

Cross Sectional Study on EMR Adoption Model

By

Vanamali Pasupuleti

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

Academic year, 2015-2017



The IIHMR University, Jaipur

1, Prabhu Dayal Marg, Sanganer, Airport
Jaipur 302029, Rajasthan
Ph: 0141 3924700, Fax: 3924738
Website: www.iihmr.edu.in

Cross Sectional Study on EMR Adoption Model

By

Vanamali Pasupuleti

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

Academic year, 2015-2017

NTT Data Information Processing Services Pvt. Ltd. Bengaluru



The IIHMR University, Jaipur

1, Prabhu Dayal Marg, Sanganer, Airport
Jaipur 302029, Rajasthan
Ph: 0141 3924700, Fax: 3924738
Website: www.iihmr.edu.in

TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Vanamali Pasupuleti** student of **MBA Hospital and Health Management** from The IIHMR University, Jaipur has undergone internship training at **NTT Data Services, Bangalore** from **February 5th, 2017 to May 5th, 2017**.

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

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.



Dr. Ashok Kaushik
Dean - Academics and Student Affairs
The IIHMR University, Jaipur



Dr. Jagajeet Prasad Singh
Associate Professor
The IIHMR University, Jaipur

NTT DATA Information Processing Services Private Limited

(Formerly known as Dell Business Process Solutions India Private Limited)

Plot 123, EPIP Phase II, Whitefield Industrial Area
Bengaluru, Karnataka 560 066, India

To whomsoever it may concern

This is to certify that **Dr. Vanamali Pasupuleti** of **The IIHMR University, Jaipur** has been working with NTT DATA Services for his summer project.

Project Details:

Project Name : A cross sectional study on EMR adoption model
Duration : 90 days
Location : Bangalore
Guide Name : Shweta Yadav & Manjunath S
Sponsor Name : Ajay Aiyar

He has successfully completed his project and his performance during the tenure of the internship has been found to be satisfactory.

His findings in course of the project has been found to be practical and relevant and some of the recommendations will be incorporated on the floor on approval from the business.

Thanking You,

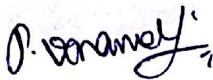
Regards,



Dilipkumar Santhanam
Business Partner Director, Services HRBP Team
NTT DATA Services

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "**A cross-sectional study on EMR adoption model**" and submitted by **Vanamali Pasupuleti** Enrollment No. IIHMR-U/01/2015-17/0360 under the supervision of **Dr.J.P.Singh** for award of Postgraduate Diploma in Hospital and Health Management of the University carried out during the period from 6th February 2017 to 5th May 2017 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

THE IIMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that all ethical issues have been considered while collecting data for my dissertation titled **Study on A Cross Sectional Study on EMR Adoption Model.**


Signature

2. INTRODUCTION:

Based on Healthcare information and management system Society (HIMSS), an

EMR is a part of an electronic health record which is belonging to the healthcare provider. EMR is a set of work flow tools and applications that digitizes the design, compilation, storage and management of patient information within the margins of an organization.”

Adoption is a method that” involve the multitude of decisions,activities and evaluations that include the broad effort to effectively integrate an innovation into the well-designed structure of an organization.” An adoption model helps in changing the complex process into a simple manner.

2.1 HIMSS Adoption Model

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

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

Figure 2.2.1: Stages in EMR Adoption model

3. OBJECTIVES:

- To identify the current scenario of Electronic Medical Records adoption and its stages (EMRAM Model) in the 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.

4. LITERATURE REVIEW:

Mc Lane S (2005) (1) stated that Electronic Medical Records (EMRs) are computerized medical information systems that collect, store and display patient information. They are a means to create legible and organized recordings and to access clinical

information about individual patients. Further, EMRs are intended to replace existing (often paper based) medical records which are already familiar to practitioners.

Schlegel K, Chandler N, Shaffer V (2013) (4, 5, 6) concluded that the worldwide expansion and growth of the mobile market has led to the formation of new markets in the majority of industries that are centered on mobile functionality.

Chaudhry B, Wang J, Wu S, Maglione M, Mojica W, Roth E, Morton SC, Shekelle PG (2006), Hillestad R, Bigelow J, Bower A, Girosi F, Meili R, Scoville R, Taylor R (2005), Nambisan P, Kreps GL, Polit S (2013) (10, 11, 12) stated that Electronic Medical Records (EMRs) are widely implemented in health care organizations, and much is known about factors affecting implementation processes. Nambisan P, Kreps GL, Polit S (2013) (12), Boonstra A, Broekhuis M (2010) (13) stated that despite the expected benefits of EMRs the adoption of EMRs proceeds slowly. Ammenwerth E, Iller C, Mahler C, Ancker JS (2006) (14), Kern LM, Abramson E, Kaushal R (2012) (15, 16, 17, 18) concluded that the body of literature of implementation of EMRs is considerable and many competing theories and models exist. Otieno GO, Hinako T, Motohiro A, Daisuke K, Keiko N (2008) (19) stated that in many theories and models, the organization, the type of innovation or technology and the user play a role. Evidence on organizational factors affecting innovation processes in health care organizations is mixed. Lium JT, Tjora A, Faxvaag A (2008) (20) concluded that some studies find positive associations and others find little or no effect on the innovation process. Reasons for users to resist the implementation of an EMR are a poor design, too much pressure to adopt the EMR or a lack of user involvement in the implementation process.

According to Transparency Market Research (TMR), the industry of healthcare in the middle of an ample move from paper based to digital based, which in turn upshot the enhancement of the EHR^{20,21} worldwide. Globally Market of electronic health records will place at US\$25.98 billion in the year of 2020 as per report by a CAGR. Mainly in the United

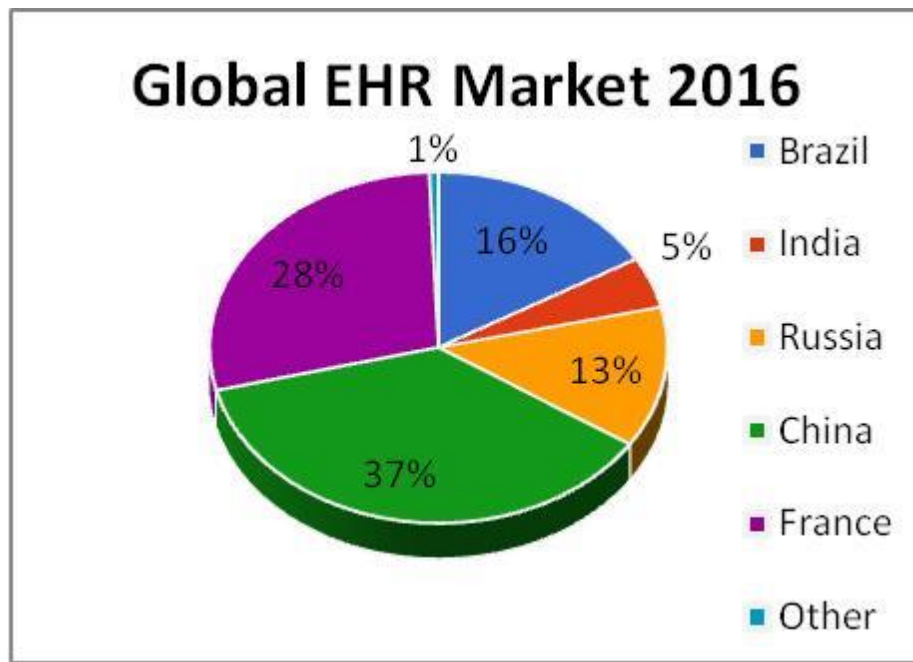


Figure 4.4.1 Global EHR Market

Kingdom and United State, continuous efforts are going on to accelerate this evolution across the whole public and private healthcare network. The United States will remain the largest EHR market in the Americas and globally as per the report of Accenture. The EHR Incentive Program²² offering both incentives for compliance and penalties for non-compliance if EHR system not used. In comparison to Asia Pacific, the EHR market of the Middle Eastern, European, and African is supposed to be lead by value of \$7 billion approximately. Figure 1 depicted the globally overview of EHR market. Impending markets of France, China, Russian, India and Brazil are anticipated to mature promptly in upcoming years in EHR markets. (Cited from 21)

4.1 GLANCE OF GLOBAL EMR STAGES

Table 4.1 Number of hospitals at stage 6 & 7 in Asia pacific region

Hospitals at stage 6	Hospitals at stage 7
➤ India-6 hospitals ➤ P.R. China-19 hospitals ➤ Taiwan-5 hospitals ➤ Thailand-2 hospitals ➤ Singapore-8 hospitals ➤ Malaysia-1 hospital	➤ Singapore-1 hospital ➤ Korea-1 hospital ➤ China-4 hospital ➤ India-0 hospitals

❖ Indian hospitals at stage 6

- 1) Apollo hospitals, Hyderabad
- 2) Apollo hospitals, Chennai

3) Apollo hospitals, Nandanam, Chennai

4) Apollo hospitals, Aynambakkam, Chennai

5) Max hospitals, East wing, Saket

6) Max hospitals, West wing, Saket

5. RESEARCH METHODOLOGY:

The study has carried out in 14 health care facilities of Bangalore.

5.1 STUDY DESIGN:

Descriptive cross sectional study

5.2 TOOLS OF STUDY:

Open ended structured questionnaire.

In depth interviews.

5.3 SAMPLING TECHNIQUE:

Purposive sampling.

5.4 SAMPLE SIZE:

Doctors, Nurses and Administrative staff from each health care facility.

5.5 EXCLUSION CRITERIA:

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

5.6 DATA COLLECTION:

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

5.7 STUDY METHOD:

An open-ended questionnaire will be used. The participants will be surveyed on demographic factors, duration and frequency of use, barriers and facilitators of EMR.

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

6. DATA ANALYSIS AND INTERPRETATION:

The data from the survey will be analyzed using Microsoft Excel. Analysis will be done with descriptive statistics mode which computed frequencies and graphs.

7. ETHICAL CONSIDERATIONS:

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

8. RESULTS AND ANALYSIS:

A cross-sectional and descriptive study tool was used to collect data from 14 hospitals in Bangalore, India. The study used a questionnaire, which was available in paper-based formats and Google forms .

A total of 168 questionnaires were circulated in 14 selected hospitals and 150 participants completed the survey, giving a successful response rate of 89%. All participants remained voluntarily completed the whole questionnaire. Participants of this research involved different healthcare personnel such as nurses, administration staff, physicians, pharmacists, laboratory staff all of whom use an EMR. Questionnaires were distributed in 11 Private and 3 Non- profit hospitals in Bangalore, India. For this research, hospital size was characterized based on bed capacity ranging from 250-500 beds, 500-750 beds and >750 beds.

Table 8.1: Table showing demographics of the questionnaire respondents

VARIABLE		'n' VALUE	PERCENTAGE
Response code	Doctors	n=44	29.3%
	Nurses	n=55	36.6%
	Admin staff	n=51	34%

		Total = 150	
Age group	20-30 31-40 41-50 >50	n=31 n=48 n=4 n=2 Total=85	36.4% 56.4% 4.7% 2.3%
Work Experience	Less than 5 Years 6 to 10 Years 11 to 20 Years Greater than 20 Years	76 34 11 02 Total n =123	61.7% 27.6% 8.9% 1.6%
Hospital Size	250-500 bedded >750 bedded OPD & Day care centres Super speciality hospitals	n=6 n=3 n=2 n=3 Total=14	42.8% 21.4% 14.2% 21.4%

Table 8.1 shows that most respondents (56.4%) were between the ages of 31-40 years. Most of the respondents (61.7%) are having a working experience ranging between 0-5 years. Majority hospitals (42.8%) covered are 250-500 bedded.

Table 8.2EMR Utilization in hospitals

VARIABLE		'n' VALUE	PERCENTAGE
Frequency of usage of computer	Very frequently Frequently Often Rarely	n=48 n=94 n=5 n=3 Total=150	32% 62.6% 3.3% 2%

Internet usage for patient care	1) Cli.research,Telemed,e-consul, Appoint. Sched	n=4	28.5%
	2) Telemedicine, e-consul and Appoint.sched	n=4	28.5%
	3) Telemedicine and Appoint.sched	n=6	42.8%
		Total=14	
Usage of EMR outside clinical office	Yes	n=23	15.3%
	No	n=127	84.6%
		Total=150	
No. of years of using EMR/HIS	1-2 Years	n=42	28%
	3-5 Years	n=51	34%
	5-7 Years	n=34	22.6%
	>7 Years	n=23	15.3%
		Total=150	
No. of training sessions on EMR/HIS	1-2	n=53	35.3%
	3-4	n=81	54%
	5-6	n=5	3.3%
	None	n=11	7.3%
		Total=150	
Effect of training on EMR/HIS implementation	Satisfied	n=121	80.6%
	Neutral	n=24	16%
	Dissatisfied	n=5	3.3%
		Total=150	
Effect of EMR/HIS in increasing productivity (i.e. patients per day)	Agree	n=142	94.6%
	Neutral	n=8	5.3%
	Disagree	n=0	
		Total=150	

Table 8.2 shows that majority of the respondents (62.6%) uses their computer frequently for patient care. Most of the hospitals (42.8%) use internet for Telemedicine and Appointment scheduling. 84.6% of the respondents will not use the EMR outside the clinical office. Around 34% of the hospitals are using EMR/HIS for 3-5 years. About 54% respondents are having 3-4 training sessions on EMR/HIS per year. 80.6% respondents are satisfied with the training sessions 94.6% are agreeing that EMR/HIS will increase the productivity (i.e. patients per day).

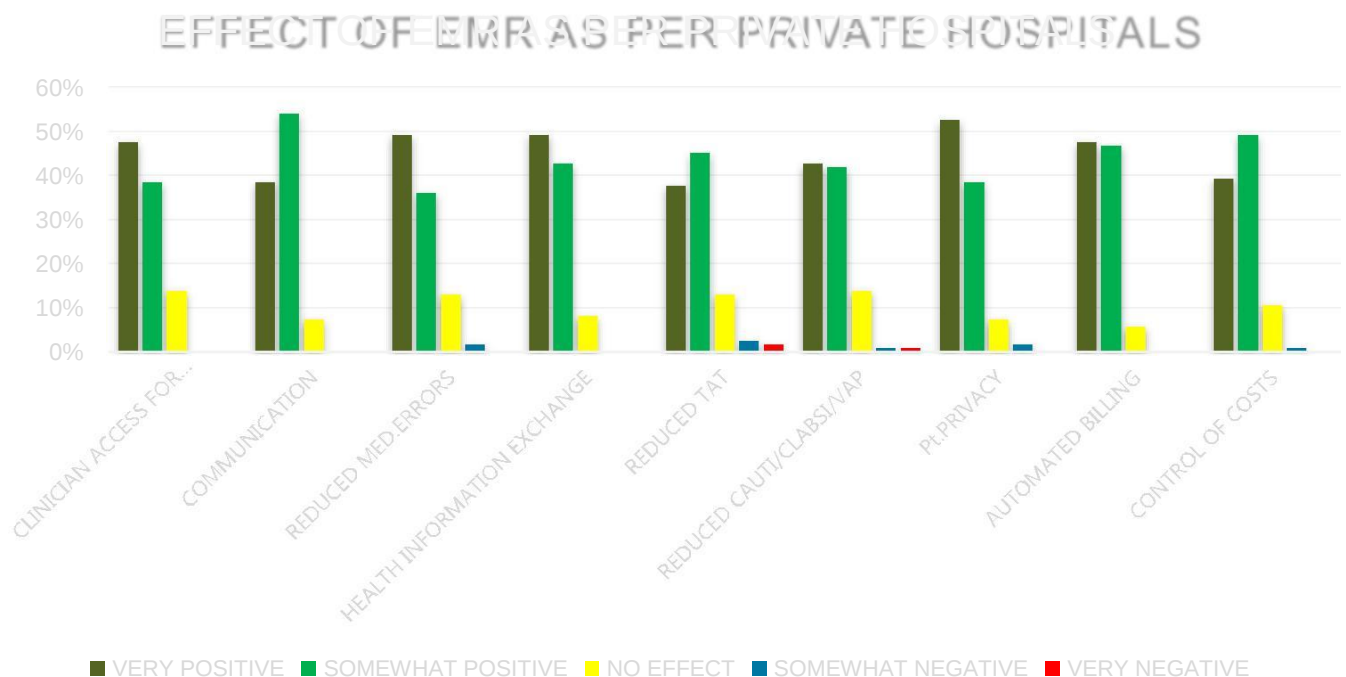


Figure 8.8.1 Perception of Private hospitals staff about the effect of EMR

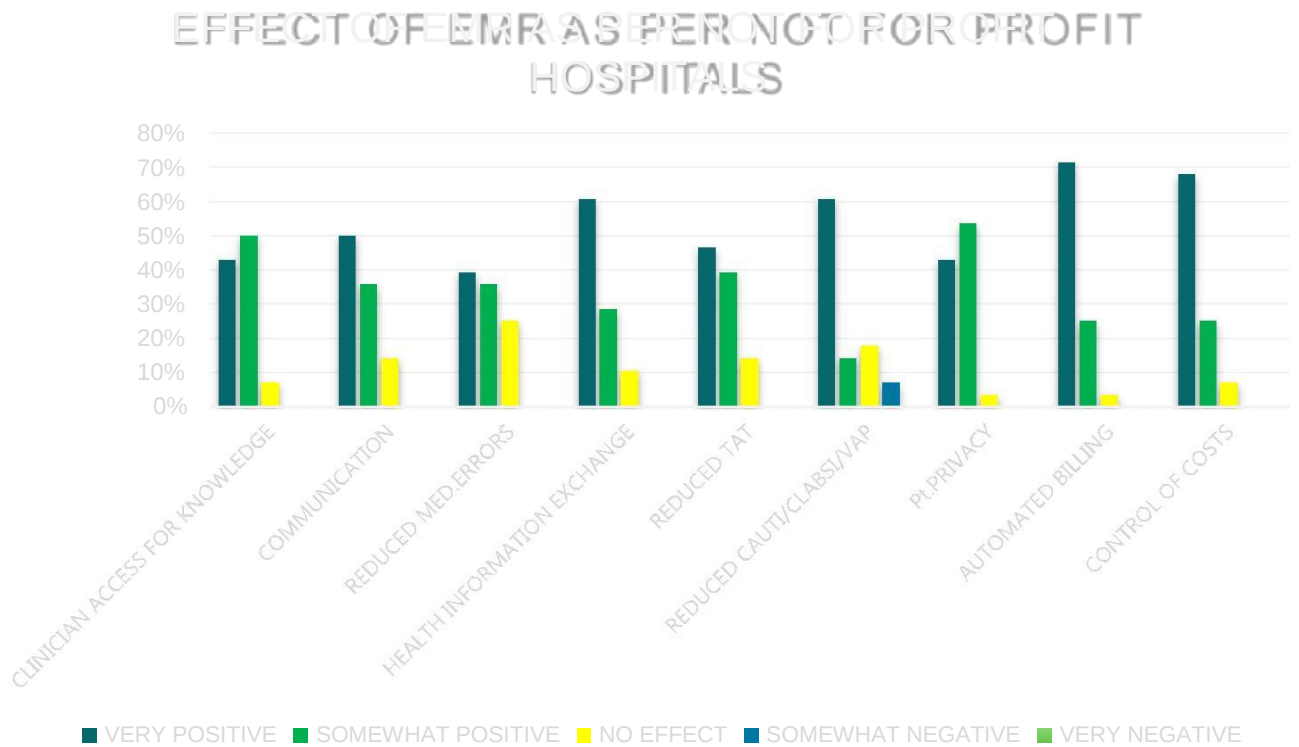


Figure 8.8.2 Perception of Not for profit hospitals staff about the effect of EMR

Figures 8.8.1 and 8.8.2 explains that maximum number of respondents are having a perception that the effect of EMR on various parameters like clinician access, communication between healthcare professionals, reduction in medication errors, Health information exchange, reduction in TAT, reduced CAUTI, CLABSI and VAP, patient privacy, automated billing and control of costs will have a positive effect.

8.1 Objective 1: STAGES OF PRIVATE AND NOT FOR PROFIT HOSPITALS

Figures 8.8.3 and 8.8.4 shows that out of 11 private hospitals 1 hospital is in stage 5, 3 hospitals are in stage 4, 2 hospitals are in stage 3 and 5 hospitals are in stage 2 whereas out of 3 Not for profit hospitals 2 are in stage 3 and 1 is in stage 2.

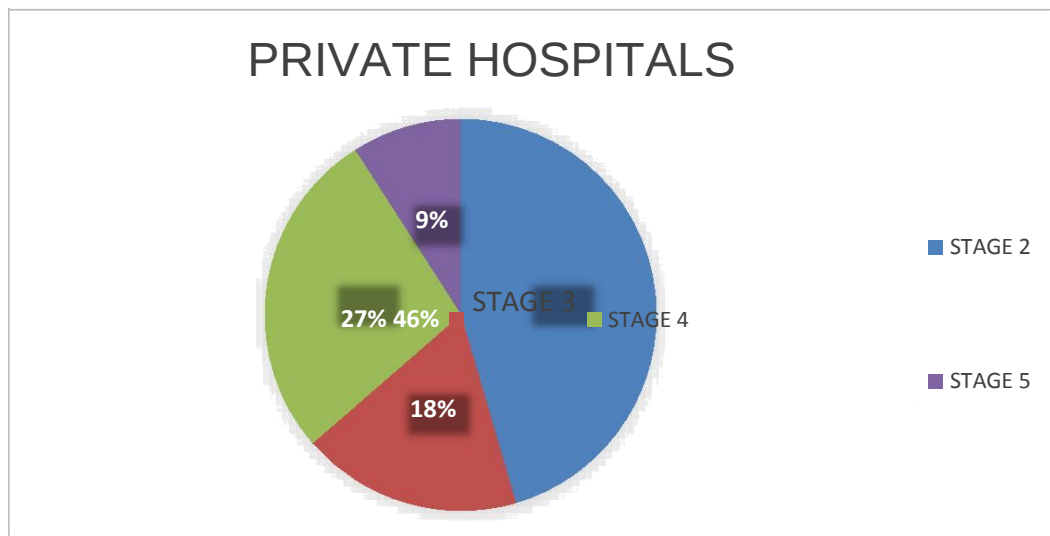


Figure 8.8.3 EMRAM stages of private hospitals in Bangalore

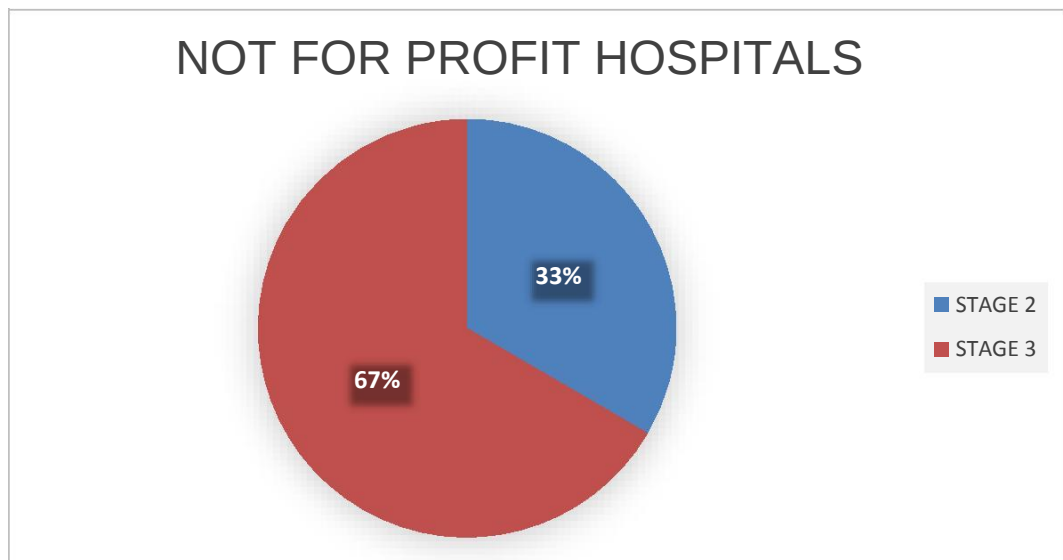


Figure 8.8.4 EMRAM stages of Not for profit hospitals in Bangalore

8.2 Objective 2: Greatest inhibitors for EMR adoption in the hospitals

Figures 8.8.5 to 8.8.10 shows the six categories of barriers that are inhibiting the adoption of EMR in the hospitals which were mentioned by the respondents in their questionnaire . The respondent has to give a rating on the scale of 1 to 5, 5 being the greatest inhibitor and 1 being the lowest. Based on the computed frequencies the below figures were analyzed to know the greatest inhibitor.

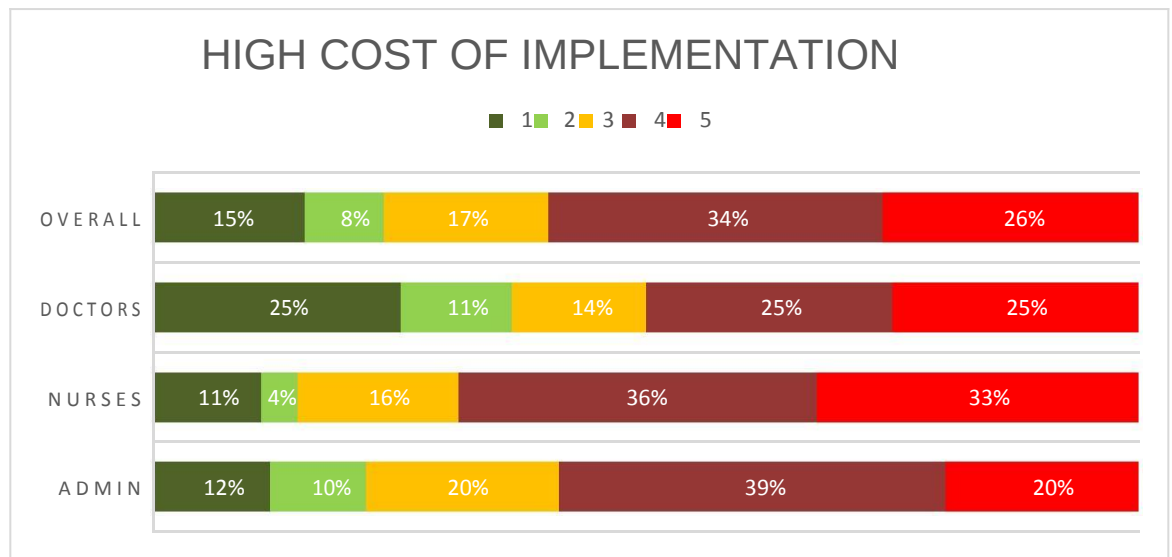


Figure 8.8.5 Response rate of high cost of implementation on Likert scale 1 to 5

Figure 8.8.5 summarizes that most of the overall responses (60%) had given that the high cost of implementation is a greatest inhibitor for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (69%) number to state that cost of implementation is the greatest inhibitor.

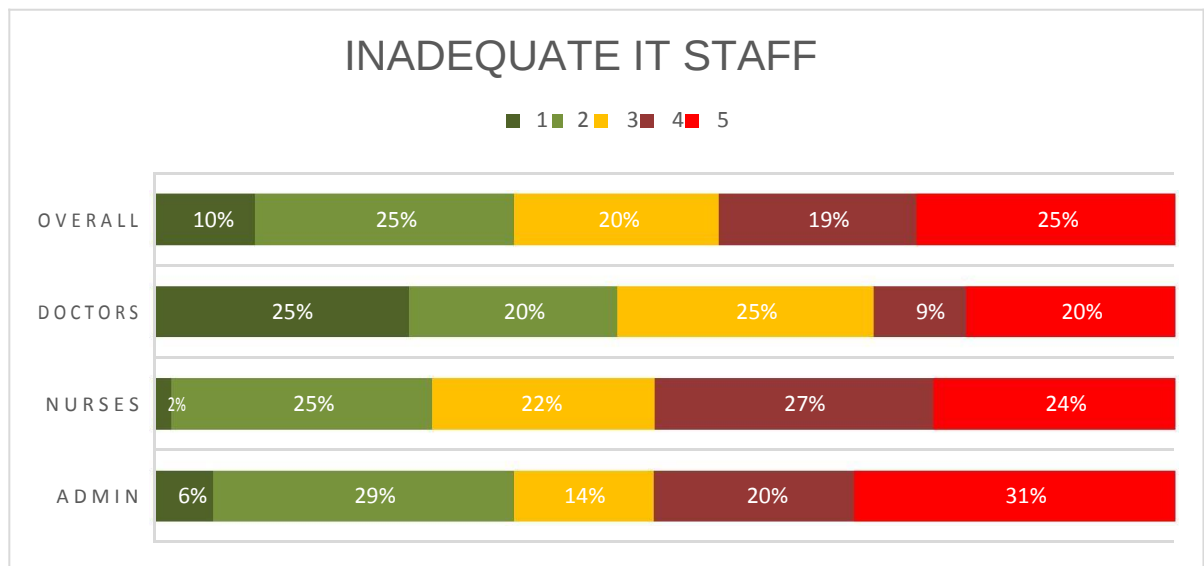


Figure 8.8.6 Response rate of Inadequate IT staff on Likert scale 1 to 5

Figure 8.8.6 summarizes that most of the overall responses (44%) had given that the Inadequate IT staff is a greatest inhibitor for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses and admin staff has gained maximum (51%) number to state that Inadequate IT staff is the greatest inhibitor.

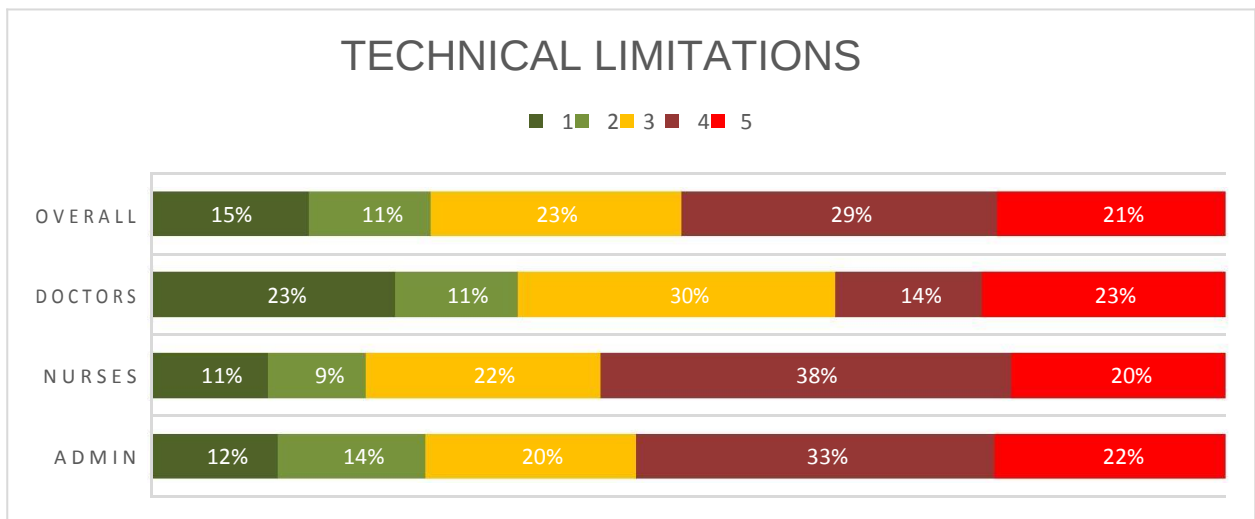


Figure 8.8.7 Response rate of Technical limitations on Likert scale 1 to 5

figure 8.8.7 summarizes that most of the overall responses (50%) had given that the technical limitations is a greatest inhibitor for the adoption of EMR. If we compare among

doctors, nurses and admin staff, nurses has gained maximum (58%) number to state that technical limitations is the greatest inhibitor.

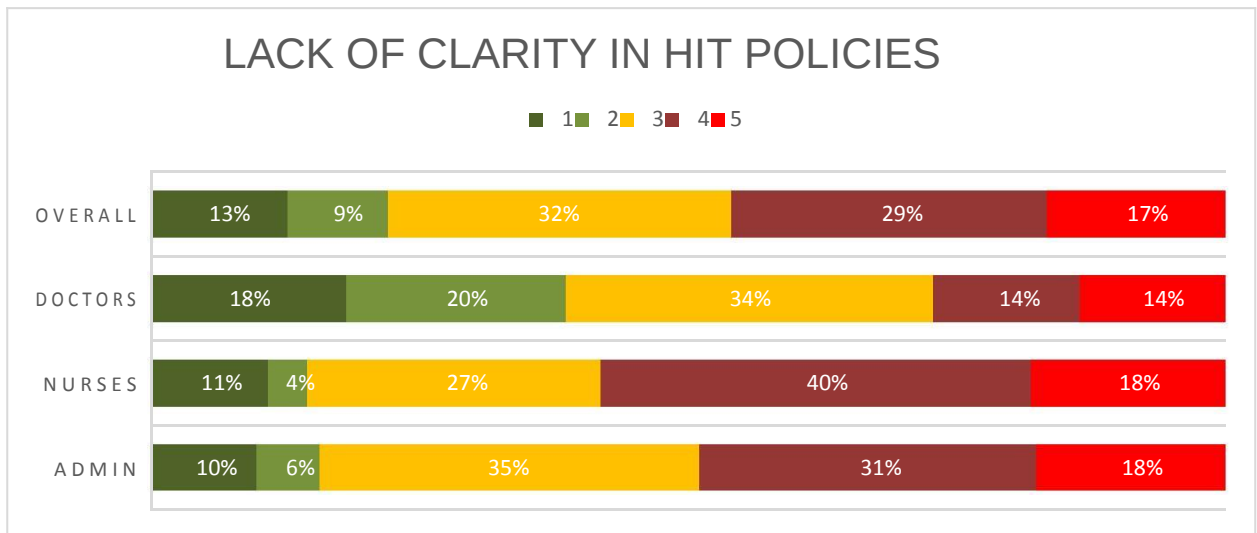


Figure 8.8.8 Response rate of Lack of clarity in HIT policies on Likert scale 1 to 5

Figure 8.8.8 summarizes that most of the overall responses (46%) had given that the lack of clarity in HIT policies is a greatest inhibitor for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (58%) number to state that lack of clarity in HIT policies is the greatest inhibitor.

Figure 8.8.9 summarizes that most of the overall responses (48%) had given that the Lack of training is a greatest inhibitor for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (58%) number to state that Lack of training is the greatest inhibitor.

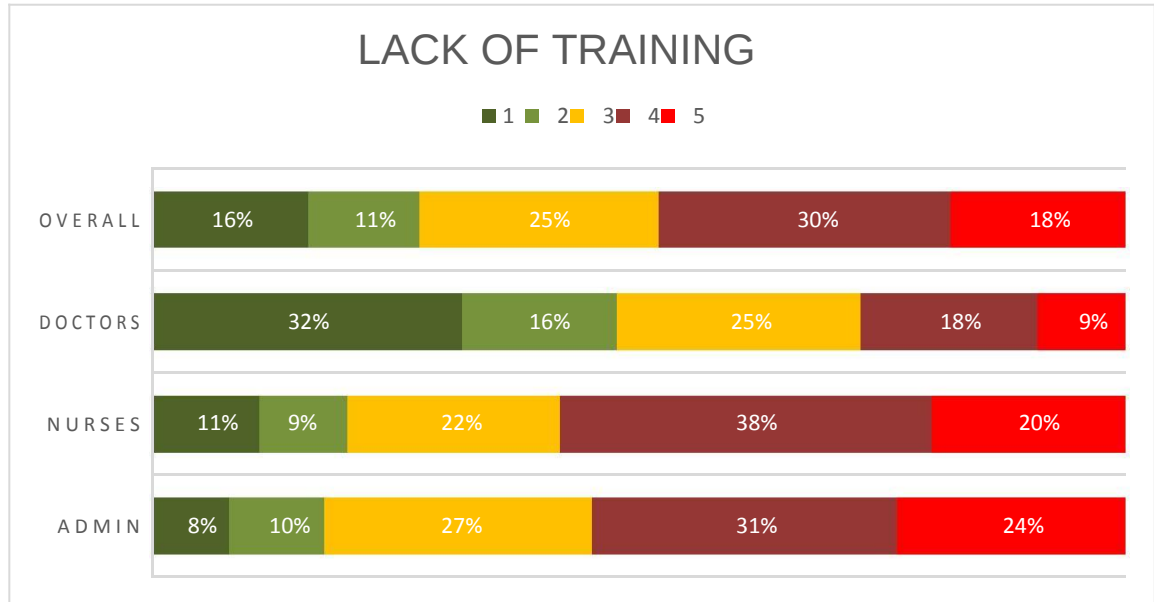


Figure 8.8.9 Response rate of Lack of training on Likert scale 1 to 5

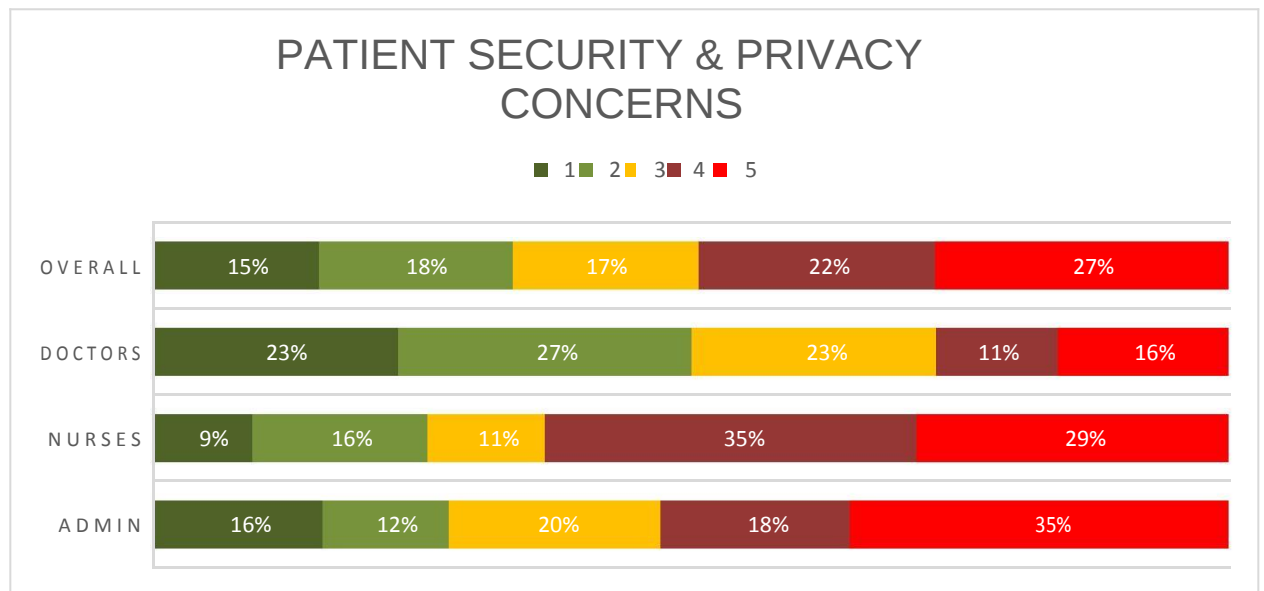


Figure 8.8.10 Response rate of Patient privacy & security concerns on Likert scale 1 to 5

Figure 8.8.10 summarizes that most of the overall responses (49%) had given that the patient privacy and security concerns is a greatest inhibitor for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (64%) number to state that patient privacy and security concerns is the greatest inhibitor.

8.3 Objective 3: Suggestions to improve the adoption of EMR in the hospitals

Figures 8.8.11 to 8.8.15 shows the five suggestions that are to be followed to overcome the barriers that are inhibiting the EMR adoption in the hospitals which were mentioned by the respondents in their questionnaire . The respondent has to give a rating on the scale of 1 to 5, 5 being the greatest one and 1 being the lowest. Based on the computed frequencies the below figures were analyzed to know the most followed suggestion.

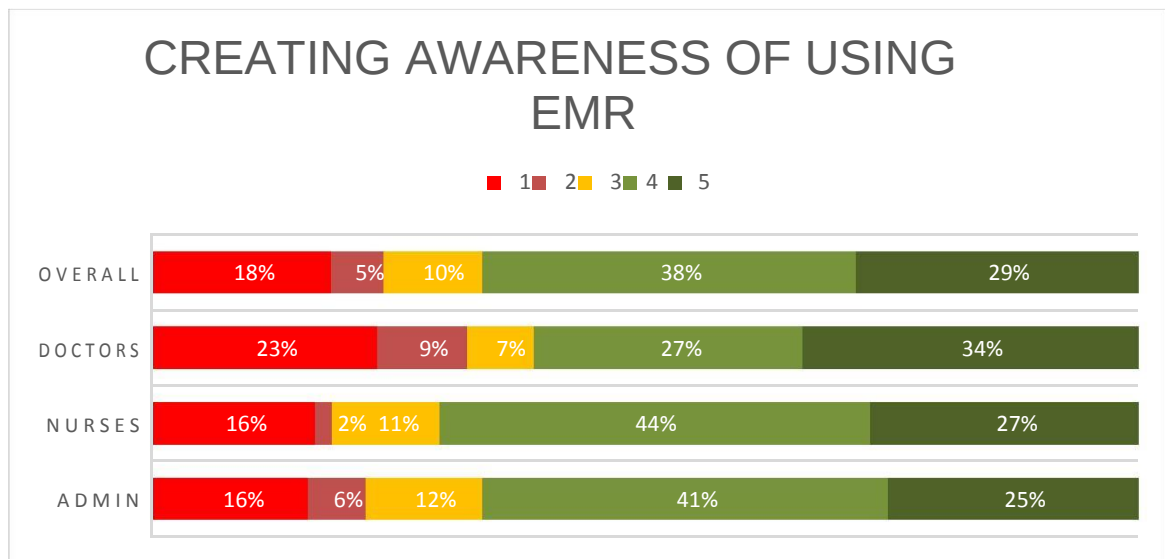


Figure 8.8.11 Response rate of creating awareness of using EMR on Likert scale 1 to 5

Figure 8.8.11 summarizes that most of the overall responses (67%) had given that creating awareness of using EMR is a greatest suggestion to overcome the barriers and to improve for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (71%) number to state that creating awareness of using EMR is the most recommended one.

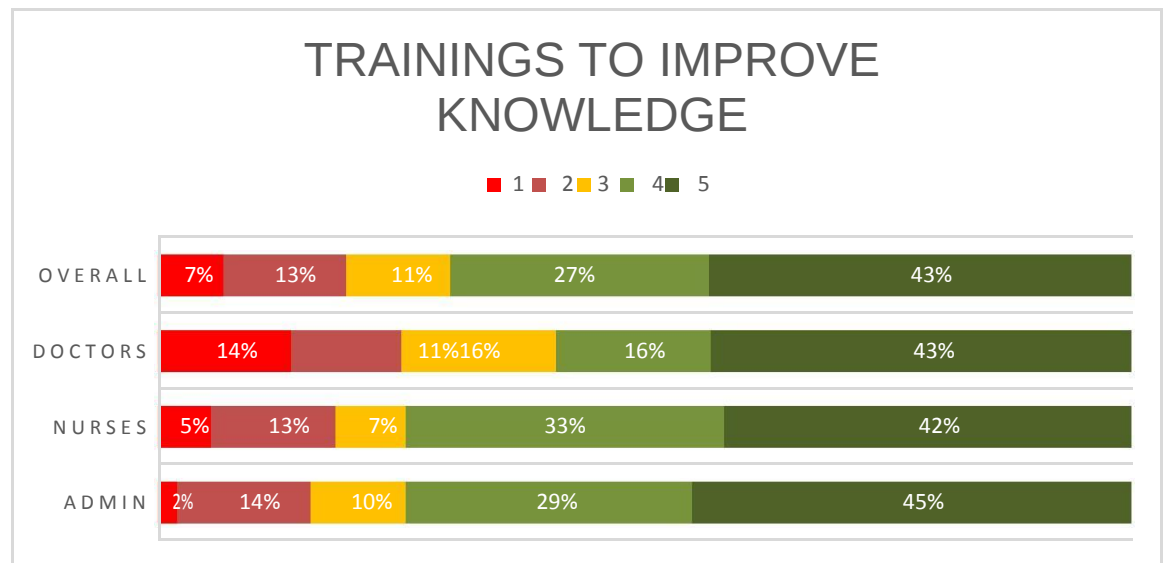


Figure 8.8.12 Response rate of Trainings to improve knowledge on Likert scale 1 to 5

Figure 8.8.12 summarizes that most of the overall responses (70%) had given that Trainings to improve knowledge is a greatest suggestion to overcome the barriers and to improve for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (75%) number to state that Trainings to improve knowledge is the most recommended one.

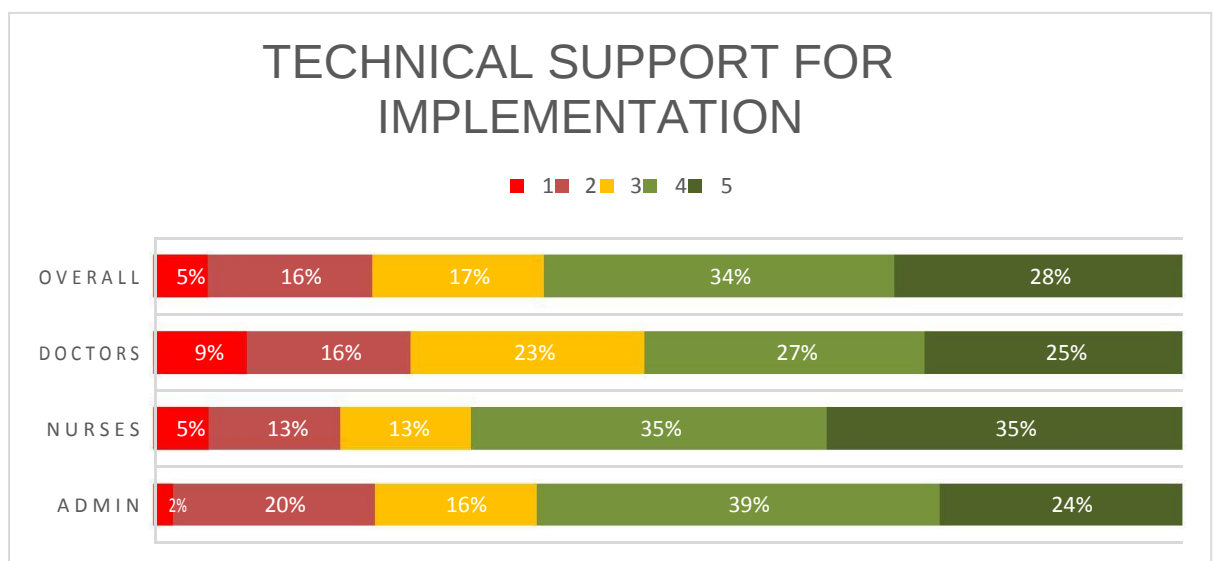


Figure 8.8.13 Response rate of Technical support for implementation on Likert scale 1 to 5

Figure 8.8.13 summarizes that most of the overall responses (62%) had given that Technical support for implementation is a greatest suggestion to overcome the barriers and to improve for the adoption of EMR. If we compare among doctors, nurses and admin staff, nurses has gained maximum (70%) number to state that Technical support for implementation is the most recommended one.

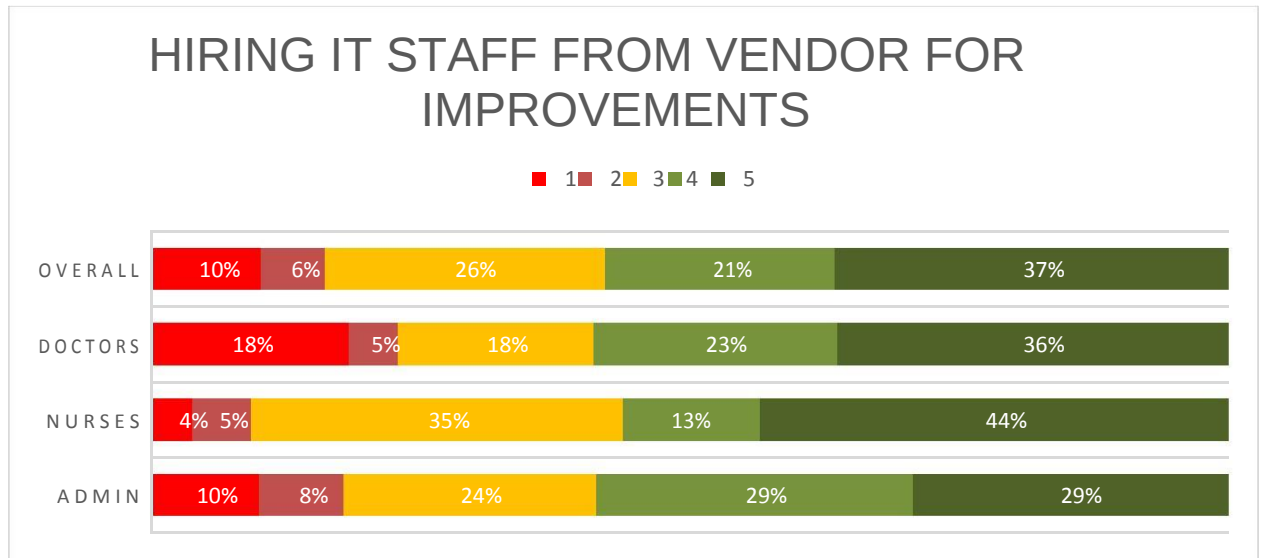


Figure 8.8.14 Response rate of Hiring IT staff from vendor for improvements on Likert scale 1 to 5

Figure 8.8.14 summarizes that most of the overall responses (58%) had given that Hiring IT staff from vendor for improvements is a greatest suggestion to overcome the barriers and to improve for the adoption of EMR. If we compare among doctors, nurses and admin staff, doctors has gained maximum (59%) number to state that Hiring IT staff from vendor for improvements is the most recommended one.

Figure 8.8.15 summarizes that most of the overall responses (65%) had given that Flexible EMR design is a greatest suggestion to overcome the barriers and to improve for the adoption of EMR. If we compare among doctors, nurses and admin staff, doctors has gained maximum (73%) number to state that Flexible EMR design is the most recommended one.

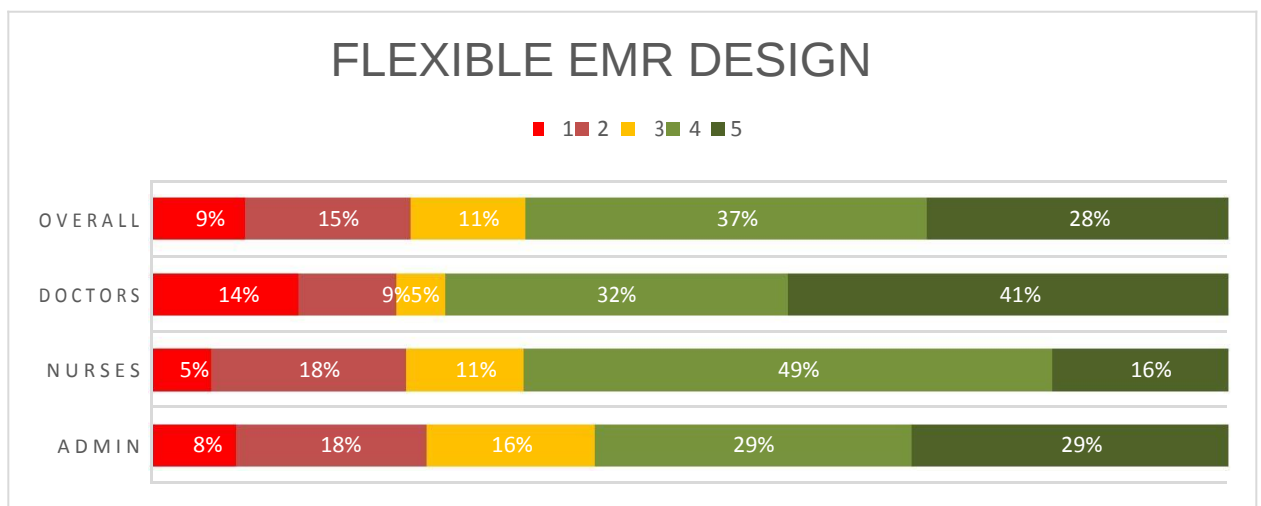


Figure 8.8.15Response rate of Flexible EMR design on Likert scale 1 to 5

9. DISCUSSION:

Respondents uncover that the EMR provides a better overview of reduction in medication errors, CAUTI, CLABSI, VAP and reduced TAT. They are also positive, about the Controlling costs of healthcare, automated billing, clinician's access to upgrade data knowledge and communication among healthcare professionals and also patient privacy. Yet, there is a significant gap between actual and mandated adoption of the EMR and other associated work procedures.

The second-most-frequent category, "Time", refers mainly to technical issues such as inferior system design and slow response times making it time consuming to use the EMR. In some conditions, time refers to social issues, such as lack of training and insufficient computer skills make the EMR time consuming to use.

The respondents in our survey are the Nurses, Doctors and Admin staff who were formally responsible for their unit's constant use of the EMR and fulfilment with associated work procedures. Hence, respondents get to know the extent to which the EMR and work procedures are adopted, the barriers that impede regular adoption, and how to address these barriers. So, however, there is considerable uncertainty among respondents about

the actual level of adoption and the related barriers, complicating directed efforts to solve the barriers. Stating that barriers exist but not having knowledge about what they are is the barrier most frequently mentioned by respondents. While this barrier reflects a lack of knowledge, the lacking kind of knowledge is not incorporated in common definitions of knowledge barriers.

10. SWOT ANALYSIS:

This study took the perception of the different aspects present in the SWOT analysis In order to collect information to perform the SWOT analysis, .

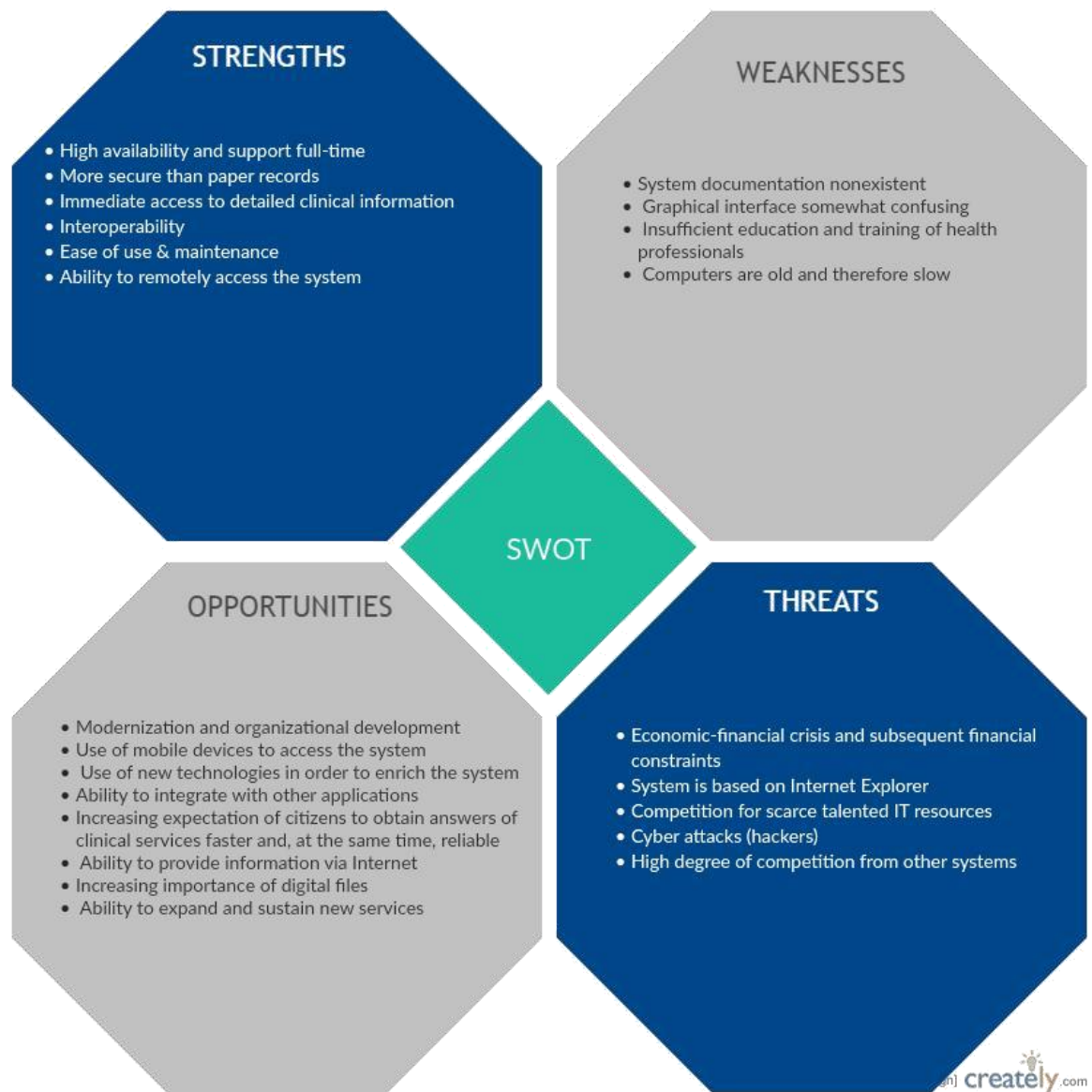


Figure 10.1 SWOT analysis

11.CONCLUSION:

- As per the survey out of 11 private hospitals 1 hospital is in stage 5, 3 hospitals are in stage 4, 2 hospitals are in stage 3 and 5 hospitals are in stage 2 whereas out of 3 Not for profit hospitals 2 are in stage 3 and 1 is in stage 2.
- By this study, it can be conclude that EMR adoption was gaining in India.

- According to the survey the major inhibitors are
 - High cost of implementation
 - Technical limitations
 - Patient privacy and security concerns
- The major suggestions as per the survey are
 - Trainings to improve knowledge
 - Creating awareness of using EMR
 - Flexible EMR design
- The other inhibitors that were mentioned by some respondents as the questionnaire is open ended:
 - Too many options with too many entries
 - Integration of EMR leads more application part to view patient data
 - More habitual to work manually
- As the questionnaire is open ended some of the respondents has given their own suggestions to adopt EMR.
 - Simple & user friendly
 - Should not waste time in loading
 - Flexibility and versatility are the key terms to adopt EMR

12.RECOMMENDATIONS:

- Have a plan before implementing the adoption process
 - Assess workflow of all the departments and spot which processes can be changed.
 - Identify what you "need to have" versus what is "good to have" in terms of EMR capabilities.
 - Avoid to create extensive data entry-focused templates for the physicians.

- Select hardware after discussion with your EHR vendor.
- Create and implement a plan of action in case of emergency.
- Appeal workflow customization from your EHR vendor upfront.
- Determine how can you scan and import all your old charts
- Right Vendor Partnership Relationship
- Training needs to take place on a regular basis which includes application functions, basic skills and live instruction.
- Physicians need to be an essential part of the training as a representation of the significance of EHR implementation and to improve their own ability to utilize the system which plays a crucial part of EHR success because, if your staff is not trained properly, then the EHR implementation becomes a tough process.
- Utilize compatible hardware. Assessing your current hardware and making appropriate changes will ensure that all hardware is upgraded and running for training, implementation and use of the new EHR system.
- Doctors, nurses and key stakeholders are engaged early and responsible to lead the clinical transformation.