

Analysis of Health Record Management System in Private Hospitals

*Ms. Sheetal Johar

**Dr. BasannaPatagundi



ABSTRACT

The National Health Policy of India, 2017 emphasizes that at district level there should be electronic database at all health care systems by 2020. Health record of any patient is the most important document which gives information about the patient's health in past and present which helps doctors to give better and faster treatment to the patients. The study was conducted at selected private hospitals in Karnataka to assess the usage and challenges in implementing electronic health management system. Karnataka is the eight largest state in area, geographically in India. It was found that it is easier to use EHR in health centres with lesser number of patients when compared to health centres where large number of patients had to be examined every day. In a few private hospitals EHR was not implemented and manual record system was in use. Majority of them looked forward to moving to using EHRs, although a small number of them were reluctant to shift from manual system as they were at ease at using the manual system for many years. It was found that some of the respondents who do not use computers often found it difficult to make entries on the system.

Keywords – EHR, NHP, health record, health centre.

*Research Scholar CMR University Bangalore, India

** Professor and Head of the Department of MBA Cambridge Institute of Technology, Bangalore, India

INTRODUCTION

Health Record of any individual is clinically very meaningful when maintained from the conception or birth till death of an individual. Throughout one's life there will be various encounters with doctors, health check-ups, vaccination and now with the devices people even use to do regular check-up at home. The details maintained in one single record becomes helpful for any kind of examination by physicians. It cuts down the costs for unnecessary repetitive diagnosis and also helps in better and faster diagnosis of the health issue¹.

An Electronic Health Record is collection of various medical records during one's life span². These life time records need to be maintained with some standards else it would be very difficult to bring together the records from different hospitals or health care centres together. Hence, to achieve all this there has to be pre-defined standards for information capture, retrieval, storage, analytics, exchange and it includes text, images and clinical codes which are used globally.

The importance of electronic health record is to provide people with the ease to access their health record anywhere anytime at any hospital or health centre so that the doctor can have the complete history of the patient and can give proper medication or treatment required faster. Hence, the need for interoperability. This will interconnect all health care centres across the country and with the appropriate authorisation the health records could be accessed. HIMSS defines interoperability (2013)³ as the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged. Data exchange schema and standards should permit data to be shared across clinician, lab, hospital, pharmacy, and patient regardless of the application or application vendor. In a country like India with huge population demographics play a lot of importance. In remote and hilly regions accessibility to networks is less and very difficult. It will be important to have interoperability at different levels as it cannot be the same in all regions.

In the areas where interoperability is possible, same or similar structures can be used and the vocabulary or codes could be common and understood (example SOMED CT(Systematized Nomenclature of Medicine Clinical Terms) or ICD 10(International Code for Diseases, Version 10)). If the vocabulary can be matched it becomes easier to understand. To achieve complete inter-operability, it will require multiple layers of network transfer protocol, data information, description, vocabulary and code sets to be standardised and represent all the requirements. Even after implementing the model there will always be continuous up gradation of the software, rules and regulations, codes, certification and continuous guidance from the authorities.

1. Circular on Electronic Health Record by Ministry of Health and Family Welfare <http://mohfw.nic.in/showfile.php?lid=1671> as extracted on 25th August 2018
2. Electronic Health Record Standards for India , NHP, <http://www.nhp.gov.in/ehr-standards>, extracted on 26th August 2018.
3. <https://www.himss.org/library/interoperability-standards/what-is-interoperability1> , extracted on 26th August 2018.

Health Record Systems requires to be secured by all means. They cannot be accessed by anybody without proper authorisation. The healthcare providers will have to consider the following security measures⁴:

- Ensure complete confidentiality, integrity and availability of the electronic health records that are created, transmitted, received or maintained.
- Protect against any anticipated threat to the security of EHRs.
- Provide protection against inappropriate use and disclosures of electronic health record that are not permitted under Privacy standards.
- Ensure that their workforce will follow the rules and regulations set for security policies and to follow the procedures.

After the NHP 2002, the next NHP was in 2017⁵. The primary aim of this policy is to inform, clarify, strengthen and make the role of Government as a priority in shaping health systems. There is a need for organisation of healthcare services, to prevent diseases, promote good health, access to the technology, have better human resources, knowledge base, financial strategies, have more stronger regulations and health assurance. The policy emphasises that at district level there should be electronic database at all health care systems by 2020.

Current health status and policy in Karnataka

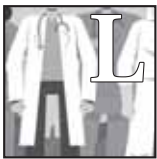
Karnataka is the Eight largest state in area (191791 sq kms), geographically, in India. The population of this state is 6.6 crore as per Census 2016. Karnataka has made a lot of progress in improving health care services over the past few years.

A systematic analysis was done to study HIS and it was found that there was:

- (a) Very less use of data for decision making. HIS (Health Information System) ensures proper data capture, analysis and dissemination of information in a reliable and timely manner so that correct decision can be taken. The current status of HIS in Karnataka needs a lot of improvement. There is a lot of discrepancy in the kind of data available for public health managers, policy makers and researchers. The HMIS (Health Management Information System) currently, which is being used, captures only routine monthly reporting from peripheral centres to district and national levels. Most of the data is just available on one HMIS portal and several other new programmes are not integrated to this
4. Electronic Health Record Standards for India , NHP, <http://www.nhp.gov.in/ehr-standards>, extracted on 26th August 2018.
 5. https://www.nhp.gov.in/health-policies_pg extracted on 28th August 2018
 6. https://www.karnataka.gov.in/hfw/kannada/Documents/Karnataka_Integrated_Public_Health_Policy_2017.PDF

- (b) Outmoded Information Systems: The existing staff in most of the public health sector are over burdened by maintaining multiple registers. They lack training in data collection, reporting and submission of reports for many programmes. There is lot of data redundancy.
- (c) Private sector Information is unavailable, although the Government has regulations and policies in place to be followed by private health care services, there is still difficulty to ascertain the number of Practitioners in private health services in the state.

National Informatics Centre (NIC) has developed an open source HMIS⁷ (Health Management Information System) which is configurable and easily customizable. This is mainly for the hospitals in the Government sector. As of August 2018, about 71 hospitals and health education institutions have started using this system.



LITERATURE REVIEW

Various studies have shown advantages of using electronic health records. EHR helps in timely decision making as patient records can be easily found electronically. The benefits came in as reduction in transcription staff as physicians moved from dictation to typing records themselves. The integration of billing with electronic medical records software and electronic documentation with the coding system will reduce the data entry staff and bring in financial benefits along with reduced timing in doing the work by maintaining quality (Miller & Sim, 2004).

It is time for information to be fed only once into the system electronically and this should be available at all times during the care. The reports should not have any redundant information in them. (Arya, 2015). Although there were many benefits of EHRs in comparison to paper records, like paper records would get old, soiled or spoiled with water, termites or fire, but still there was only partial adoption of EHRs. The goal was to have EMRs accessible across the country and for this there was a great need of interoperability and technical and policy conformance among various networks (Burrows & Ashley, 2014). It was found that there were many problems faced during the process of using the electronic health record systems (EHRs), but the benefits outweigh them and hence justifying their use. The benefits were standardization of processes, ease and agility in recovery of information, the control over prescriptions, materials and procedures were better (Cortes et al, 2011). It was found that EHRs empower the patients and support care between their visits (Ralston et.al, 2010).

Despite the advantages of EMR, the adoption rate is still low, there is less acceptance by the physicians. There is a need to accelerate the use of EMRs and for this it needed educational campaigns to demonstrate the advantages of EMRs and further improve the physicians' perceptions of EMRs (Parvin et.al, 2014). Resistance to change is a common thing. Moving on from paper-based record system to EHR also faced

resistance. It is important to involve the staff, give them proper training and educate them and support them to practice using it (Callan et.al, 2007).

Communication. Kathrin M. Cresswell (2012), studied about the consequences faced by users of new technology involving electronic health record. Due to the complex processes involved in implementing and adopting new technology there were changes in organisational functioning and work practices. This study was taken up in English health care setting about national implementation of electronic health records and one of the procured systems was Lorenzo. It was found that most importantly, national implementations need to build on a solid basis of local technology adoption by allocating sufficient time for individual users and organisations to adjust to the complex changes that often accompany such service redesign initiatives. Usage of IT in healthcare sector in India was very less and to expand it, several actions had to be taken. There was a need to formulate policies, standards or guidelines to maintain and control the quality. Government funding need to be improved in areas which can result in availability and improvement in current infrastructure, purchasing and installing technology, recruiting the competent staff or train existing health staff. Government should arrange training programs to enhance computer skills for health staff which can be done in partnership with private sector (Sharma Kalpa, 2012). Lack of funds, shortage of suitable governance health policies and interoperability standard issues are major barriers in adoption of EHR in India. EHR should be made mandatory in large and medium sized hospitals (Meenakshi, Himanshu, 2016).



STATEMENT OF PROBLEM

Electronic Health Records (EHR) have been proposed by Ministry of Health Affairs, standards are being set, and both public and private hospitals have to implement the standards. The purpose of EHR is to have complete record of the patient from conception to death. This helps the doctor to treat the patient faster and more precisely. But we still find that patients have to physically carry all the records of test reports and the history of health while visiting the doctors. If the patient visits another doctor there is completely no access to his/her previous Electronic Health Records (EHRs). There is no interoperability in place.

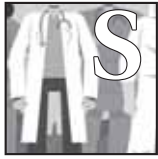
This study makes an attempt to assess the issues and challenges in implementing electronic health records.



PURPOSE OF STUDY

The purpose of this study is to find the prevailing health record system in private hospitals in Karnataka. Further, to study the implementation of electronic health record system, its implications and barriers in implementation. The aim of the research is to find out the actual status of EHRs. The assessment of EHRs and possibilities of implementing it is being done by various stakeholders which include the vendors, hospitals and physicians, but to ascertain the right scenario by using various techniques of research led to this study.

1. <https://ehospital.gov.in/ehospitalso>



SIGNIFICANCE OF THE STUDY

The present health policies by the Government of Karnataka is aiming to have complete EHRs at all health centres through the state. This study is covering a few private hospitals from different administrative sections of Karnataka which can be representative of the population. The study aims to bring out the experiences of the people using EHR to maintain health records, the problems if any, in using EHRs and the problems faced for implementing EHRs. This study will help various stakeholders involved in implementing EHRs to understand the problems faced in implementing and using EHRs.



PRIMARY RESEARCH QUESTIONS

To understand and find answers for following questions with reference to private hospitals in Karnataka.

1. What is the current system followed to maintain health records?
2. Are EHRs implemented in hospitals?
3. Is Electronic Health Record System helpful for physicians?
4. Is there enough technical support available at hospitals to use EHR?
5. What are the barriers in implementing EHRs?



OBJECTIVES OF THE STUDY

- v To study EHRs being currently used by private hospitals in Karnataka
- v To assess the usage of Electronic Health Record System for physicians
- v To find the barriers in implementing EHRs
- v To understand the usage pattern of Health Record Systems by doctors, nurses and clinical technicians



METHODOLOGY

The study is descriptive in nature. Questionnaire was developed to collect responses from doctors/ nurses/ technicians. Data was collected and analysed using statistical tools. Observation method is also used to assess the use and usability of EHRs.



VARIABLES CONSIDERED FOR STUDY

The study comprises of identifying if the hospital under study is using manual health record system or electronic health record system.

If the hospital under study is following manual system, then the functionality of the manual system, the convenience of use, intentions to move to EHR and barriers in implementing EHR are studied.

If the hospitals under study are using EHR, then following characteristics are studied.

- Technology characteristics- Considering if the end users have prior knowledge of using computers.
- Use and usefulness – The ease of using EHR and its usefulness
- Documentation – To understand as to what extent it is helpful in documentation
- EHR support – The kind of IT support they get for using EHR.

The various characteristics would be helpful in understanding the implementation status, barriers and problems faced after implementation. These will further help in improving the software if needed to make it more user friendly, to find solutions based on what the study brings out.

Target Group

The target group is doctors, nurses and clinical staff. The software used is expensive and hence big hospitals with more than 500 beds are considered.

Sample Size:

Method of convenient sampling is used for selecting samples and sample size. Since the study has the target group as doctors, nurses and lab technicians, time is very important and crucial for them and hence difficult to target too many of them. Considering these reasons, the sample size decided in each hospital is: 20 doctors, 20 nurses, 10 lab technicians. Questionnaire to be filled by 200 respondents from private hospitals (50(20 doctors+ 20 nurses + 10 clinicians) from each hospital). In this study five hospitals were considered from Karnataka and hence total 228 respondents answered the questionnaire.

Sample selection Process:

Since the study comprised of private hospitals in Karnataka. The state of Karnataka is divided into four administrative divisions, a private hospital is selected from each division. Hence cluster stratified judge mental sampling was used. Since there is only one such large public hospital in some divisions of Karnataka, a uniformity is maintained and one private hospital from each division is considered for the study. In case, such big hospital is not available in any particular division then the next highest bedded hospital is considered for the study. If in any division the hospital selected does not permit to conduct the study there, then an equivalent hospital is selected in Bangalore for the study.

The four administrative divisions of Karnataka are:

Source: <https://www.karnataka.com/districts/about-districts/>

1. Bangalore Division
2. Belgaum Division
3. Kalaburagi Division
4. Mysore Division



LIMITATIONS

Geographical location: The study is conducted only for the state of Karnataka and in the state only four places were selected, one from each administrative region based on highest number of bedded hospitals. In absence of getting permission from any one of these chosen hospitals similar hospital was chosen from Bangalore and not any other hospital in that region.



DATA ANALYSIS

Respondents Using EHR

Descriptive Analysis of the responses is summarised as follows:

- A total of 228 respondents from 5 private hospitals in Karnataka formed the sample for this study. From the respondents 41% were doctors, 39% were nurses and remaining 20% were clinical staff.

2 years but less than 3 years and remaining 31% have been using EHRs for more than 3 years.

- 4% of the respondents used EHRs for only out-patients whereas 5% of the respondents used EHRs only to prepare discharge summaries and 91% of the respondents used EHRs for both out-patient and for discharge summaries.

Technology Characteristics

The response on technology Characteristics which includes their experience on use of computers and EHRs were studied and analysed as below.

The above table shows the response of 156 respondents who are using EHR at their respective hospitals. The table clearly shows that majority of the respondents are comfortable using computers and EHRs. Majority are happy with the training provided on how to use the EHR system and would prefer additional training on the same. Majority of them found EHRs

Technology Characteristics

Technology Characteristics	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Enables machine to locate appropriate					
Comfortable using Computers	40.4	53.8	4.5	1.3	-
Comfortable using EHRs	30.8	55.1	11.5	1.9	.6
Training provided on using EHR	26.5	56.8	13.5	2.6	.6
Additional training on EHR if provided	29.5	49.4	19.2	1.9	-
EHR helps in reducing errors in health records	30.8	51.3	14.7	3.2	-
Overall happy with EHR implementation	28.2	53.8	14.1	3.8	-
Ease of using EHR on hand held devices	26.9	44.9	22.4	5.8	-
Prefer to use EHR from home	23.1	39.7	20.5	12.2	4.5

- 21% of respondents were in age group 20-25 years, 31% belonged to the age group 26-30 years, 22% belonged to the age group 31-35 years, 11% belonged to age group 36-40 years, 8% were in age group 41-45 years and remaining 7% belonged to age above 45 years.
- 41% of the respondents were male and 59% of them were female.
- 59% of respondents were from hospitals in Bangalore, 22% were from Mysore and 20% were from Bellary. No respondents from Belagavi as the hospital selected for study did not permit to conduct the study and hence an alternate hospital was selected from Bangalore.
- Only 68.4% of the respondents were using Electronic Health Records at the hospital and the remaining 31.6% were using manual system to store health records.
- 33% of the respondents have been using EHRs for a period of less than 6 months, 10% of them have been using EHRs for more than 6 months but less than one year, 17% have been using EHRs for more than 1 year but less than 2 years. 9% have been using EHRs for more than

help in reducing errors in maintaining health records. About 82% of respondents are happy with the implementation of EHR and about 72% of them feel that it is easier to enter the details of health records on hand held devices. Only about 53% of respondents preferred to use EHR from home for any reference and the rest 47% were either neutral or not ready to use EHRs from home for any reference or calls.

Use and Usability:

The responses of the respondents on use and usability of EHR were analyzed and found the following results.

The above results were found from a total of 156 respondents. Some respondents did not respond to use of EHR to assess patients and recommend medication as they were clinical staff and had never prescribed medication to any patients whereas at some hospitals the clinical staff were medical doctors and knew the use of EHR regarding patient's medication prescribed electronically. Almost 75% or more of the respondents were at ease using EHRs and found it easy to search patient records electronically and also prescribe medication easily. But many others, almost 25% were neutral about their comments and very few were not comfortable

Usability and Usefulness of EHR

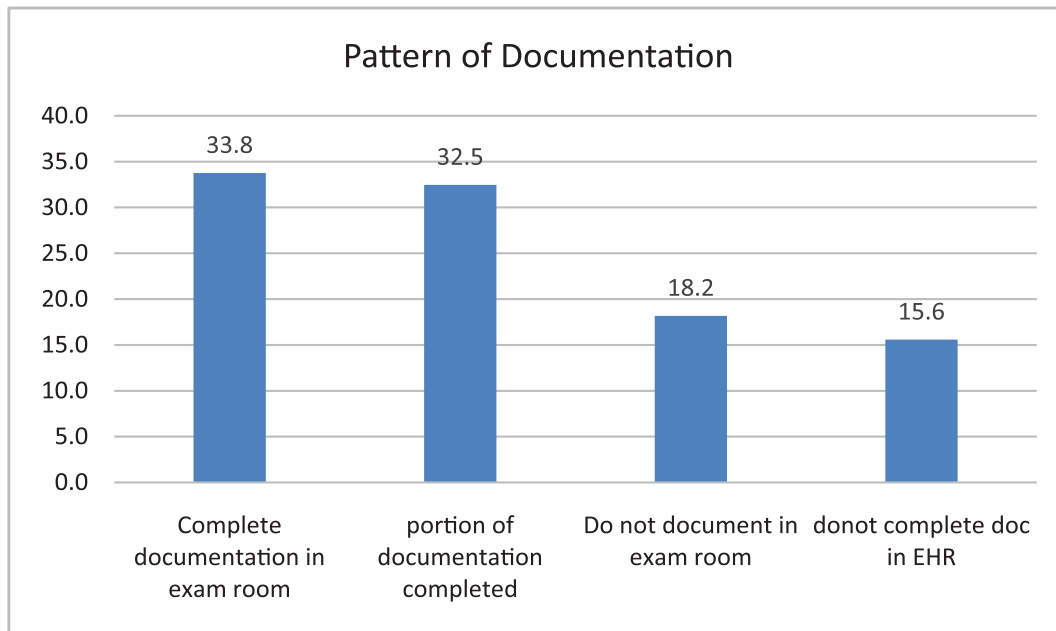
Usability and Usefulness of EHR	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Easy documentation while seeing patients	32.7	55.1	7.1	4.5	.6
Enables machine to locate appropriate format	26.3	55.8	17.3	.6	-
Easy navigation to explore various features embedded in it	25.6	60.9	12.8	.6	-
Able to effectively use various modules	19.4	56.8	21.3	2.6	-
Able to electronically review patient's ancillary and diagnostic test results	31.4	51.9	14.7	1.9	-
All information needed to assess a patient's condition is available	22.4	59.6	15.4	2.6	-
Able to quickly search, select and enter patient's medication	22.4	56.4	18.6	1.9	.6
Able to electronically prescribe patient's medication with ease	19.5	50.6	22.7	6.5	.6
Provides useful tools for disease management	16.7	50.0	27.6	5.8	-
Helps in faster insurance processing	14.1	61.5	21.2	2.6	.6

using EHRs. A larger number, close to 33% did not comment or did not find EHR providing useful tools for disease management. A lot of respondents, 75% of them found EHR helpful in faster insurance processing.

Pattern of documentation using EHR

The figure shows the documentation pattern by respondents while seeing patients. It was found that 34% of the

respondents completed the documentation using EHR while they were with the patient in the examination room. Majority of these were consultants who examined Out Patients. 33% of the respondents completed a portion of the documentation using EHR while they were in examination room with patient and the rest was completed later. 18% of the respondents did not document in EHR when they were the patient in the examination room whereas 15% of the respondents did not complete the documentation using EHR instead they would either dictate or use hand written notes.



Documentation Pattern

Documentation using EHR:

The above table shows that about 75-80% of the respondents were able to document their recommendations for patients in EHR and were able to find these recommendations with ease. About 80% of the respondents were able to complete the documentation electronically on the same day that they saw the patient and the remaining were neutral and less than 2% disagreed with the same. About 72% of the respondents found

computers for the people working in the hospital. To procure the computers with proper hardware and network them with good connectivity to the server so that the patient records can be accessed and stored with high speed. The respondents experience regarding this is as shown in the table above. Of the 156 respondents who were using EHR about 77% of them had the required hardware and network facilities, about 76% of the respondents felt that the network speed required for EHR was reliable and that the devices enabled them in efficient work

Documentation using EHR (in %)

Documentation using EHR	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
All recommendations for patient care are documented using EHR	22.4	60.9	14.7	1.9	-
Recommendations for patient's plan of care are easily found	16.0	64.1	16.7	3.2	-
Able to complete patient encounter documentation on the same day of seeing patient	18.1	61.9	18.7	.6	.6
Documentation is as complete on EHR as it was on paper	16.7	55.8	21.2	6.4	-
Documentation is as accurate on EHR as it was on paper	16.7	55.8	20.5	7.1	-
Appropriate CPT codes available on EHR to be included in patient report	17.9	46.2	33.3	2.6	-
EHR helps improve quality of patient care	20.6	60.6	16.8	1.9	-

their documentation on EHR to be as complete and accurate as it was on paper and the remaining respondents were neutral about it and about 7% disagreed with it. About 66% of the respondents found CPT (Current Procedural Terminology) codes on EHR which they could include in patient report whereas the majority of remaining were neutral on their comment and less than 3% disagreed. Majority of the respondents found that EHR helped to improve the quality of patient care.

flow. The remaining respondents were neutral about their response regarding these and less than 7% disagreed that they had the right hardware and network facilities to use the EHR. 76% of the respondents found the IT support responsive at their organisation while the remaining were neutral and less than 4% disagrees with it. 75% of the respondents felt that their respective organisations had the right number of IT resources to support them in using EHR whereas about 17% were neutral and 6% disagreed on having the right IT resources to support the use of EHR. About 72% of the respondents could easily get help from the IT people in their hospitals if they had any problem in using EHR and found the technical team considering their EHR enhancements requests, whereas 19% were neutral and less than 10% disagreed to the same.

Technical Support:

The IT/Systems department plays a very important role in every hospital. They are given the responsibility to get enough

Technical Support (%)

Technical Support (%)	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Hardware and network support for EHR available	20.5	56.4	21.8	1.3	-
The hardware and network supporting EHR were reliable in terms of speed	20.0	56.1	17.4	6.5	-
The devices used to access EHR enabled efficient work flow	12.8	62.2	20.5	4.5	-
IT support at the organisation very responsive	18.7	58.1	19.4	3.2	.6
The organisation has right number of IT resources to support in using EHR	15.4	61.5	17.3	5.8	-
Can easily get help from IT team when having a problem using EHR	14.1	58.3	19.2	7.7	.6
The technical team in organisation considers enhancement requests when submitted	14.1	61.5	18.6	5.8	-



HYPOTHESIS TESTING

Hypothesis were tested using Chi-Square and results are summarised in the table below. Ease of documentation using EHRs while seeing patients were checked if influenced significantly by various technology and IT support characteristics

Factor Analysis

KMO value .871 indicates that data is sufficient and sample is

adequate. The total variance table is shown below:

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.871
Sig.	.000

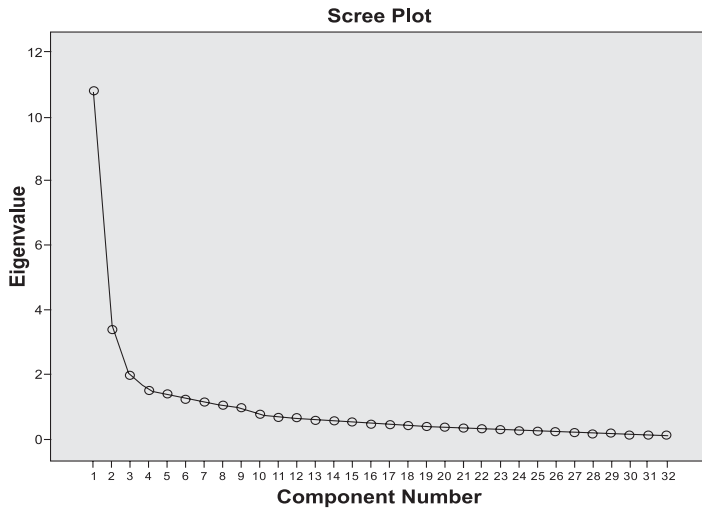
#	Null Hypothesis	Alternate Hypothesis	Sig. Value	Acceptance/Rejection of Null Hypothesis
1	Ease of using computers does not significantly influence the ease of using EHRs	Ease of using computers does significantly influence the ease of using EHRs	.000	Rejected
2.	Training provided to respondents has no significant influence on ease of using EHRs.	Training provided to respondents has significant influence on ease of using EHRs.	.000	Rejected
3.	Respondents being comfortable using computers has no significant influence on them finding EHRs easy for documentation while seeing patients	Respondents being comfortable using computers has significant influence on them finding EHRs easy for documentation while seeing patients	.000	Rejected
4.	Respondents being comfortable using EHRs has no significant influence on them finding EHRs easy for documentation while seeing patients	Respondents being comfortable using EHRs has significant influence on them finding EHRs easy for documentation while seeing patients	.000	Rejected
5.	Respondents given additional training on EHR no significant influence on them finding EHRs easy for documentation while seeing patients	Respondents given additional training on EHR has significant influence on them finding EHRs easy for documentation while seeing patients	.459	Accepted
6.	EHR's characteristic of helping in reducing errors in health records has no significant influence on easy documentation using EHRs while seeing patients	EHR's characteristic of helping in reducing errors in health records has a significant influence on easy documentation using EHRs while seeing patients	.000	Rejected
7.	EHR on hand held devices has no significant influence on the ease of documentation in EHRs while seeing patients	EHR on hand held devices significantly influence the ease of documentation in EHRs while seeing patients	.035	Rejected
8.	The devices used to access EHR at practice do not have significant influence on ease of documentation in EHRs while seeing patients	The devices used to access EHR at practice have significant influence on ease of documentation in EHRs while seeing patients	.000	Rejected
9.	The IT support being responsive at the organisation has no significant influence on ease of documentation in EHRs while seeing patients	The IT support being responsive at the organisation has significant influence on ease of documentation in EHRs while seeing patients	.103	Accepted
10.	Organisation having right number of IT resources has no significant influence on ease of documentation in EHRs while seeing patients	Organisation having right number of IT resources has significant influence on ease of documentation in EHRs while seeing patients	.009	Rejected

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.772	33.661	33.661	10.772	33.661	33.661
2	3.384	10.575	44.236	3.384	10.575	44.236
3	1.968	6.149	50.385	1.968	6.149	50.385
4	1.524	4.764	55.149	1.524	4.764	55.149
5	1.408	4.401	59.550	1.408	4.401	59.550
6	1.250	3.908	63.458	1.250	3.908	63.458
7	1.161	3.629	67.087	1.161	3.629	67.087
8	1.046	3.268	70.355	1.046	3.268	70.355
9	.978	3.056	73.411			
10	.766	2.392	75.803			
11	.681	2.129	77.933			
12	.656	2.050	79.983			
13	.586	1.831	81.814			
14	.566	1.769	83.583			
15	.520	1.624	85.207			
16	.459	1.434	86.641			
17	.456	1.424	88.066			
18	.421	1.316	89.382			
19	.405	1.266	90.648			
20	.371	1.158	91.806			
21	.338	1.058	92.864			
22	.321	1.004	93.868			
23	.302	.945	94.813			
24	.261	.817	95.629			
25	.239	.748	96.377			
26	.222	.693	97.070			
27	.199	.623	97.693			
28	.172	.539	98.231			
29	.169	.528	98.759			
30	.144	.451	99.210			
31	.132	.411	99.621			
32	.121	.379	100.000			

Extraction Method: Principal Component Analysis.

There are eight components which explain the variables having 70% influence on the study. The scree plot and the variance values above show that the last four components are not having much variation and hence the first four components are considered for explanation.



Four components can be identified as follows:

1. Ease and use of EHRs
2. Technical support availability to use EHR
3. Additional use of using EHR
4. Use of EHR on day to day basis.

The items under the four components are as mentioned below:

1. The first component comprises of - comfortable using EHRs, EHR being helpful in improving the quality of care of patients, Recommendations for patient's plan of care are easily found, comfortable using computers, able to complete most of patient encounter documentation within the same day of seeing the patient, able to effectively use the various modules, EHR provides useful tools for disease management, appropriate CPT codes are available to be included in report, documentation is as complete as it was on paper/using dictation, Overall, happy with EHR implementation, All the information needed to assess a patient's condition is available, able to electronically prescribe patient's medications with ease, able to electronically review patient's ancillary and diagnostic test results and the training provided on EHR.
2. The second component comprises of preference to use EHR from home (eg when on call), IT Support being responsive at the organization, EHR helps in faster insurance processing, and being able to get help when having problem with EHR.
3. The third component comprises of EHR provides useful tools for disease management, comfortable using computers, able to effectively use the various modules.

4. The fourth component comprises of EHR helps in faster insurance processing, able to complete most of the patient encounter documentation within the same day of seeing the patient, IT Support being responsive at the organization.

Respondents not using EHR

73 of the total respondents were not using electronic health record system and still followed the manual record system. Analysis of the data collected from them is as follows:

At these hospitals where EHR was either not implemented or was still not fully functional, computers were used for registration of patients and hence all demographics of patients were found online.

Convenience to look into old information of patients stored manually

55% of the respondents found it convenient to look into old information of patients stored manually, 18% were neutral and 27% found it inconvenient to look for records of patients stored manually.

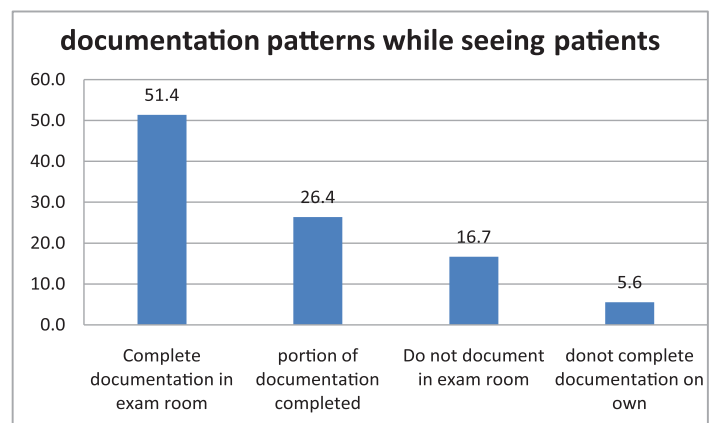
convenient to look into old information of patients stored manually(%)	
Very Convenient	21.1
Convenient	33.8
Neutral	18.3
Inconvenient	25.4
Very Inconvenient	1.4

In these hospitals diagnostic centres maintained all reports electronically.

Preference to view patient reports

It was found that only 4% of the respondents preferred to view the reports only in hard copy format, 42% of the respondents preferred to view it only on computers and the rest 54% preferred both soft copy and hard copy of the reports.

Documentation patterns while seeing patients



The figure above the documentation patterns of respondents while seeing patients. 51.4% of them complete the documentation manually in examination room itself while with the patient, 26.4% of them complete a portion of the documentation while with patient and the rest later, 16.7% of them do not document in the examination room and 5.6% of the respondents do not document it on their own.

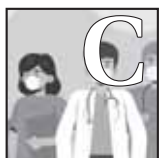
Preference to use Electronic Health Record System

93% of the respondents agreed that they prefer to use EHR and only 7% were neutral of their opinion.

Specific reasons for not implementing EHR

About 42% of the respondents felt lack of approval from authorities as a reason for not implementing EHR, 22% felt the software not user friendly and hence the reluctance to use it, 15% of the respondents were not willing to shift from manual system to electronic system, 12.5% of them felt there could be lack of security in maintaining records electronically and 8% felt lack of funds as a reason for not implementing EHR.

Specific reasons for not implementing EHRs (%)	
Lack of funds	8.3
Lack of approval from authorities	41.7
Software not user friendly	22.2
End users not willing to shift from manual system	15.3
Lack of security of records	12.5



CONCLUSION

It was found that 68% of the private hospitals in Karnataka considered for study had

implemented EHR and the others still used the manual system to maintain the health records. Along with analysis of questionnaire, observation method was also used and showed that most of the hospitals which implemented EHR were situated in Bangalore and some were found in Mysore region but private hospitals in other regions of Karnataka were yet to implement EHR. It was also found that although some private hospitals had implemented EHR software it was not used for maintaining health records, it was used for registration, billing, pharmacy, discharge summary and other modules but clinical modules were yet to be used. Various reasons identified during the study were, it was more difficult to use EHR in hospitals where there were too many patients, since saving records electronically took a little extra time and it was difficult to use. Some hospitals were using EHR only for out-patients and were in process of adopting it for in-patients. Hospitals where EHR was not implemented had majority respondents willing to shift to electronic method from the manual method. The reasons identified for not implementing EHR were lack of approval from authorities (42%), software not user friendly (22%), end users not willing to shift from manual system (15%), the feel that there would be lack of security of records stored electronically (13%) and lack of funds (8%). Overall, it was found that respondents found it easier to save and retrieve patient records stored electronically which helped them give faster and better treatment to patients. The critical factors for using EHR were identified as respondents found it easier to use EHR as they were comfortable using computers which helped them in improving and providing better care to patients. The doctors were willing to use EHR from home which helped them to give treatment to patients on call. With good IT support from respective hospitals the doctors were able to finish all documentation of patient record on time.

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