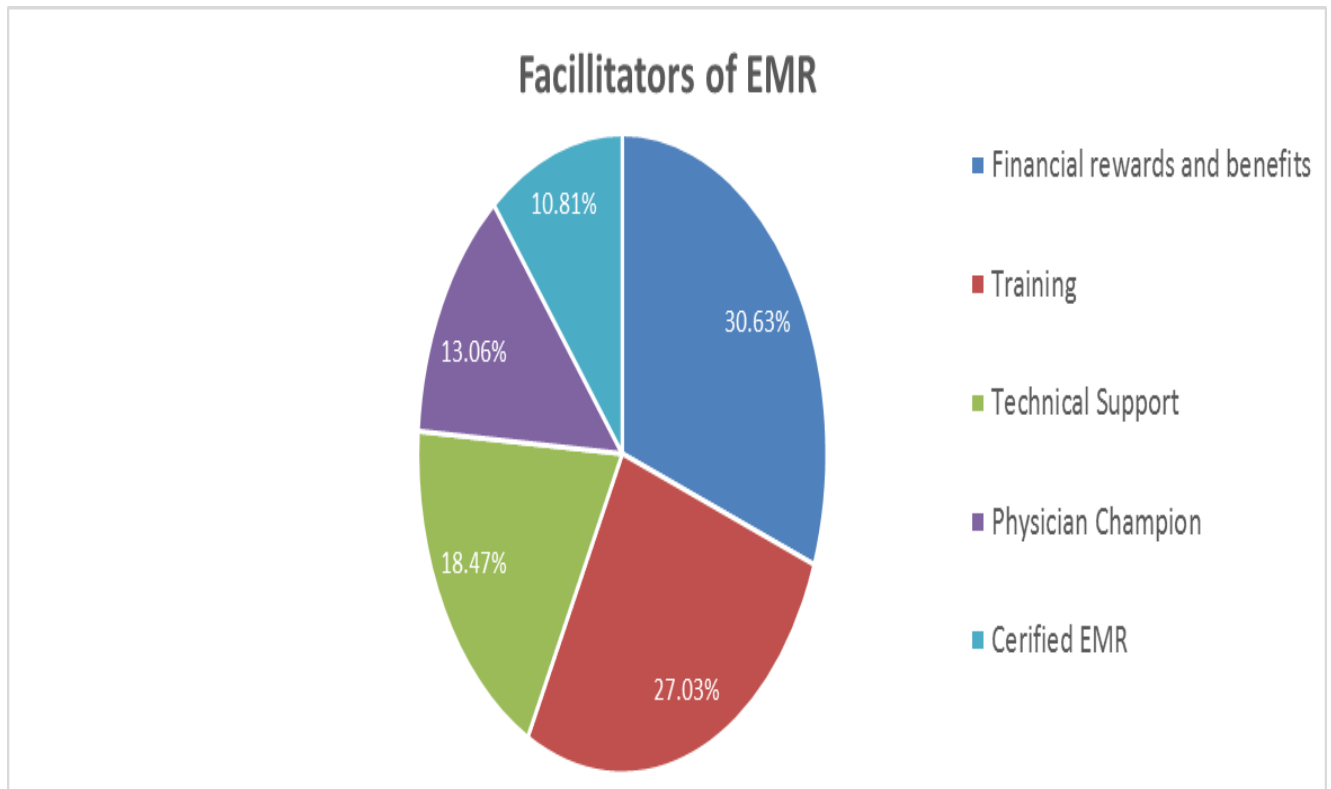


Figure no. 5

- The major facilitators for EMR were found to be financial rewards and benefits followed by training.
- Certified EMR refers to a list of EMR which are standardized.
- Physician champion physicians who is expert using EMR explains other physician and other user all the process regarding EMR motivates them to use EMR
- Financial rewards and penalties should be given to increase EMR adoption.

DISCUSSION

The adoption of EMR in High income countries is increasing and gradually gaining pace. But, the adoption of EMR in Low Income countries is very slow.

1) Financial Considerations

According to this study, around one in three people cited cost as major barrier. These include costs of purchase, cost of maintenance and return on investment.

A study was done in USA ,seventy four percent respondents cited inadequate capital for purchase ,forty four percent cited maintenance costs and thirty two percent stated unclear return on investment as a major barrier⁽¹²⁾

According to another study done among nurses of Tamil Nadu in India, eighteen percent of respondents cited cost as a major barrier⁽²⁴⁾

Other studies have also shown cost as a major concern for adoption and implementation of EMR. Lauren in his study writes “Most of the author realized that significant barrier to EMR implementation was related to financial burden and it was difficult to prove the actual cost benefit that could be potentially realized with the implementation of EHR system.”⁽³⁵⁾

Some countries have insufficient funding for adoption of EMR. Sweden, France, Africa have already transitioned to government funding⁽³²⁾

Expense of EHR includes equipment and programming cost. Equipment cost includes the expense of printer, scanner and should not influence their general work routine. While programming cost includes the establishment and upkeep cost. A superior alternative would be if EHR suppliers additionally share the upkeep cost. Also, the expense includes training the clinical staff and other people who would be using the EMR. Therefore, the budget for EMR adoption and implementation should also include training health care professional.⁽¹⁷⁾

Prior studies have demonstrated that 15-20% of money can be saved for physicians and 20-25% for health care facilities after the EMR has been executed⁽³⁵⁾

For small to medium health facility without vast IT spending plans, costs remain the greatest hindrance to EMR adoption. The high monetary expenses of adopting EMR’S is a major

challenge to their adoption and implementation. This challenge is exacerbated by lack of clarity whether health care facilities will get any monetary return or not.

2) IT Support

IT support (49%) was found to be a major barrier in this study.

It included lack of expert support, inadequate IT staff, lack of technical and vendor support. Expert support refers to succor provided from physician who is expert in the field to other.

Technical support is needed during and after adoption of EMR.

Vendor support is essentially needed in case a new feature needs to be added or if there is a problem with a current version. Doctors are worried that vendors are not competent enough to give appropriate support and guidance or will leave business and vanish from the business sector, resulting in absence of technical support and an extensive monetary loss. Health care facilities are reluctant to adopt EMR without having trust in vendors.⁽³⁾

Numerous doctors whine of poor vendor support, for example, vendors failed to provide technical support, guidance and instruction and for issues regarding the EMRs. According to a study by Ludwick et al. doctors battle to get technical coaching for the frameworks from the seller. As doctors are not specialized specialists and the frameworks are naturally confused, doctors see a requirement for appropriate specialized preparing and bolster, and are hesitant to utilize EMRs without it.⁽¹⁵⁾

Simon et al. found that 66% of doctors showed an absence of technical support as an obstacle for them to embrace EMRs.⁽³⁰⁾ Ludwick et al. observed that a few doctors reported an absence of technical support by the vendor.⁽¹⁵⁾

Inadequate IT staff is another major concern. This could mean either there are lesser number of IT staff or they are less trained. Both the scenarios could be a potential cause of concern.

3) Security and Privacy

A major concern in the health care facilities has been security and privacy issues. Doctors and other EMR users are required to keep their data safe to prevent access by unapproved people. Privacy enhances the requirement for accuracy of data and reduces indiscretion by health care professionals.

EMRs have the ability to improve efficiency, effectiveness, precision, accessibility, enhance the quality of care and decrease costs however its execution and acknowledgement is impossible unless its privacy and security issues are tackled⁽¹³⁾

Protection of data gathered amid human services procedures is fundamental on account of huge financial, psychological, and social damage that can come to people when individual wellbeing data is unveiled⁽²⁾

“The Healthcare Information Systems Society (HIMSS) has created the HIMSS global taskforce which has investigated a battery of EHR components within each country including security, quality, financing sources and barriers”.⁽³²⁾

In the USA, the Health Insurance Portability and Accountability Act (HIPAA) has set up certain norms of security to ensure that health data of patients remain protected. HIPAA compliance must be taken by all health care facilities for storing, transferring or accepting patient information in electronic format. Any individual or facility who breaks this law will have to pay fine that will be forced by the central government⁽¹⁶⁾

There might be instances of breach in security from hacking or human blunder. For instance suppliers may share passwords or not utilize them .They may fail to encode health data on electronic medical records or in the clinical data repository. Physicians may lose portable computer or pen drives containing valuable health information. Health care professionals need to be very careful while handling patient data.

"Inside assaults," the most routine sort of security transgressions is one such concern. Such assaults are conferred by persons who are approved system users with benefits however they misuse their benefits for creating grapevine or for monetary inspirations. The financial value of such wellbeing information however, is moderately low (not at all like some monetary information or military insider facts), so it is assumed that the transgressor won't spend exorbitant assets (cash and time) on endeavoring to procure such information by PC break-in or cryptanalytic assault⁽²⁾

Another case of potential dangers originates from data hungry employers, companies which provide indemnity and managed care associations. These associations have more prominent

financial assets, alongside the inspiration of critical benefit from what they can know about people. Benefit inspired wellbeing care-related associations and unscrupulous "private investigators" might be interested to get the health care related data for instance, accumulate HIV information, which could be utilized on a clandestine premise to deny medicinal protection scope⁽²⁾

The above dangers concern assaults on patient privacy, but risk models ought to likewise consider assaults on the uprightness and accessibility of wellbeing information. Health care organizations should be careful and should remain vigilant at all times to prevent such threats.

4) Lack of Training

Lack of training among staff also acts as a obstacle to adopt EMR. The utilization of EMR alone won't enhance the quality of care. The health care professionals must be instructed and guided well to use EMR. Health care professionals feel uncomfortable to use EMR technology if they are not coached properly. Motivation and devotion to learn and utilize EMR are critical elements to consider in the implementation of EMR. The health care providers must be trained to use EMR effectively and efficiently. The lack of training could result in employees being irritated and frustrated. Proper training and instruction is required for health care professionals for EMR adoption and implementation to be rewarding⁽²⁰⁾

Training aids in reversing adverse discernments and improves the probability of adopting and implementing EMR. Continuous training with regular follow up is the best strategy to guarantee expansive EHR acceptance^(9, 15) Training should also be provided to individuals who need computer aptitude, documentation abilities, and individuals who may discover the frameworks hard to navigate. It is essential to have separate financial budget for training.

5) Lack of Clinician Computer skills

The ability needed to listen to patients objections, evaluate medicinal pertinence, think about mediations and write notes would require a noteworthy level of focus, writing aptitude, and recognition with the application's client interface, not regularly found in the most proficient computer clients.

EMR suppliers seem to think little of the level of computer aptitude required from doctors, while the framework is extremely mind boggling to use by these doctors. Further, good computer skills are required to enter medicinal data, clinical notes and other patient related information into the EMRs, and a few doctors don't have these skills⁽³⁾

Meade et al. noticed that a majority of the present era of doctors in Ireland got their capabilities before IT software's came out⁽¹⁸⁾ Shachak et al. noticed that EMR use presents another kind of the medical errors: grammatical errors⁽²⁹⁾ Furthermore, it is the doctors as well as other staff at the health care facilities who need satisfactory computer aptitude. This general absence of aptitude impedes the wide appropriation of EMRs.

6) Willingness to Adopt

This study showed that around two percent of people believed that Physicians reluctance could act as a major barrier to the EMR adoption and implementation process.

This may be due to an absence of comprehension about the client benefits which may be associated with trepidation of alteration⁽⁹⁾. The recognition that an EHR framework will basically not be valuable could likewise be an aftereffect of bad marketing skills by EMR merchants. Health care professionals may come to a conclusion that EMR's are not useful because of not adequately executing the EMR framework and neglecting to accomplish expected advantages⁽³⁰⁾

Adopting and implementing EMRs would mean an adjustment in the way doctors work and, at first, most individuals are apprehensive of switching to EMR and are uncertain of its need. Further, the doctors' doubt and negative impression of EMRs are influenced by the social impacts around them.

In any case, concern that the framework will be hard to utilize can be answered to by selecting a framework with an attention on client interfaces. Moreover, misconstruing EHR advantages may prompt recognition that utilizing this innovation will lessen the measure of time doctors and attendants go through with patients. An amazing finding was that the negative effect seen by the suppliers was because of an absence of training⁽⁵⁾

The physician's approval to EMR adaptation is necessary as physicians can influence other clinicians to take up EMR and help with the EMR adoption process.

7) Loss of Efficiency

After being guided and instructed still a doctor on EMR can be less efficient and this could be due to the following reasons. They might have trouble finding imperative data, for instance when was the patient's last Chest X-ray done? Does the patient require an insulin injection?

Time taken to type a clinical note is more than writing the note.. Some undertakings are exhausting to finish with the EMR, e.g., reordering perpetual medicines The EMR framework reaction time can be long. Changing exam rooms requires logging off one session and surviving through an extensive login to another one. Absence of assimilation leads to placement of data required for one assignment on numerous screens, e.g., investigating lab results as influenced by an adjustment in medicines. Physicians looking for a procedure which had been carried out or a diagnosis, investigation can at times deliver pointless results. Doctors talk one dialect, yet the system might have an alternate arrangement of codes. Some screens have data that is not required, in others some data might be missing. Some screens are thickly stuffed with data, making data elusive.

A couple of investigators have thought about the effect of utilizing EMR on physician and patient relationship. Having an eye contact with the patient is critical and is believed to improve the quality of health care. In the examination by Ludwick et al. a few doctors reported that at times they quit utilizing EMRs because they have to search for the menus and other buttons which disrupts the patient encounter⁽¹⁵⁾

In Shachak's study, 92% of doctors felt EMR use disrupted correspondence with their patients. Doctors need to swing their head towards the computer to enter patient related details amidst the clinical encounter and this can be tedious particularly when they experience the ill effects of constrained computer aptitude. A study by Shachak et al shows that utilizing EMRs expands the normal screen look time of doctors from 25% to 55% of the consultancy session, definitely bringing about less eye-contact and less discussion with the patient. On the other hand, the doctors need to give additional time per patient. This leads to physicians seeing less number of patients or spending more time at hospital or both especially during the earlier phases of adoption⁽²⁹⁾

Further, as some EMRs are accessible to patients, they may disrupt the clinical experience with more impedance and diversions from the patient.

In this manner, the conventional physician patient relationship will be affected by the implementation of EMRs. Notwithstanding, whether this is truly an issue for doctors and patients requires further exploration since this issue has so far been disregarded by a majority of investigators.

8) Ease of data exchange

It is defined as “the ability of health information systems to exchange data in a semantically meaningful way, whether at the aggregate or patient level.”⁽³⁶⁾

In the health care sector, there are many basic classifications that have been produced and are kept up by different associations. The International Health Standards Development Organization built up the Systematized Nomenclature of Medicine-Clinical Terms (SNOMED CT) , which includes the SNOMED characterization framework with Clinical Terms (codes), created by the College of American Pathologists and the United Kingdom's Department of Health, separately. WHO keeps up the International Classification of Diseases (ICD) and additionally the International Classifications of Functioning, Disability, and, Health (ICF) and International Classification of Health Interventions (ICHI).⁽³⁶⁾

Around 4% of respondents were of the sentiment that interoperability is a noteworthy hindrance. The motivation behind gathering and saving patient data is to make it accessible at the time of making judgments for investigation, analysis and for policy making by the administration. It is vital to understand that most patients have more than one clinical point of care. They may have a general physician or a family doctor along with physicians who are specialized in their domain. They may shift their location and move to a different city or a different nation. It is fundamental that their patient data is accessible at all clinical points of care at all time for examination. To achieve this objective there must be norms for information and for correspondence. Dispersed health information systems have been proposed to enhance the capacity to gather and dissect information over establishments which would lead to enhanced performance, security, and quality of health care.⁽³⁾

Interoperability is a principle element for adopting the EMR frameworks as it could help diminish revamp via health care professionals; enhance spread and development of new therapeutic learning among doctors. Interoperability is imperative since it diminishes the expense of electronic medical records and makes it plausible for an individual or little gathering of doctors to gain and embrace these frameworks.

Another obstacle to EMR use was the absence of sufficient electronic information trade between the EMR and other clinical information frameworks, (for example, lab, radiology, and referral frameworks). Having both electronic and paper-based frameworks constrained doctors to use these frameworks alternatively, resulting in reduced work process; need to physically enter information from outside frameworks, and enhancing doctor's reluctance to use EMR. Moreover, with less information in the EMR, there was lesser chance of interceding electronically to enhance quality, and diminished capacity to perform inward investigations or to report execution outwardly for quality report cards or execution motivator programs. This was found to be true for smaller health care facilities.

Valdes et al. noticed that more than 264 different kinds of programming systems were being used in the EHR framework⁽³³⁾ The arrangement of information fluctuates among the distinctive programming bundles and frameworks, because of the absence of uniform information norms inside the business, and this makes information trade troublesome if not unimaginable between frameworks. This issue is more intense in littler practices than in bigger ones due to the moderately constrained authoritative assets, for example, aptitude and experience.

CONCLUSION

- The adoption of EMR in India is low.
- According to the survey, maximum hospitals are in Stage 1 with a few in transitions towards Stage 2. Lack of awareness among the clinicians was another reason for low adoption of EMR. Thus, for the advancement of hospitals towards successive stages of EMRAM model awareness among clinicians and administrators about the benefits of EMR should be increased.
- Technical support should be provided during business hours.. Expert support, vendor support and IT support should be provided during EMR adoption and implementation.
- Training of end users is necessary for successful implementation of EMR.
- Clinician computer skill is another important factor that should be considered. They should be trained to overcome the gap in their computer using skill.
- Physician champion are physician who is expert using EMR explains other physicians and users all the processes regarding EMR and motivates them to use EMR.

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ANNEXURES

CONSENT FORM

Dear Sir/Mam,

I am a student undertaking (M.B.A Health and Health Information) at Institute of Health Management and Research University, Jaipur. As part of my course I am undertaking a research study titled: - **“Current State of EMR Adoption Model in India ”**

This study focuses on identifying the current scenario of EMR adoption and its stages (EMRAM Model) in hospitals of Bangalore in India. This study attempts to understand the barriers faced by the hospitals in EMR adoption and to identify the ways to overcome these barriers.

I would be grateful, if you could take a few minutes to complete the questionnaire attached. The questionnaire consists of total of 16 questions, based on the factors contributing to the barriers and recommendations to the EMR adoption.

The information you supply on the questionnaire will be treated with total confidence and will not be divulged to any third party.

Please do fill in the designation and years of experience mentioned on the questionnaire.

Thanking you,

Regards,
Dr. Shruti Gupta

QUESTIONNAIRE

Respondent code:

Age:

Sex:

Qualification:

Area of specialization:

Working experience:

Size of the facility:

1) Type of facility

- ☐Hospital ☐Stand Alone Clinic ☐Nursing Home
☐Ambulatory Surgical Centre ☐Day Care Centers ☐Others

2) How do you store patient related data?

- ☐Paper ☐Computer
☐Computerized Data and Electronically

3) What are the available health records being maintained by hospitals?

- ☐Admission Register ☐Patient case-notes ☐Nursing and wards
☐X-ray films ☐Financial records ☐Personnel records
☐Patient indexes/records ☐Pharmacy/drug records
☐Pathological specimen ☐Central administrative records ☐Others

4) Availability of computer in personal office?

- ☐Yes ☐No

5) Do you use internet for only checking emails?

- ☐Yes ☐No

6) Do you use EMR outside of clinical office?

- ☐Yes ☐No

7) How long have you been using EMR/HIS?

☐1-2 years

☐3-5 years

☐5-7years

☐ >7 years

8) How frequently do you use EMR?

☐I do not use

☐I use some of the time

☐I use most or all of the time

9) Who all are using EMR in your facility?

☐Clinical staff (nurse, doctors, paramedics)

☐Administrative Staff

☐IT Staff

☐All

☐Other_____

10) Are the departments integrated by HIS?

☐Yes

☐No

11) What are the number of training sessions per year conducted by the health care facility on EMR?

☐1-2

☐3-4

☐5-6

☐0

☐Others_____

12) Effect of training on EMR implementation.

☐Helpful

☐Not helpful

Q13)Has quality of care/patient safety improved after EMR implementation?

☐Yes

☐No

14) Stage of adoption of EMR?

☐0 –All three major ancillary laboratory, pharmacy, and radiology are not implemented.

☐1 -All three of the major ancillary clinical system are installed.

☐2-Physicians have access to laboratory, pharmacy, and radiology results.

☐3 -Clinical documentation (e.g. vital signs, flow sheets) is required.

☐4- CPOE along with the second level of clinical decision support capabilities related to evidence-based medicine protocols.

☐5-The closed loop medication administration environment is fully implemented in at least one patient care service area.

☐6-Full physician documentation/charting (using structured templates) is implemented for at least one patient care service area.

☐7-Paperless EMR environment. Clinical information can be readily shared via electronic transactions or exchange of electronic records with all entities.

15) Which of these parameters do you think inhibits EMR adoption? Arrange these parameters on scale of 1 to 5 being the greatest inhibitor and 1 being the lowest inhibitor.

1 2 3 4 5

☐ Inadequate capital for purchase

☐Unclear return on investment

☐Maintenance cost

☐Inadequate IT staff

☐Interoperability - The ability of health information systems to exchange data in a meaningful way, whether at the aggregate or patient level.

☐Lack of technical support (eg.system crash)

☐Lack of incentives

☐Lack of expert support

☐ Lack of vendor support

☐Decreased quality of doctor- patient relationship

☐Loss of productivity (time-consuming data entry, slow access of data)

☐Technical limitations of computers (e.g., slow response times)

☐ Lack of training

☐Lack of clinician computer skills

☐Reluctance of clinician to adopt EMR

☐Patient privacy or security concerns

Q16)What are the ways to improve EMR adoption?

- ☐ Additional reimbursement for EMR use
- ☐ Financial incentives for adoption
- ☐ Technical support for implementation
- ☐ Objective third party evaluation of EHR
- ☐ List of certified EHRs
- ☐ Physician “champion”
- ☐ Creating dis- incentives for not using this technology
- ☐ Encourage development of trained IT professionals
- ☐ Conducting training sessions for EMR users
- ☐ Other

OBSERVATION CHECKLIST

- | | | |
|--|------------------------------|-----------------------------|
| • Demographic characteristics of patients | ☐ Yes | ☐ No |
| • Physicians' notes | ☐ Yes | ☐ No |
| • Nursing assessments | ☐ Yes | ☐ No |
| • Problem lists | ☐ Yes | ☐ No |
| • Medication lists | ☐ Yes | ☐ No |
| • Discharge summaries | ☐ Yes | ☐ No |
| • Advanced directives | ☐ Yes | ☐ No |
| • Laboratory reports | ☐ Yes | ☐ No |
| • Radiologic reports | ☐ Yes | ☐ No |
| • Radiologic images | ☐ Yes | ☐ No |
| • Diagnostic-test results | ☐ Yes | ☐ No |
| • Diagnostic-test images | ☐ Yes | ☐ No |
| • Consultant reports | ☐ Yes | ☐ No |
| • Computerized provider-order entry | ☐ Yes | ☐ No |
| • Laboratory tests | ☐ Yes | ☐ No |
| • Radiologic tests | ☐ Yes | ☐ No |
| • Medications | ☐ Yes | ☐ No |
| • Consultation requests | ☐ Yes | ☐ No |
| • Nursing orders | ☐ Yes | ☐ No |
| • Clinical guidelines | ☐ Yes | ☐ No |
| • Clinical reminders | ☐ Yes | ☐ No |
| • Drug-allergy alerts | ☐ Yes | ☐ No |
| • Drug–drug interaction alerts | ☐ Yes | ☐ No |
| • Drug–laboratory interaction alerts
(e.g., digoxin and low level of serum potassium) | ☐ Yes | ☐ No |
| • Drug-dose support (e.g., renal dose guidance) | ☐ Yes | ☐ No |
| • Clinician notes | ☐ Yes | ☐ No |