Level of prevalence/penetration of Healthcare IT in hospitals across Delhi and NCR.

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

Post-Graduate Diploma in Health and Hospital Management

By

Dr. Ashish Arora (PT)

PG/10/073

International Institute of Health Management Research
New Delhi -110075
May, 2012

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Kasper
CONSULTING

Certificate of Internship Completion

Date: 10th April 2012

To Whomsoever IT May Concern

This is to certify that Mr. Ashish Arora has successfully completed his 3 months internship in our organization from 10th January, 2012 to 9th April, 2012. During this period the intern has worked on the project Level of prevalence/penetration of Healthcare IT in hospitals across Delhi and NCR region under the guidance of me and my team at Kasper Consulting and provided good results.

We wish him good luck for his future assignments

Sincerely,

Inder Kumar

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Certificate of Approval

The following dissertation titled **"Level of prevalence/penetration of Healthcare IT in hospitals across Delhi and NCR."** is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **Post- Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation

Name	Signature
Dr. Anandhi Ramachandran	
Prof. I. Bhattacharya	
Prof. (Dr.) T. MUTHUKUMAR	31/5/12
AWANISH KR. SINGH	

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Ashish Arora (PT),** a participant of the **Post- Graduate Diploma in Health and Hospital Management**, has worked under our guidance and supervision. She is submitting this dissertation titled **"Level of prevalence/penetration of Healthcare IT in hospitals across Delhi and NCR."** in partial fulfilment of the requirements for the award of the **Post- Graduate Diploma in Health and Hospital Management**.

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

Faculty Advisor

3/5/12

Dr. T.Muthukumar
Professor-Healthcare IT
IIHMR, New Delhi

Organizational Advisor

04/05/2012

Mr. Tarun Gautam
Kasper Consulting Pvt. Ltd.

Abstract

Topic:

Level of prevalence of Healthcare IT in hospitals across Delhi and NCR.

Introduction:

Health information technology (HIT) is "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making" Hospital across Delhi have started to use IT systems in a big way and utilizing the benefits of IT in hospital for quality care. Through this study we will analyze the current usage of IT systems in hospitals and understand their need for the using IT systems and also understand the barriers and challenges faced during IT implementation and day to day challenges, such as proficiency of staff using IT and adoption by end users.

Goals:

- To understand the usage of IT in hospital.
- Grading of hospital based on HIT Adoption Model (India's context).
- Across sectional analysis of No. of beds Vs HIT Adoption Model (India's context).

Sample Size:

- 31 Hospital across Delhi and NCR region.

Methodology:

- Quantitative research using close end Questionnaire Survey.

Desired Outcome:

- To understand the current usage of IT systems in hospital.
- Barriers for IT adoptions in hospitals.
- Day to day challenges in using IT systems in hospitals.
- Penetration of Health IT in hospitals.

Acknowledgement

I hereby take this opportunity to thank Mr. Amit Kumar, CEO, for giving us the opportunity to do our Dissertation at Kasper Consulting. Without him completing this project would have been a distant reality.

My sincere thanks to Mr. Tarun Gautam, Health IT Services, for giving us his valuable time and attention.

My sincere acknowledgement goes to Professor Indrajit Bhattacharya, Professor Dr. T. Muthukumar and Professor Dr. Anandhi Ramchandran for their kind assistance and support throughout my dissertation training.

Lastly, but not the least I would like to thank my family, friends and colleagues for their support and understanding.

Dr. Ashish Arora (PT)

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Acronyms / Abbreviations / Keywords

- ADE ADVERSE DRUG EVENTS.
- BCMA BAR CODED MEDICATION ADMINISTRATION.
- CPOE COMPUTERISED PHYSICIAN ORDER ENTRY.
- CPRS COMPUTERISED PATIENT RECORD SYSTEM.
- DEO DATA ENTRY OPERATOR.
- EHR ELECTRONIC HEALTH RECORD.
- E-SIGN ELECTRONIC SIGNATURE.
- FOIA FREEDOM OF INFORMATION ACT.
- GDA GENERAL DUTY ATTENDANT.
- GUI GRAPHIC USER INTERFACE.
- HIS HOSPITAL INFORMATION SYSTEM
- HIMSS HOSPITAL INFORMATION & MANGEMENT SYSTEM SOCIETY
- IP INPATIENT.
- IT INFORMATION TECHNOLOGY
- OP OUTPATIENT.
- PACS PICTURE ARCHIVAL COMMUNICATION SYSTEM
- RPH REGISTERED PHARMACIST.
- TID THRICE A DAY.
- UD UNIT DOSE.
- VA VETERANS AFFAIRS.

INTERNSHIP

REPORT

1.1 Introduction to Organization

Kasper Consulting, setup in 2008, is an Information Technology and Business consulting firm founded by a group of CIOs, CTOs and experienced management professionals. Kasper has the domain knowledge in the Financial Services, Healthcare and HR Consulting industries and advises its clients on IT strategy, business efficiencies and transformation. We do not sell hardware – we do not sell software – we do not do application software development – we do not provide telecom and data center infrastructure!

While we do not sell hardware or software, our experienced professionals can help evaluate and recommend the hardware/software for you based upon your business needs and even help you with the commercial negotiations with the vendors.

While we do not do application software development, we can evaluate and recommend third party resources best for your needs – and even help you negotiate turnkey or T&M contracts. Moreover, we will manage your projects for successful implementation using these resources.

While we do not provide telecom and data center infrastructure, we will evaluate your infrastructure and give a recommendation based upon your business model and your

existing assets. We will help define the service level agreements (SLAs) with your vendors for effective operations.

We are product/vendor neutral so we truly work for you and have your best interests in mind working for your success. We will understand your business needs – we will leverage your existing assets - and accordingly our recommendations will be based on “best of need” instead of “best of breed”. We will be accountable for your success – and therefore will not just make our recommendations but will also work with you for a successful implementation.

1.2 Area of Involvement

The Internship Period was from 10th January 2012 to 9th April 2012. During this Period, I worked as management trainee during this I carried out activities like communicating with various vendors, analyzing their solutions and preparing strategy regarding HIT consulting.

Kasper Consulting HIT Project Overview

The following are the areas in which Kasper provide their consulting services: -

- Analyzing the causes for low IT adoption amongst staff
- Providing road map to boost IT adoption within an organization.
- Studying organization IT needs and analyzing weather the current IT system will be able to meet their requirements or not.
- Suggesting solution that will best meets their IT and business requirements.
- Carrying out IT implementation and change management activities.

Since Kasper Consulting have initiated their Health IT division recently and they are relatively new in this field. So, during my Internship Period, I got opportunity to get involved in their strategy designing as well as I was involved in analyzing various Hospital Technology Systems available in the market, communicating with the vendors providing HIT solutions both software as well as hardware. Later I worked on exploring the IT penetration in hospitals by carrying out a study on **"HIT landscape among various hospitals in NCR"**.

a) Most Important learning that we have from the Kasper Consulting is the understanding on how a consultancy works. We carried out activities like Planning for Business Development, Understanding of Domain.

b) Various healthcare technologies in hospitals technology like -

- HIS (Hospital information system)
- EMR (Electronic medical record)
- CPOE (Computerized physician order entry)
- CDSS (Clinical decision support system)
- BCMA (Bar Coded Medication Administration).
- RFID

c) Study on hospital hierarchy - Various level nurses, doctors, CEO and administrator and their decision making powers and roles and responsibilities of each one of them.

d) Study on set up of IT landscape in healthcare scenario - Various vendors study, there software features and assessment of their products in market along with their client list.

- Wipro
- AKHIL Systems
- Acuis systems
- Medtrack
- Vista cprs

e) Insights from Implementation in Max hospitals.

- Regarding problems they faced
- Change management.
- Regarding their approach of implementing Vista system in big bang manner.

f) Business Development strategies in Middle East markets.

- Regarding their healthcare GDP and spending on healthcare IT.
- Regarding vendors in Middle East.
- Implementation projects in Middle East and various conferences information in that segment.

g) Various technologies available in Healthcare industry like CPRS, Sri Lankan HMIS, NetRipples, Evolko demos and assessment of their features and usability.

h) Study and Demos for Open source software's - Presentation on open source software features and there reliability in real life hospital environment.

i) Presentation on Work flows in various departments like Lab and pharmacy - Various work processes in both dept's and role of users in this dept's and there linkages with other dept's like billing and latest technologies used in these Departments.

j) Study of As is and To be processes in Implementation – AS-IS and TO-BE Processes designing and studying the best practices around the world in Hospital Sector. Studying successful IT implementations and approach followed by them.

k) In this various process in hospitals before an implementation is done is discussed in detail regarding –

- Users and there day to day activities.
- To be implementation
- This is the new system that a hospital implements and adopts newer processes.
- How the hospital user new roles and responsibilities would be this explores that in detail.

l) Study of change management in hospitals - Various human aspects of change management in organizations and how they dealt with it and their case study discussions on that aspect.

m) Study of Vendor Location in healthcare industry and there software's demos - Various vendors in various territories were located and there live demos on the office environment and there assessment based on their usability.

n) Study of Need Assessment of hospitals in terms of technology usage - Locating the hospitals need assessment in terms of what they can achieve with quality and operation efficiency.

o) Study of perception of EMR in Delhi NCR hospitals people mindsets - In depth meetings with doctors, IT people and CEO and their view on why EMR is not widely accepted in Delhi NCR hospitals and reasons for this.

p) Study of various strategies on implementation approaches like Bottom up approach or Big bang approach in hospital EMR implementation. Various discussion of positives and negatives of implementation of all modules in all departments in one go as in BIG BANG implementation or other Step by step implementation in various departments one by one.

q) Presentation on stages of EMR implementation best practice around the globe - Best practices adopted by various EMR implementation hospitals and their strategies and where they can fit in Indian context.

Process maps on hospital department like ortho process and Rfid adoption - Process mapping Process Map or a process flow chart (the terms process map and process flow chart are used interchangeably) to describe a process. a process is a structured set of activities that transform inputs into outputs.

The format of the SRS Documented was as follows: -

- Introduction to the Organization & Product Profile
- Purpose of the Document
- Scope of the Document
- Major Stakeholders & their characteristics
- Product Features
- General Workflow of the Clinic
- Data Flow Diagram
- Functional Requirements
- Non-Functional Requirements
- Traceability Matrix
- System Architecture
- ER Diagram
- HL7 Data Structure/Data Model
- Use Cases & Use Case Description

1.3 Managerial Task within the Organization

A project plan resource wise was made and is followed till date. The tool used for project management was Microsoft Excel Tool. This tool helps to manage the entire project well with timeline. The project plan cycle consisted of the following stages: -

- Project Initiation
- Project Planning
- Project Execution
- Project Evaluation
- Project Closure

The following were the task done during this phase: -

- Identify and document the need/objectives that the project will address.
- Define the objective, approach and controls of the project.
- Ensure a clear and common understanding of the deliverables that will be produced.
- Specify what work needs to be completed in order to produce the deliverables.
- Determine the type of skills that will be needed to complete the project.
- Estimate how long it will take. (The work breakdown structure)
- Obtain appropriate management approval for effort.
- Communicating with vendors and analyzing their products.

1.4 Learning from the Internship Period

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

- SRS Documentation
- Designing of RFP
- Analyzing the vendor's for their solution.
- Creating the Project Plan & Execution
- Interaction with the various vendors offering HIT solutions.
- Building the Project Proposal
- Understanding IT penetration across the hospitals in NCR.
- Understanding solutions available in market.
- Learning the process of consulting, and its importance.

Chapter 1

Introduction

Technology is one of the most pervasive and ubiquitous tools in the healthcare today. Information technology solutions have already started to become an integral part of the healthcare system to raise its productivity and enable innovations. it is now widely accepted as part of daily work practices in most of the organizations.

There is compelling evidence to demonstrate that the adoption of health informatics results in improved patient safety and the delivery of a higher level of patient care. Health care informatics uses technology, such as computers and networking, and multidisciplinary health sciences, such as biomedical and pharmacy, to improve patient care. Informatics organizes patient data into a coherent format suitable for smooth health care processes.

Incorporation of IT in healthcare industry can result in improved teamwork; diagnosis related information is delivered at a faster rate; potential drug interactions and allergies are identified earlier; and health records are maintained more consistently and securely. By demonstrating the substantial savings that can be achieved through using it in the healthcare industry, we believe that we can accelerate the deployment of new technologies to help healthcare providers tackle the challenge of stretching budgets further.

2.1 Origins

- In 1949, Gustav Wager founded the first professional organization for informatics in Germany. Informatics training programs began during the 1960s in France, spreading throughout Europe and to the United States by 1970. This early form of health care informatics focused on generating bills and patient admissions/discharges. US hospitals that implemented this structure include latter-day saints hospital in Salt Lake City, Utah; Massachusetts general hospital in Boston; and Kaiser Permanente in Oakland, California.

Technological Advances

The rapid rise and spread of health care informatics is linked to technology and computers advances during the 1970s. The systems of this time used a single mainframe and time-shared computers to process all patient information. By the 1980s, health care practitioners used several small computers on the same patient database. Organizations began to develop standards and protocols for health care information transmissions. This form of informatics was unable to produce customized reports and still focused on financial aspects.

Literature Review

For more than twenty years, the department of Veterans Affairs (VA) has developed and adopted health information technology (IT) systems that support a broad range of patient care and administrative processes. These systems include computerized patient records, or electronic health records; radiological imaging; and laboratory and medication ordering and administration. Known collectively as the Veterans Health Information Systems and Technology Architecture (VistA).

These systems were implemented with the goal of improving patient outcomes and increasing efficiency in VA health care delivery. As a result of the implementation of these systems through a series of initiatives, the VA is one of the few national, health IT– enabled, integrated delivery systems in the United States.

It helps to provide integrated electronic health care with interactive exchange among patients, providers, government agencies, and insurers, resulting in an increase in the overall quality, safety, and efficiency of health care delivery with fewer medical errors, increased administrative efficiency, decreased health care costs, and expanded patient access to affordable health care.

Electronic prescribing can reduce medical errors, decrease in pharmacy costs, improve both prescriber and pharmacy administrative efficiency, eliminate handwriting interpretation errors, reduce phone calls between pharmacists and physicians, reduce data entry, create electronic records to ensure that prescription information is retained. [1, 2]

VistA has various clinical & financial impacts. It has affected care delivery processes, costs & outcomes a lot. it has improved the efficiency in work. Efficiency can be traced by taking in to account some of the factors .these factors could be reduction in cost, time, space medication errors etc.

When we talk about costs, we can see that costs are reduced. There is no doubt that initially the implementation costs were high & also initially the speed was less so might have not helped in cost reduction, but with the due course of time it has contributed a lot in the cost effectiveness.

As far as pharmacy is concerned vista was involved in –

- Electronic capturing and reporting of allergies/adverse reactions
- Inpatient and outpatient medications
- Notifications/patient record flags
- Orders for medications
- Order checking etc.

All this was done in the CPRS i.e., Computerized Patient Record System which is a component of VistA unlike manual recording in VistA has advantages. It helped in the following ways:

- Reduced inpatient costs for preventable adverse drug events caused by inpatient medications.
- Reduced inpatient costs for preventable adverse drug events caused by outpatient medications.
- Reduced outpatient visit costs for preventable adverse drug events caused by outpatient medications.

Also concerned to VistA Pharmacy can also do real-time, point-of-care validation for administration of unit dose and IV medications.

This is done by BCMA i.e. Bar Code Medication Administration, a component of VistA. This helped in reducing inpatient costs for preventable adverse drug events caused by inpatient medication administration errors.

It has been projected that effective EHR implementation in 90% of patient care settings could save nearly $82 billion annually in health care efficiency and safety by the year 2015, with $77.4 billion saved by increased efficiency, $1billion from reduction of inpatient adverse drug events (ADES), and $3.5 billion from reduction of ambulatory ADES. Taking into account lower savings during the "ramping up" years, cumulative savings from improved efficiency and safety could reach $628 billion.

Medication errors:

One of most important thing to be taken into consideration is that use of CDSS helps in reduction of the medication errors.
Medical prescriptions are known to have a high error rate mainly because of poor handwriting and possible drug or allergy interactions with the prescribed medication. The world EHR comes with a sophisticated drug-drug, drug-allergy, and drug-lab monitoring check system. This feature is automated within EHR and has been proven to reduce medication errors.
The institute of medicine has reported that preventable medication errors result in at least 1.5 million ADES and 7,000 deaths each year in the United States.

E-prescribing is expected to reduce these errors in a variety of health care settings. The results of a study of the potential impact of CPOE on prescribing errors in a 700-bed academic medical hospital indicated that 64.4% of all verified prescribing errors were likely to be prevented with CPOE, including 43% of the potentially harmful errors. Another 22.4% were judged as possibly prevented with CPOE depending on specific CPOE system characteristics.

A 2008 retrospective review of 10 studies in hospital and ambulatory settings showed that CPOE and CDS contributed to a statistically significant decrease in ADES in 50% of the studies. four studies (40%) showed a non statistically significant reduction in ADE rates, and one study demonstrated no change. Studies on "homegrown" systems, studies comparing manual chart review to detect errors, and studies comparing e-prescribing with handwritten prescribing seemed to show a higher relative risk reduction than other studies.

It was concluded that few studies of the effect of CPOE with CDS on the rates of ADES exist and that none of these have been randomized controlled trials. More study is needed to evaluate the benefit of commercially developed CPOE with CDS systems on reducing ADES.

Also the system uses Bar Code Technology to stock, pick and return medications to reduce medication errors.

Computerized physician order entry (CPOE) systems are electronic prescribing systems where prescribers enter orders into a computer, replacing handwritten orders on paper. CPOE can significantly reduce medication errors, since past research found the majority of medication errors, 39%, occurred at the ordering stage in the medication use system.

CPOE replaces hand written prescriptions and hand transcribing of the prescription, eliminating procedures that can introduce medication errors.

Research has shown that prescriptions ordered electronically have lower error rates than handwritten prescriptions. When compared the error rates for handwritten versus computer-assisted prescriptions, it was found that, 2.3% medication error rate existed for handwritten prescriptions, with 3.9% needing clarification compared to a 7% error rate and .8% clarifications needed for computer-assisted prescribing.

Medication administration records generated automatically as part of a pharmacy management system can reduce medication errors because of increased accuracy and legibility, preventing errors at the transcribing stage where 12% of errors occur. CPOE standardizes orders by forcing prescribers to include a dose, route and frequency for each prescription entered.

Recent research has shown that health information technology in hospital pharmacies can reduce medication errors. Anderson et al (2002) used a computer simulation model to show that implementation of a comprehensive medication delivery system designed to detect and prevent ADES could save 1,226 days of hospitalization and $1.4 million annually, even if the system only prevented 26% of medication errors.

EMR Adoption Model

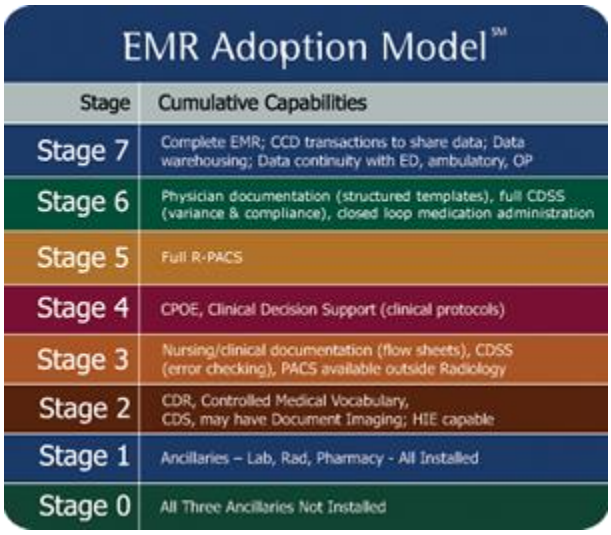


Fig 1: Stages for EMR Adoption (HIMSS Model)

EMR Adoption Model Structure Ensures Objectivity:

• All application capabilities within each stage must be operational before that stage can be achieved.

• All lower stages must have been achieved before a higher level will be considered as achieved.

• A hospital can achieve Stages 3-6 if it has met all of the application requirements for a single patient care service (e.g. single nursing floor, cardiology service).

• Using the rules above, additional points are given for the implementation of applications in stages higher than the one fully achieved by the healthcare organization.. In this fashion, other implementation paths than those prescribed by the stages can be taken into consideration for correlation with quality and financial research.

HIT Adoption Model (Indian Context)

Stages	Cumulative Capabilities
Stage 1	Patient Registeration
	Patient Appointment
	Scheduling
Stage 2	Ancilliaries installed - Laboratory
	Radiology
	Basic PACS
Stage 3	HIS w/o clinical module
	Inventory
	Patient Billing
Stage 4	HIS with clinical module
	Bed Allocation
	CDSS(Basic)
Stage 5	Complete EMR
	BCMA
	PACS(Full)
	ERP

*** BCMA is not mandatory for stage 5.**

Chapter 2

4. Objective

The objective of this project is to study:

- To understand the usage of IT in hospital.
- Grading of hospital based on HIT Adoption Model (Indian context).
- Across sectional analysis of No. of beds Vs Stage of HIT Adoption Model (Indian context).

5. Study Design

The study is divided in following stages**:**

- Study of the Healthcare IT model across globe.
- Study the HIMSS Model for EHR Adoption.
- Survey "Level of prevalence of Healthcare IT in hospitals across Delhi and NCR."
- Compilation of the data and data analysis.
- Finding / Understanding the Health IT landscape of hospital across Delhi and NCR region.

6. Methodology

6.1 Sample

- From the total number of hospital, 31 hospitals were taken for the study.
- It included both private as well as govt. hospitals.
- Sample was taken by convenient sampling.

6.2 Tools

- Survey was conducted with the help of the questionnaire as the study
- Data was coded and analyzed in MS Excel version 2007 including the application of graphical representation.

Study was basically an exploratory study using a mixed data, both qualitative and quantitative.

7. Analysis

Technology Usage

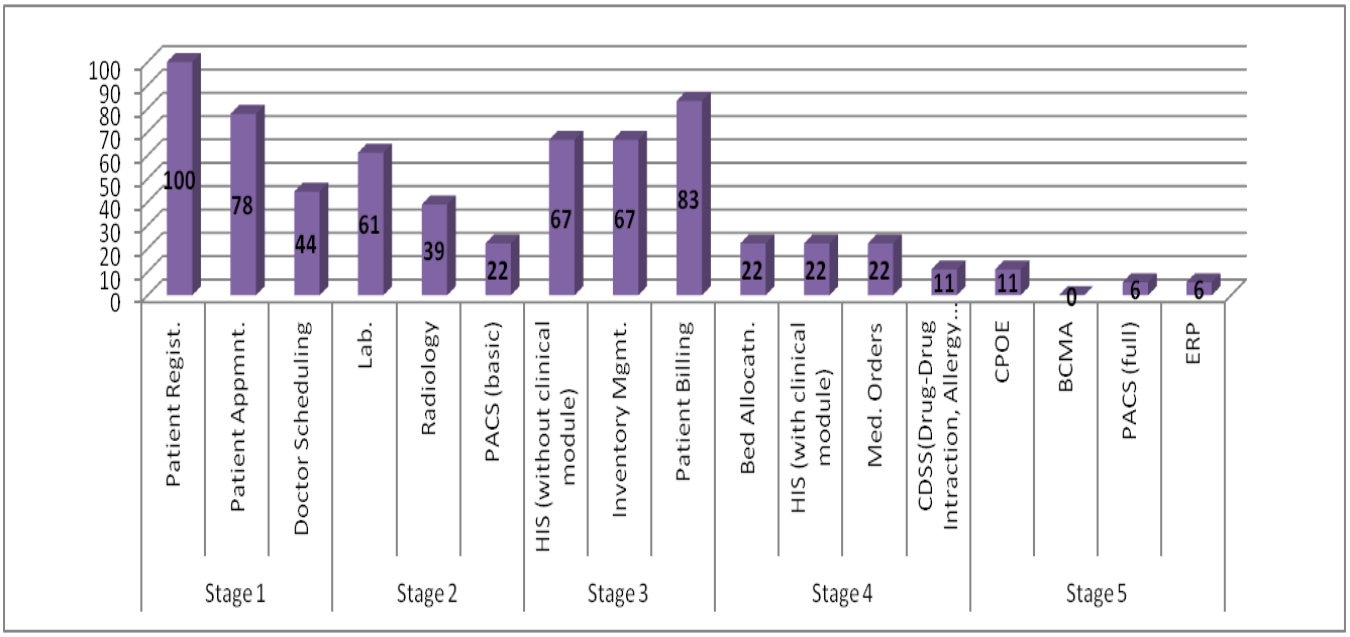


Fig. 1 (Graph a)

Interpretation

- The graph depicts the technology usage for the hospital based on their stage of hospital grading system based on modified HIMSS model according to Indian context.
- The graph shows very high percentage of usage of patient registration which is present in all the survived hospital.
- Whereas there is minimal usage of Enterprise Resource Planning (ERP) system and Barcode Medicine Administration System (BCMA).

Stage of Hospitals

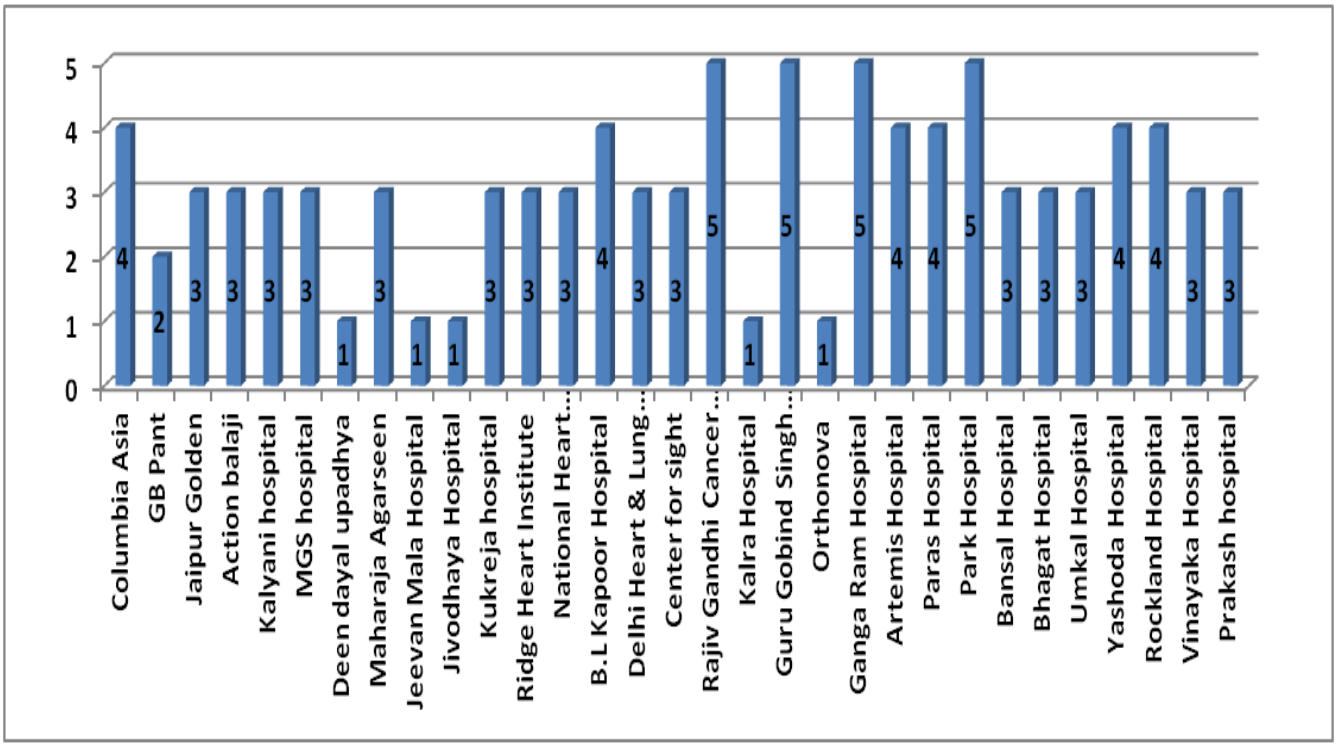
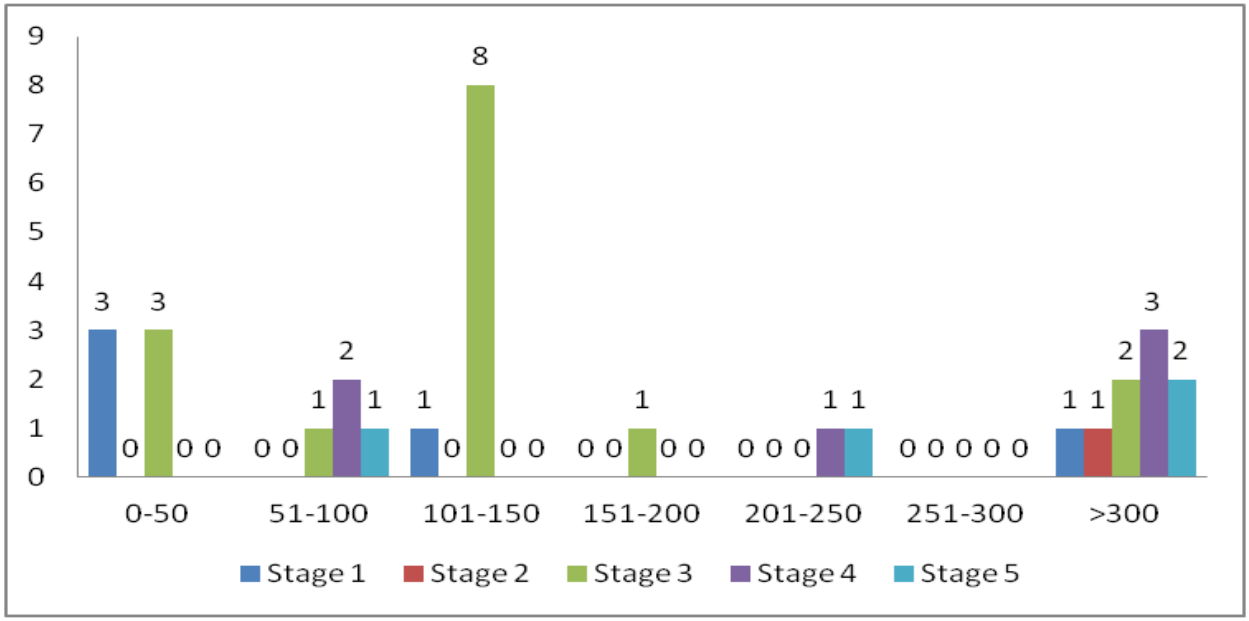


Fig. 2 (Graph b)

Interpretation

- As per the no. of surveyed hospital the majority of the hospitals of Delhi/ NCR region are found to be under stage 3 of the modified HIMSS model.
- Based on technology usage hospital have migrated to usage Hospital Information System (HIS) but without the usage of clinical module. The primary focus for the hospitals is administrative use of technology for administrative purpose.
- Total sample size of hospital = 31 Hospitals
- Stage 1 = 16% (5 Hospitals)
- Stage 2 = 03% (1 Hospital)
- Stage 3 = 48% (15 Hospitals)
- Stage 4 = 20% (6 Hospitals)
- Stage 5 = 13% (4 Hospitals)

Bed Vs Stage Analysis



Interpretation

Bed Size	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
0-50	3	0	3	0	0
51-100	0	0	1	2	1
101-150	1	0	8	0	0
151-200	0	0	1	0	0
201-250	0	0	0	1	1
251-300	0	0	0	0	0
>300	1	1	2	3	2

Stage 1 Analysis

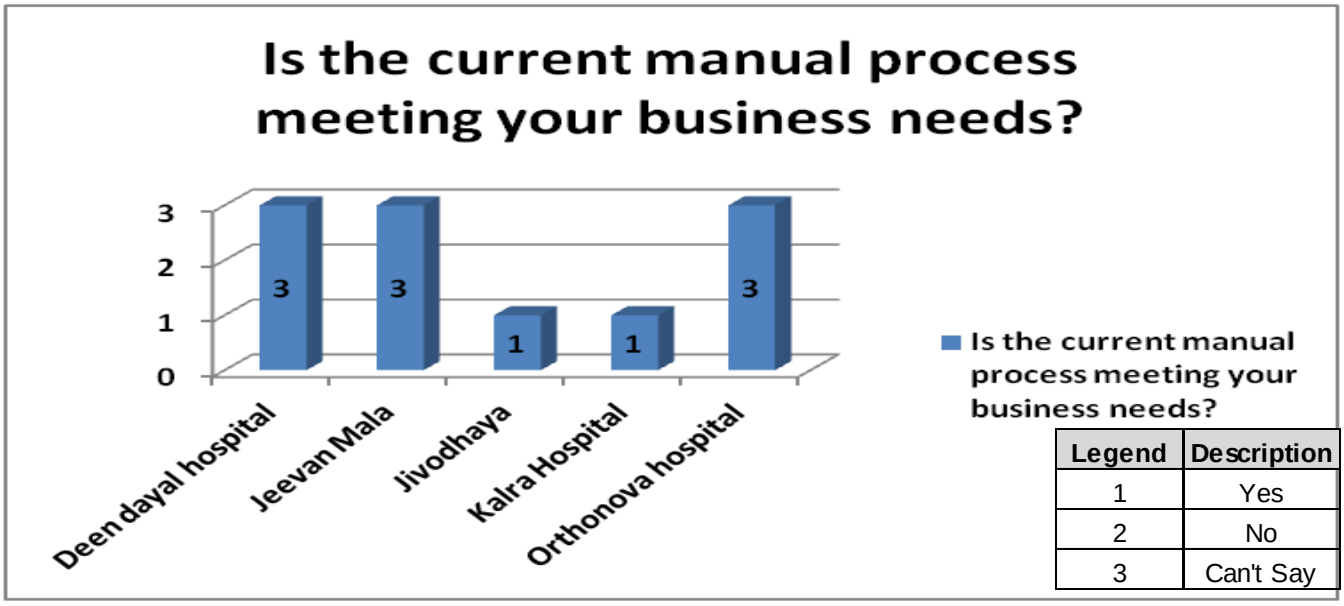


Fig. 3 (Graph c)

Interpretation

Q. Is the current manual process meeting your business needs?

Answer.

- 60% of stages 1 hospitals are not sure about their manual process current catering their need or capable of handling the business need.
- 40% of stage1 hospital are favoring their manual process to need their current business need.

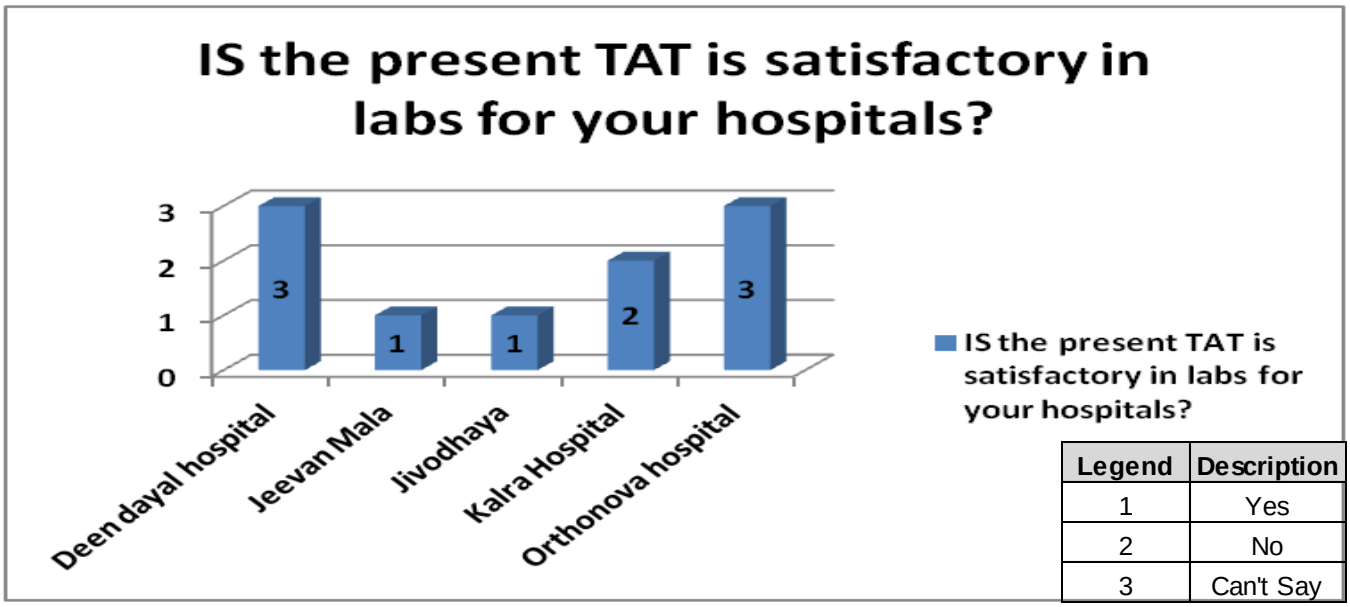


Fig. 4 (Graph d)

Interpretation

Q. IS the present TAT is satisfactory in labs for your hospitals?

Answer.

- 40% of stage1 hospitals are not sure about their satisfaction level for Turn Around Time (TAT).
- 40% of stage 1 hospitals are satisfied with their TAT for their labs.
- 20% of hospitals are not satisfied with their TAT for labs.

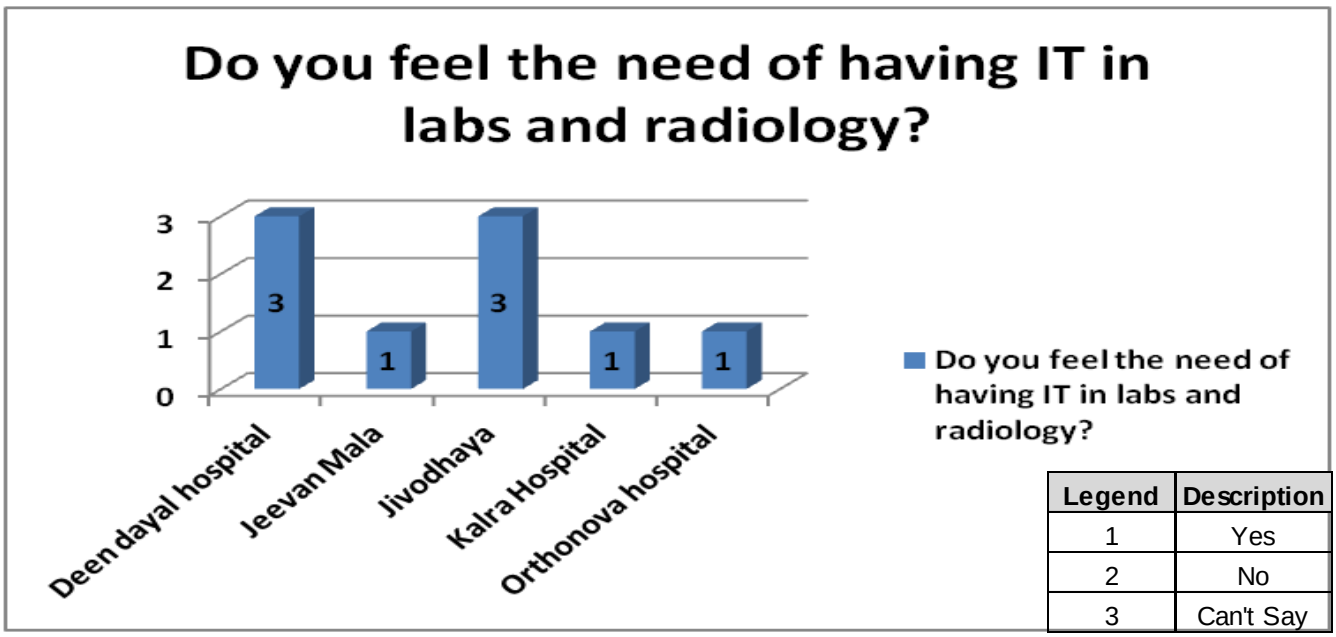


Fig. 5 (Graph e)

Interpretation

Q. Do you feel the need of having IT in labs and radiology?

Answer.

- 60% hospitals feels there's a need for IT systems in their lab and radiology departments.
- 40% hospitals are not sure for their IT needs in the hospital lab and radiology department.

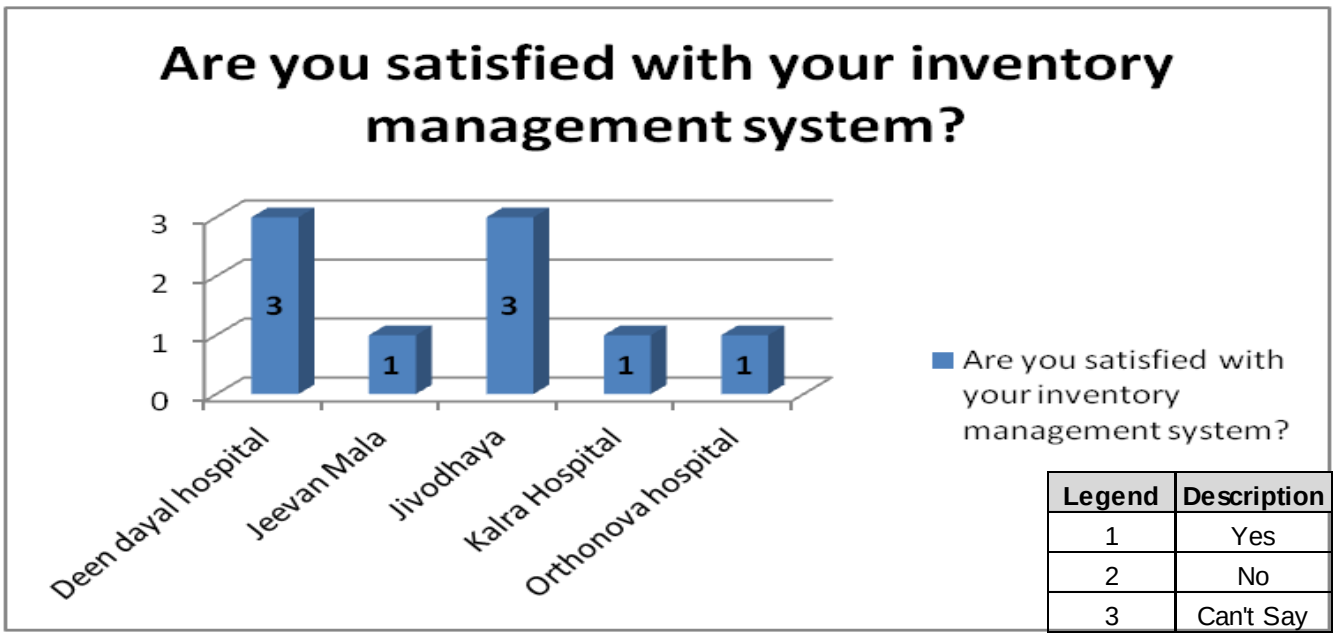


Fig. 6 (Graph f)

Interpretation

Q. Are you satisfied with your inventory management system?

Answer.

- 60% of hospitals are satisfied with their inventory management systems.
- 40% of hospitals are not sure whether their inventory management system is satisfactory or not.

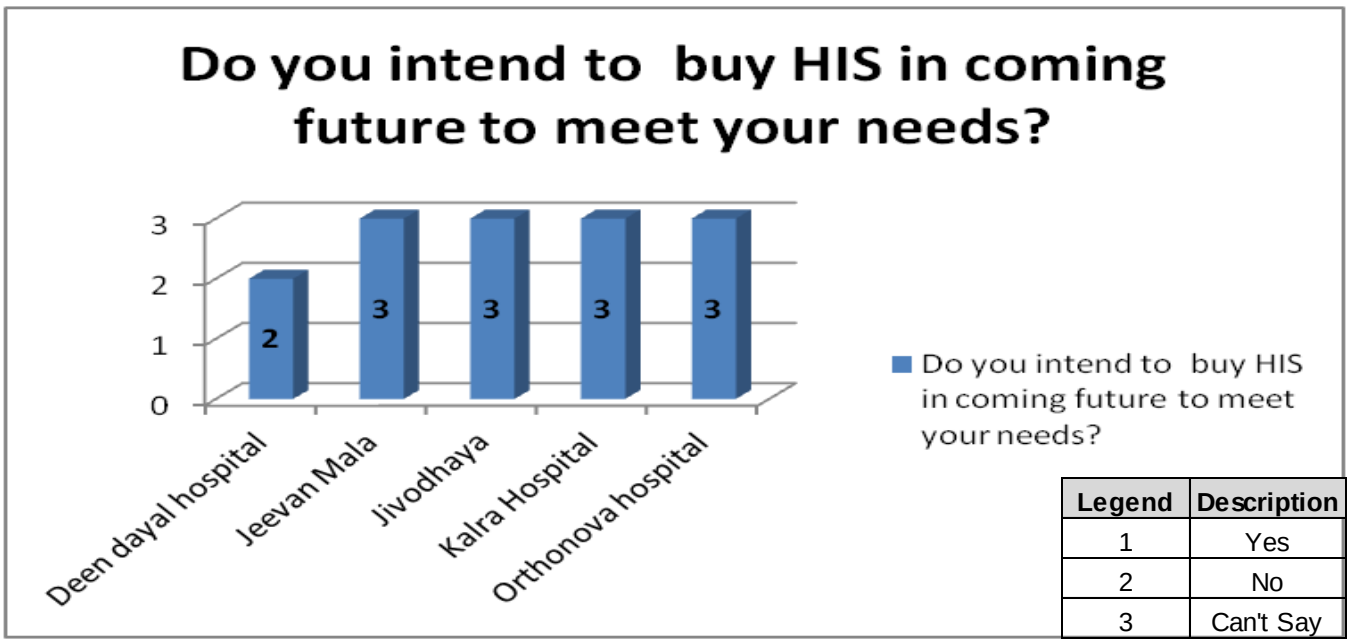


Fig. 7 (Graph g)

Interpretation

Q. Do you intend to buy HIS in coming future to meet your needs?

Answer.

- 80% of hospitals didn't comment for their plan to buy HIS systems to meet their future needs.
- 20% of hospitals had no intension to buy HIS system.

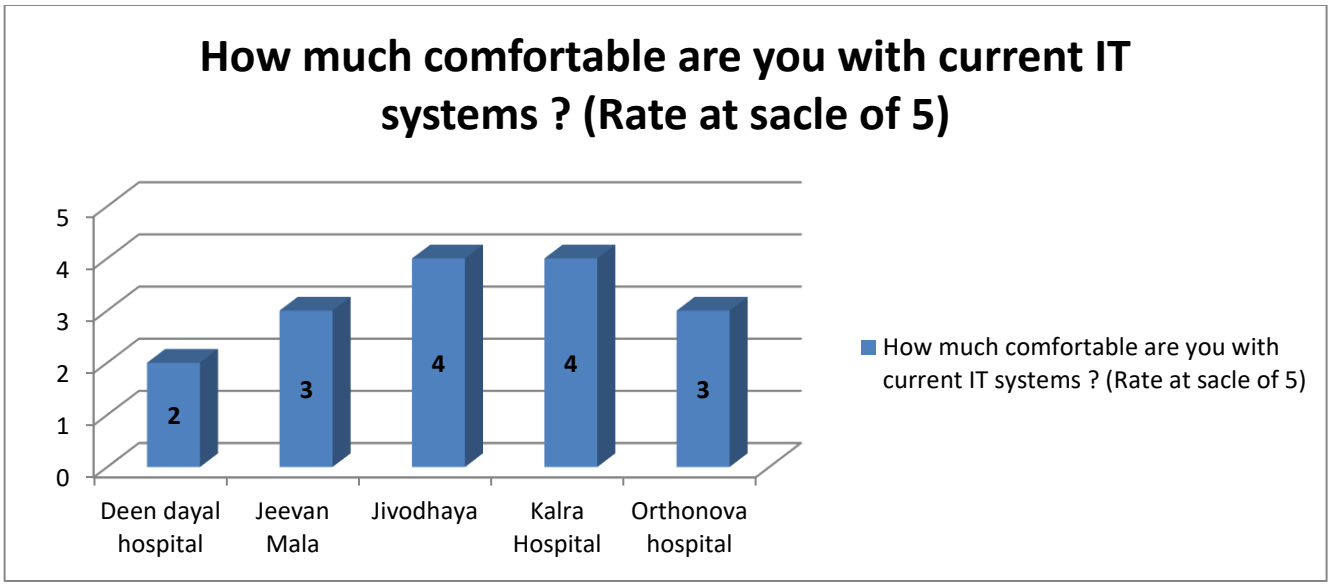


Fig. 8 (Graph h)

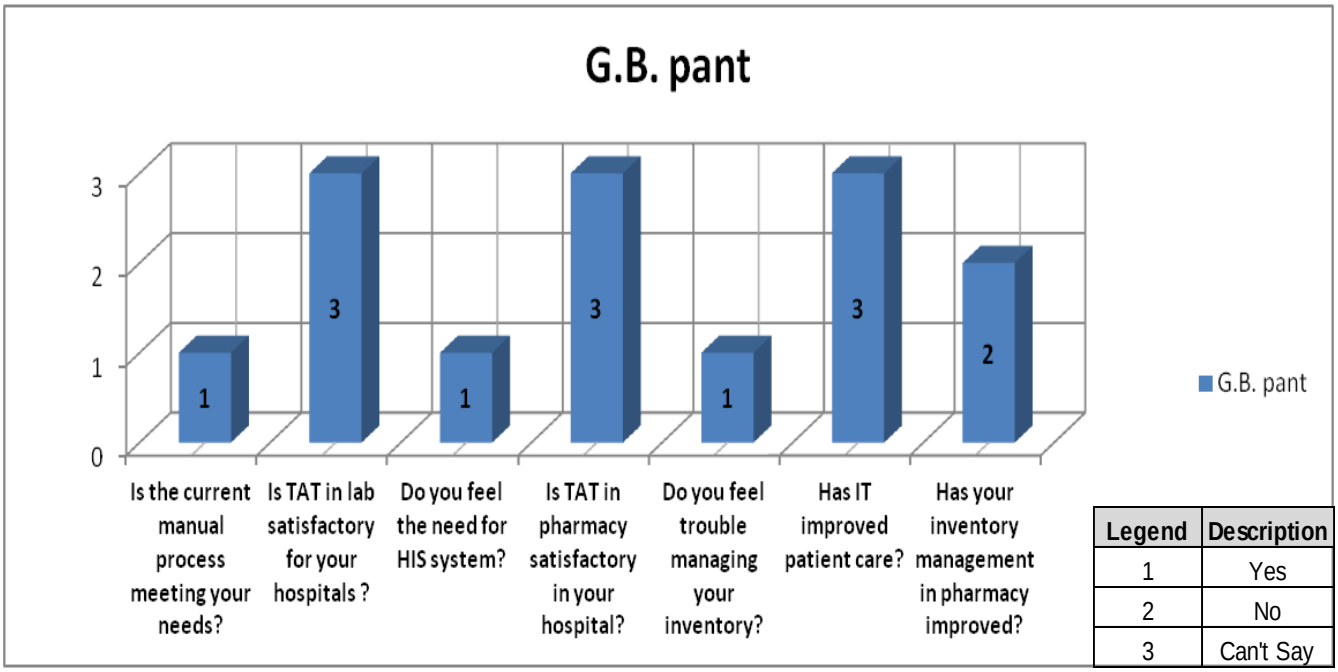
Interpretation

Q. How much comfortable are you with current IT systems?

Answer.

- Majorly all hospitals were comfortable using their current IT systems.

Stage 2



Legend	Description
1	Yes
2	No
3	Can't Say

Fig. 9 (Graph I)

Interpretation

Q. How much comfortable are you with current IT systems?

Answer.

- The hospital believes current manual process is meeting their business needs.
- Hospital is not sure for level of satisfaction of TAT for labs.
- Hospital strongly believes there's need for HIS system to help improve their efficiency.
- Hospital feels that they face a operational difficulty in managing their inventory.
- Hospital is not sure whether IT system will help in improving patient care.

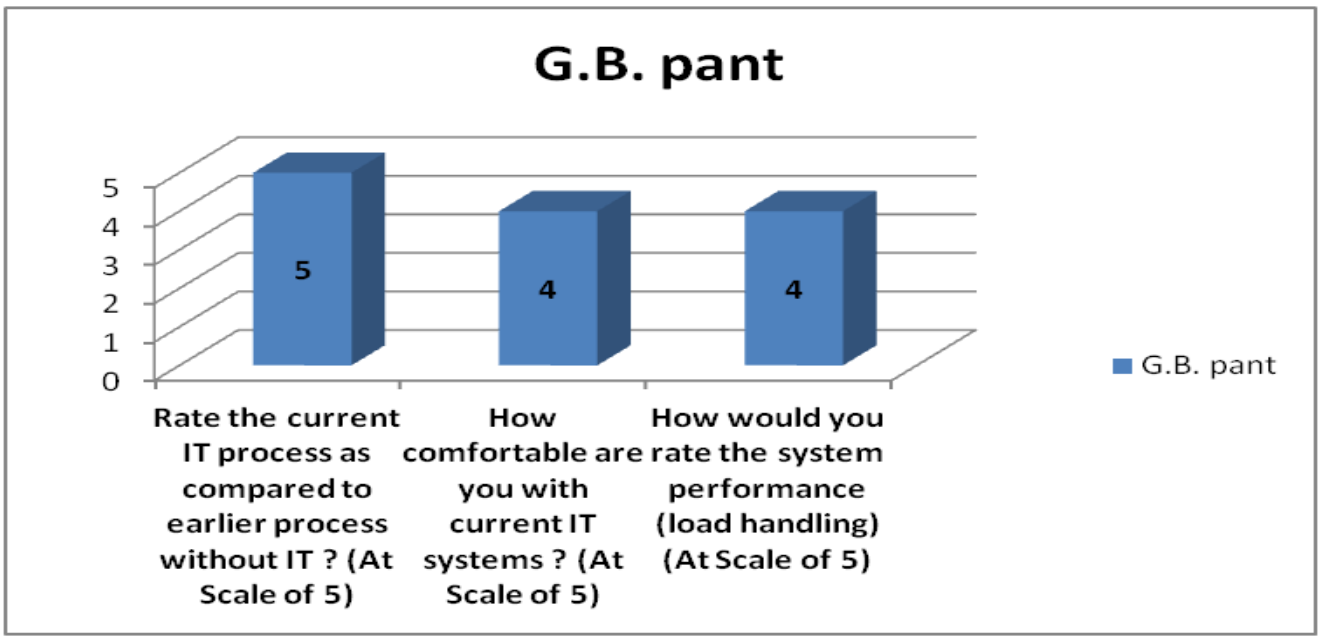


Fig. 10 (Graph J)

Interpretation

Q. Rating questionnaire

Answer.

- Hospital has highly rated their new business process against older practices in a non IT environment.
- Hospital is found to be satisfied with their current IT system and also in terms of load handling and system performance.

Stage 3

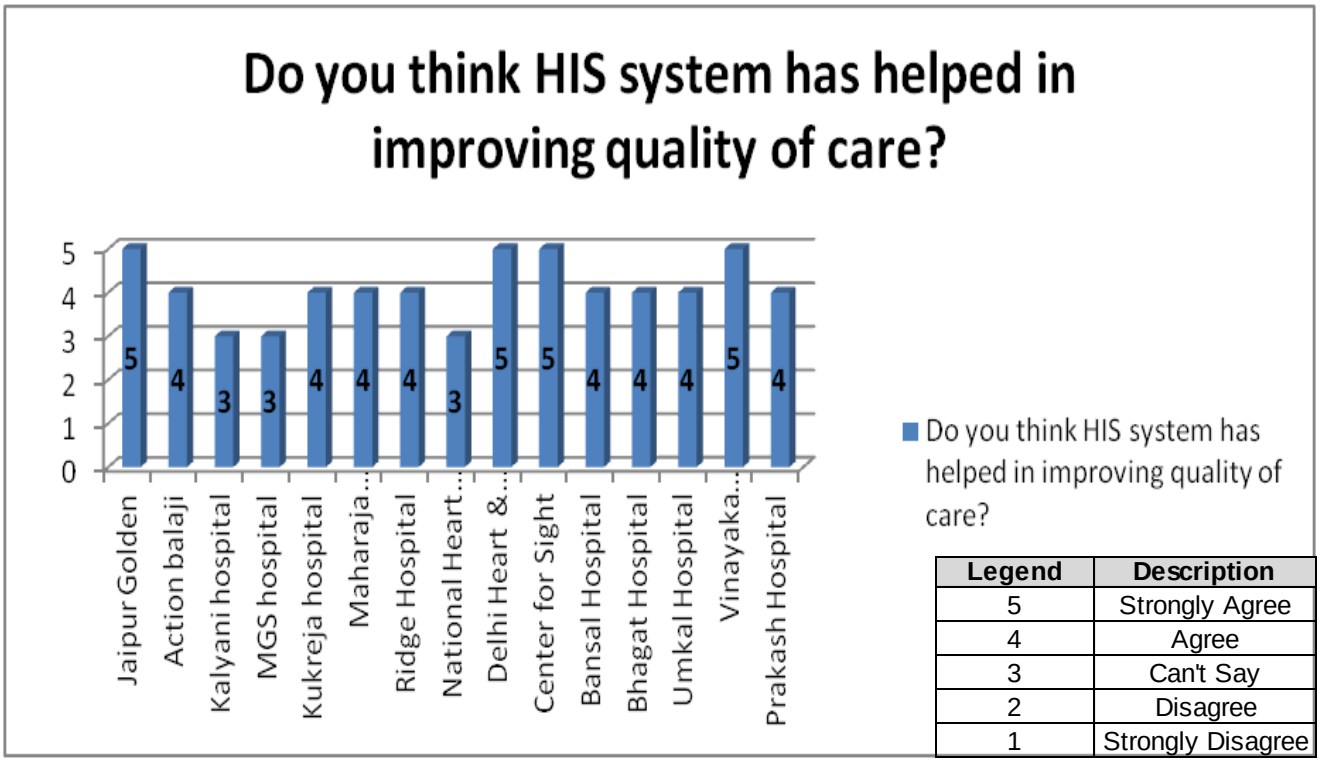


Fig. 11 (Graph K)

Interpretation

Q. Do you think HIS system has helped in improving quality of care?

Answer.

- 27% of hospitals strongly agree that HIS system has help in improving quality care.
- 53% of stage 3 hospitals agree that HIS system has help in improving quality care.
- 20% of stage 3 hospitals are not sure whether HIS will help in improving quality care.

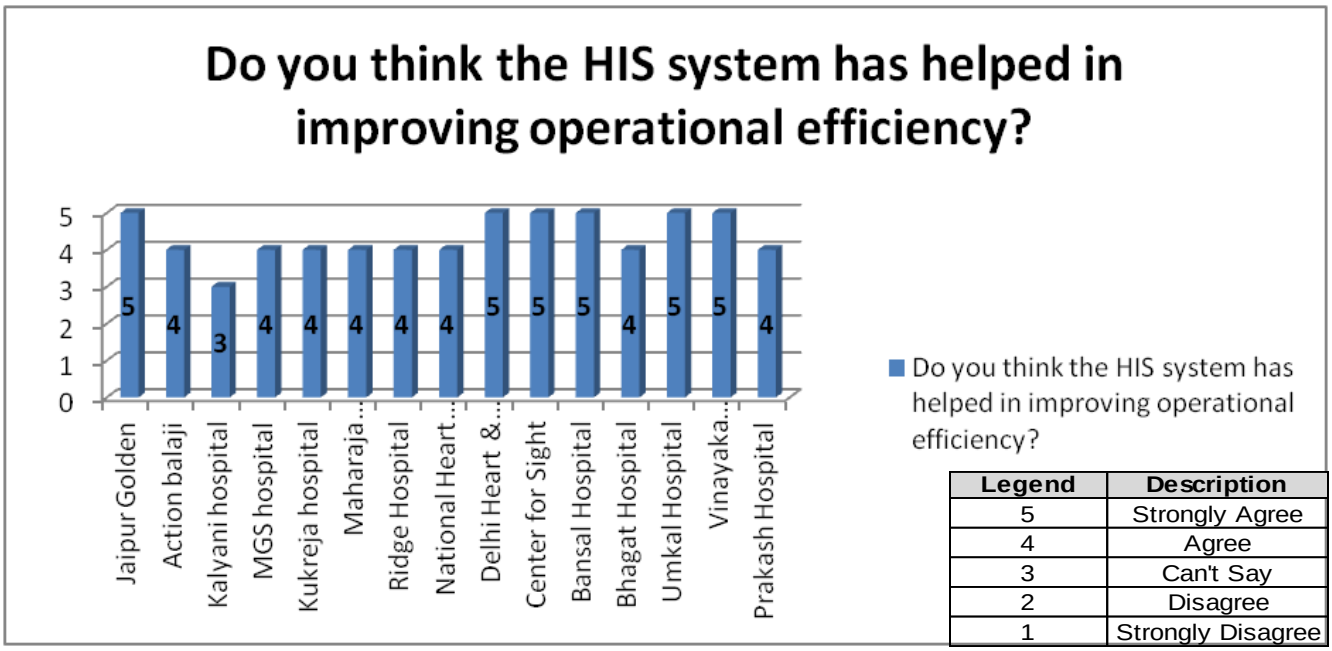


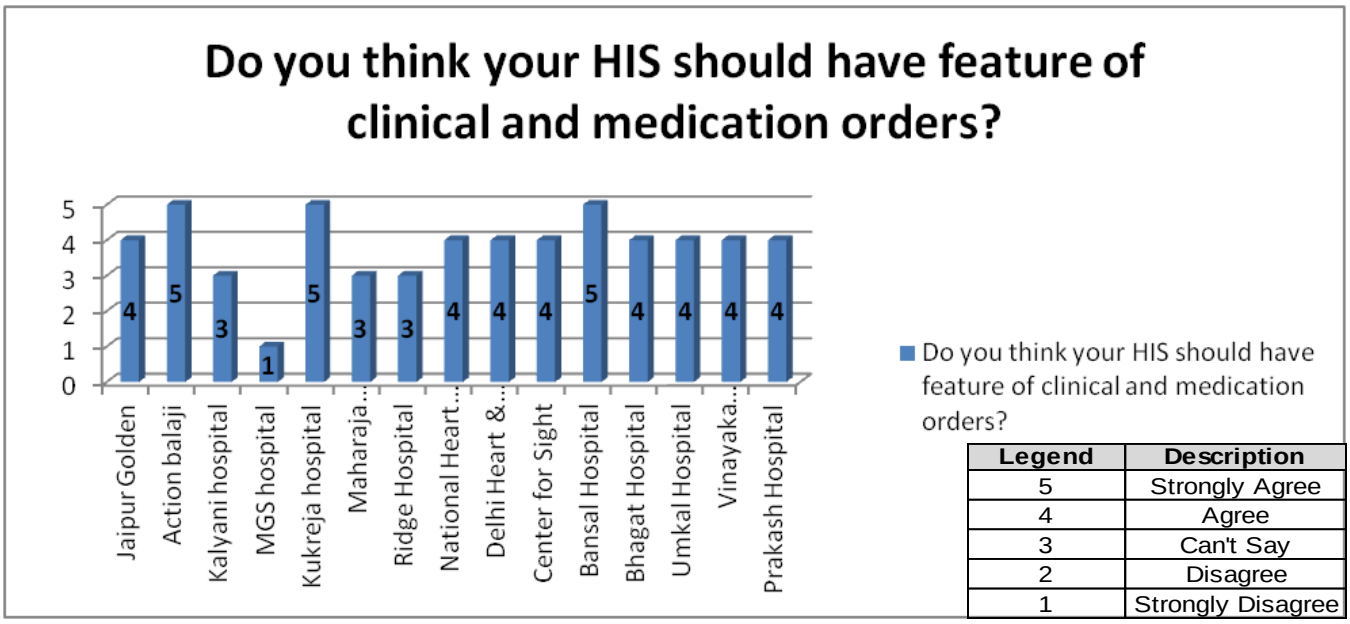
Fig. 12 (Graph L)

Interpretation

Q. Do you think the HIS system has helped in improving operational efficiency?

Answer.

- 40% of Stage 3 hospitals strongly agree that HIS system has helped in achieving operational efficiency.
- 53% of Stage 3 hospitals agree that HIS system has helped in achieving operational efficiency.
- 7% of Stage 3 hospitals were not sure about efficiency improvement through the use of HIS system.



Legend	Description
5	Strongly Agree
4	Agree
3	Can't Say
2	Disagree
1	Strongly Disagree

Fig. 13 (Graph M)

Interpretation

Q. Do you think your HIS should have feature of clinical and medication orders?

Answer.

- 20% of Stage 3 hospitals strongly agree with having clinical features and medication order.
- 53% of Stage 3 hospitals agree with having clinical features and medication order.
- 20% of Stage 3 hospitals are not sure will clinical features and medication order help in operational process.
- 7% of Stage 3 hospitals strongly disagree with having clinical module in their HIS system.

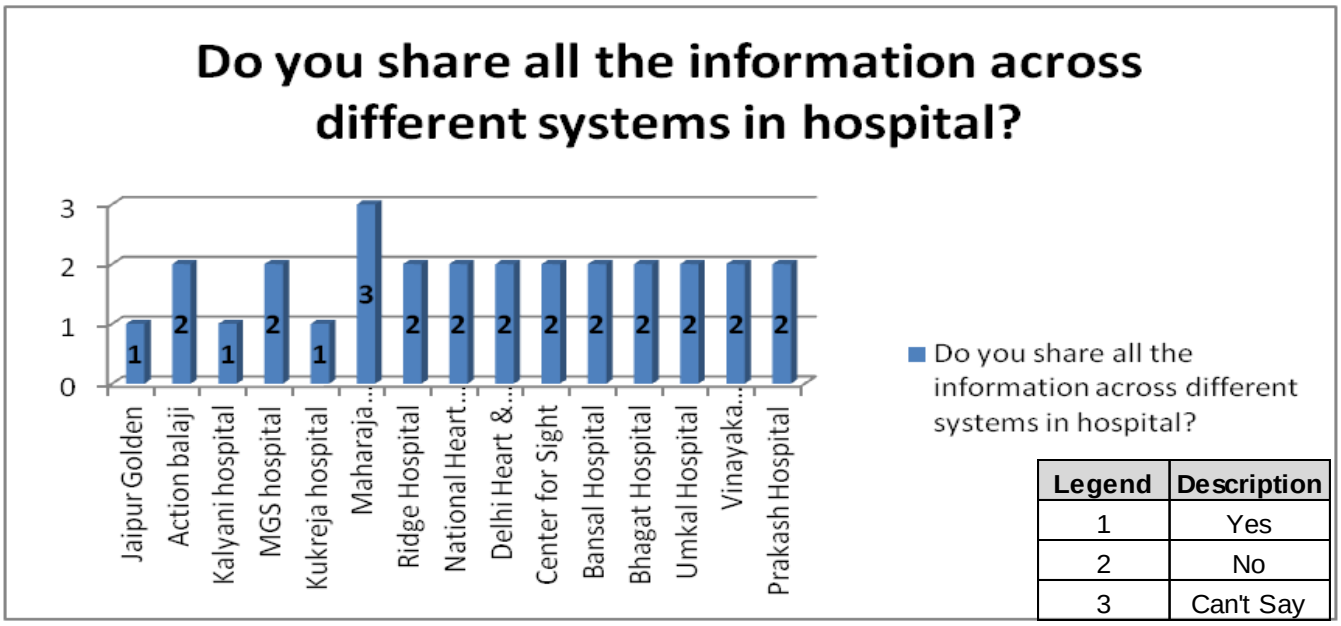


Fig. 14 (Graph N)

Interpretation

Q. Do you share all the information across different systems in hospital?

Answer.

- 73% of Stage 3 hospitals didn't share all information across the hospital using current IT systems.
- 20% of Stage 3 hospitals share all information across the hospital using current IT systems.
- 7% of Stage 3 hospitals were not sure whether they share all information across the hospital using their current IT systems.

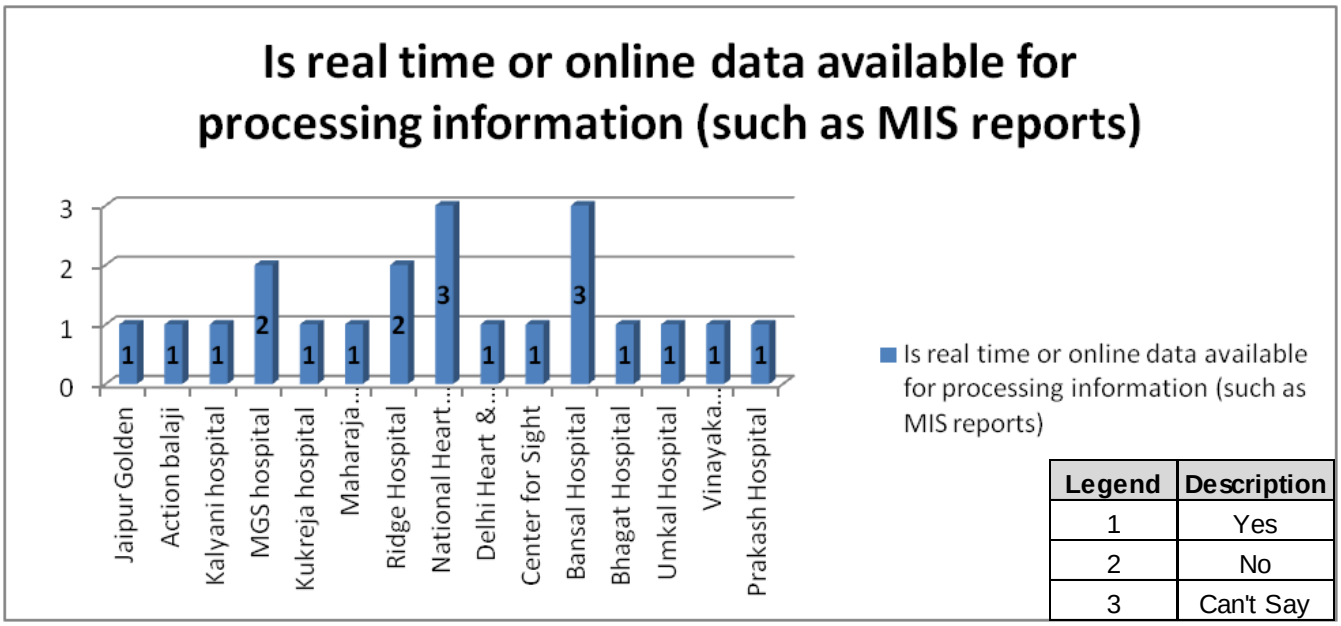


Fig. 15 (Graph O)

Interpretation

Q. Is real time or online data available for processing information (such as MIS Reports)

Answer.

- 73% of stage 3 hospitals use real time data for MIS report generation.
- 13% of stage 3 hospitals do not use real time data for MIS report generation.
- 13% of stage 3 hospitals are not sure whether real time data is available for MIS report generation.

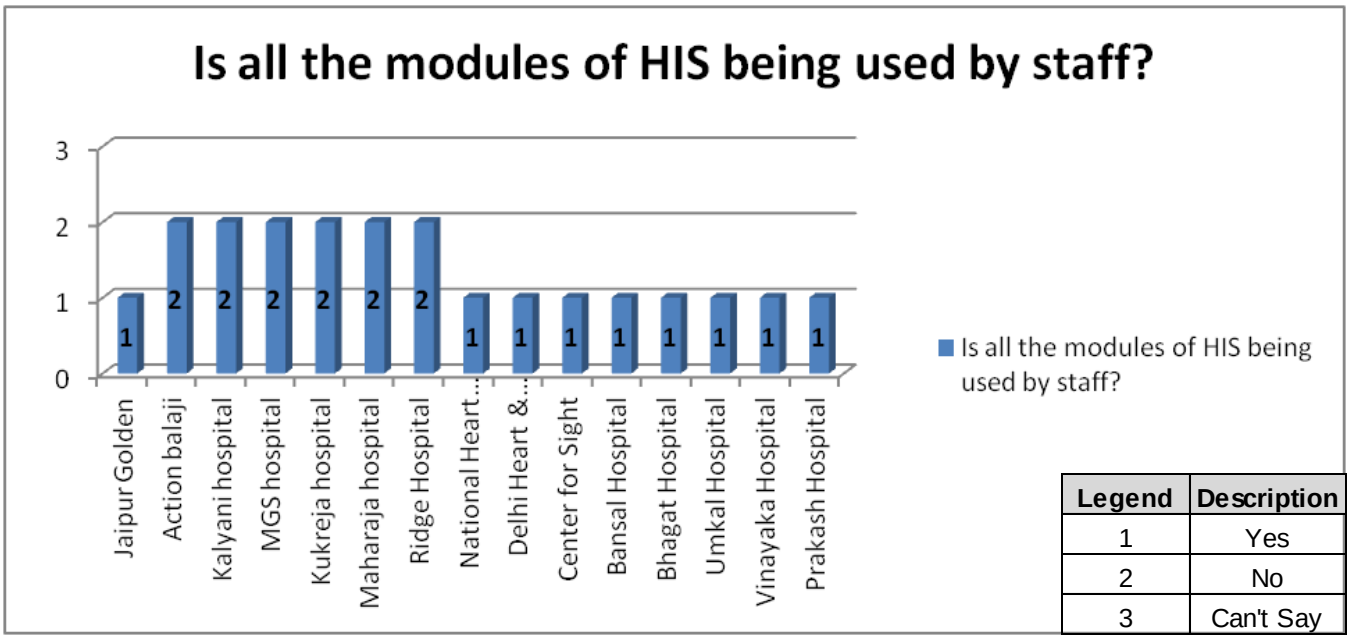


Fig. 16 (Graph P)

Interpretation

Q.Is all the modules of HIS being used by staff?

Answer.

- 60% of stage 3 hospitals agree of using all the modules of their current HIS system.
- 40% of stage 3 hospitals disagree of using all the modules of their current HIS system.

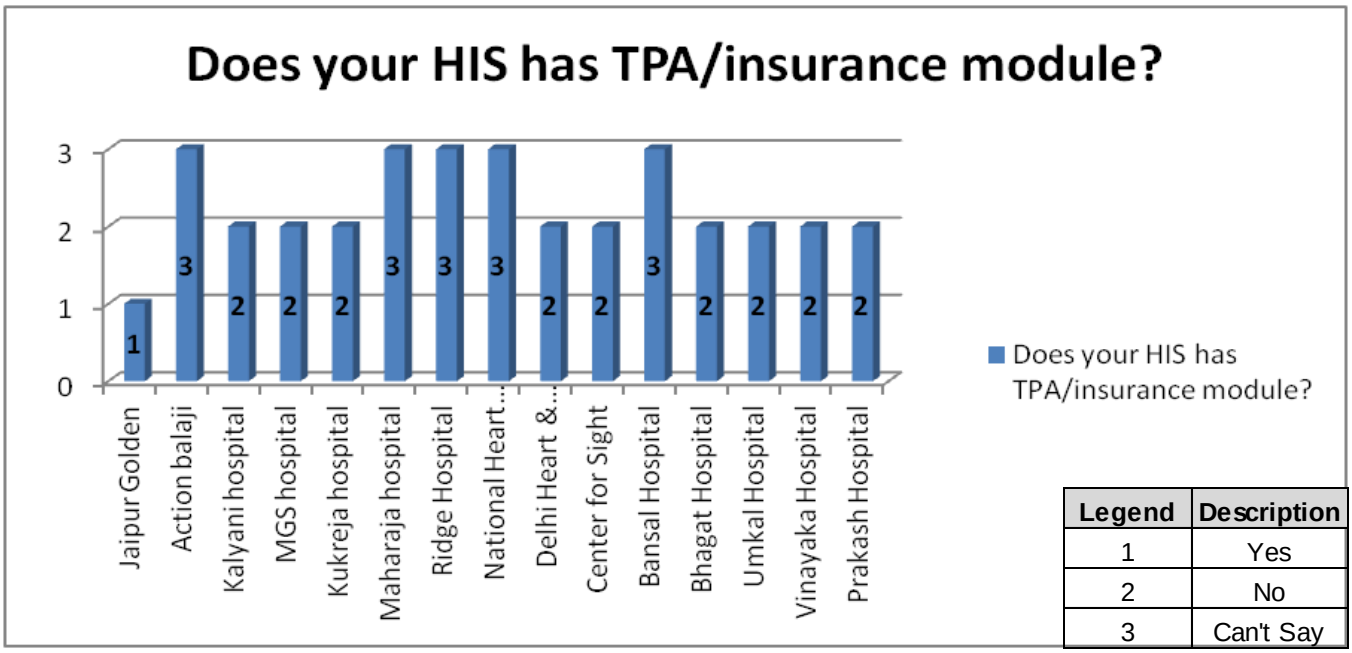


Fig. 17 (Graph Q)

Interpretation

Q. Does your HIS has TPA/insurance module?

Answer.

- 60% of stage 3 hospitals do not have TPA/Insurance Module.
- 33% of stage 3 hospitals are not sure whether they have or use TPA/Insurance Module.
- 7% of stage 3 hospitals have TPA/Insurance Module.

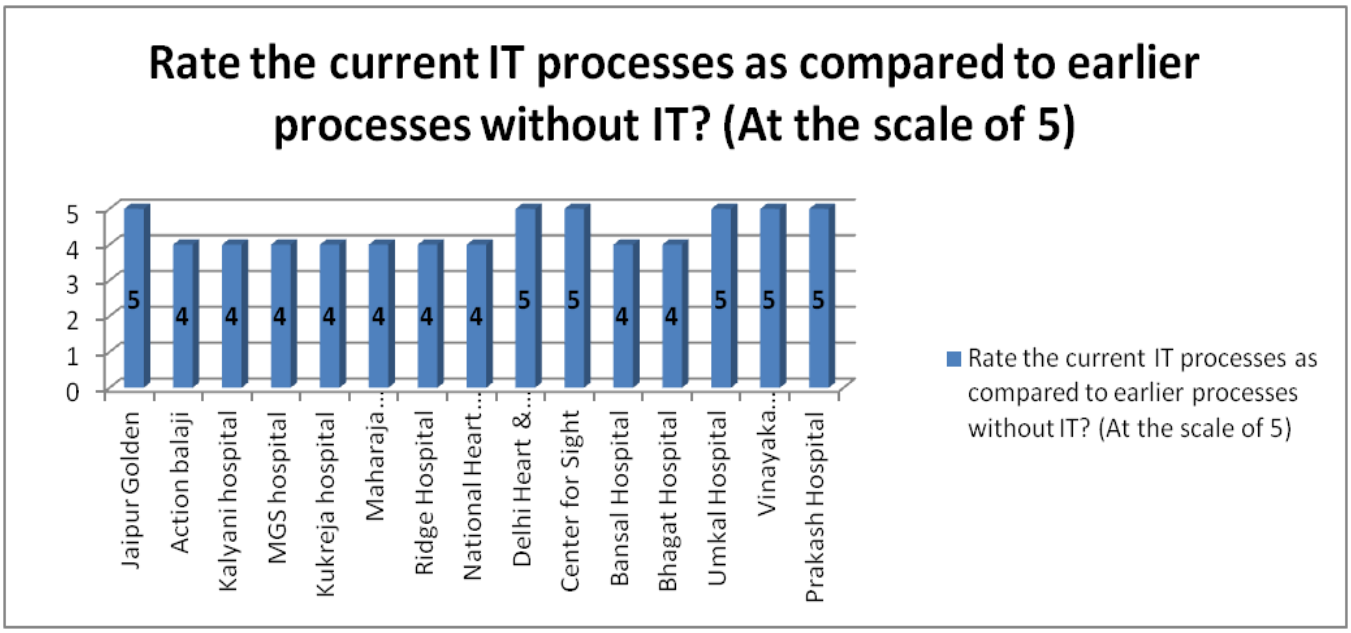


Fig. 18 (Graph R)

Interpretation

Q. Rating questionnaire

Answer.

- Hospital has highly rated their new business process against older practices in a non IT environment.

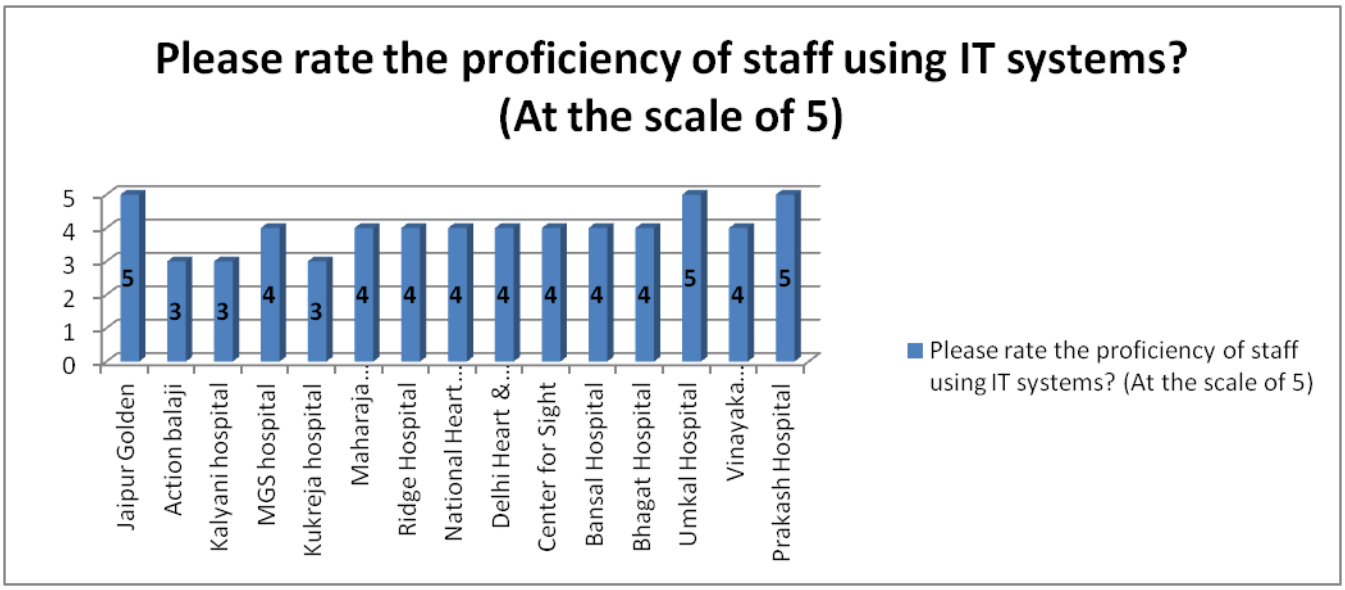


Fig.19 (Graph S)

Interpretation

Q. Rating questionnaire

Answer.

- Hospitals have highly rated the proficiency level of their staff using current IT systems.

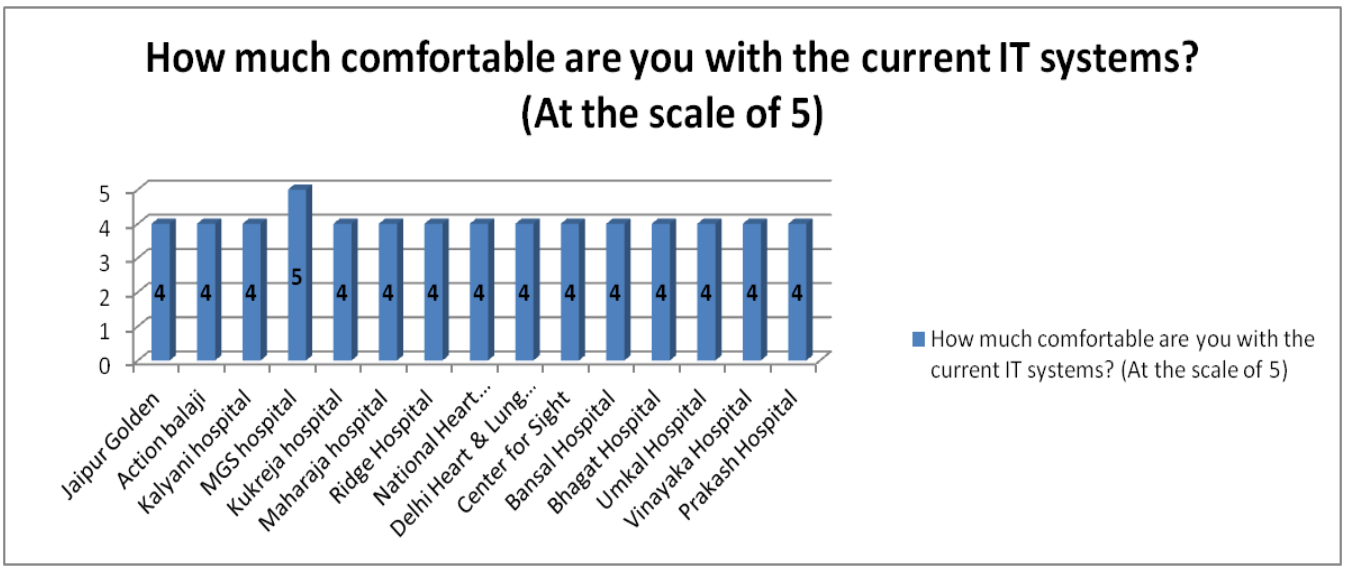


Fig. 20 (Graph T)

Interpretation

Q. Rating questionnaire

Answer.

- Hospitals have reported high comfortableness for the usage current IT systems.

Stage 4

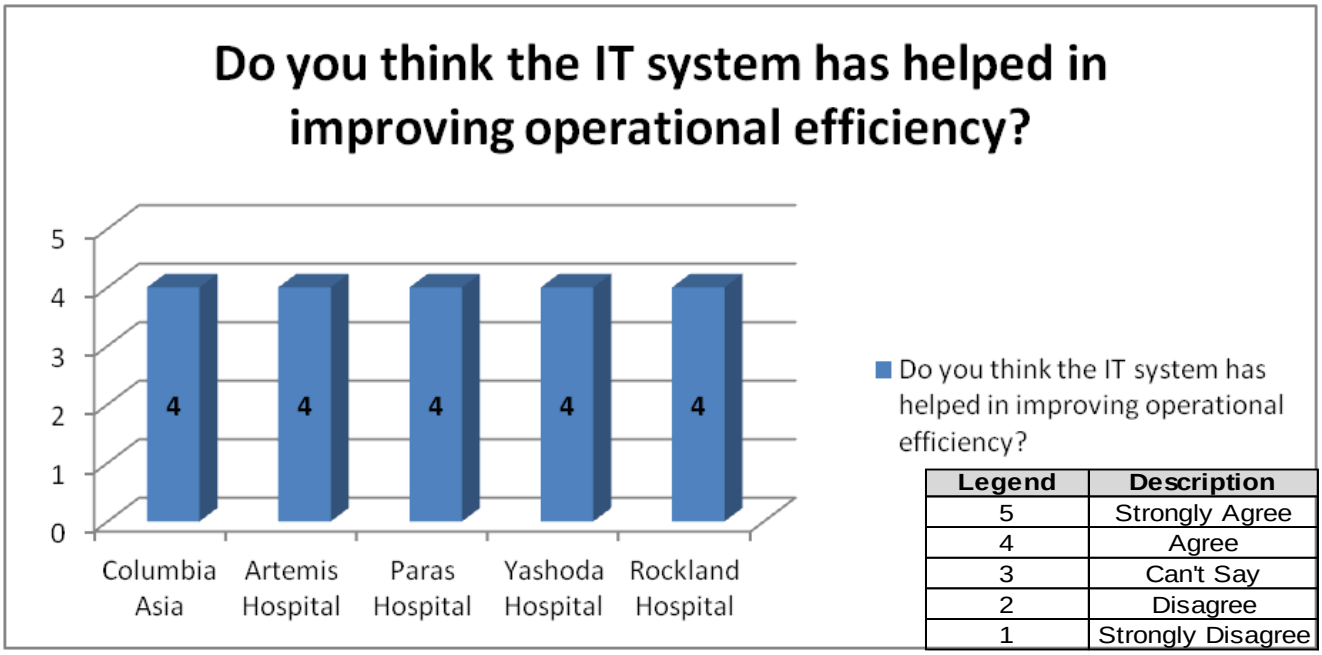


Fig. 21 (Graph U)

Interpretation

Q. Do you think the IT system has helped in improving operational efficiency?

Answer.

- 100% of Stage 4 hospitals agree that HIS system has helped in achieving operational efficiency.

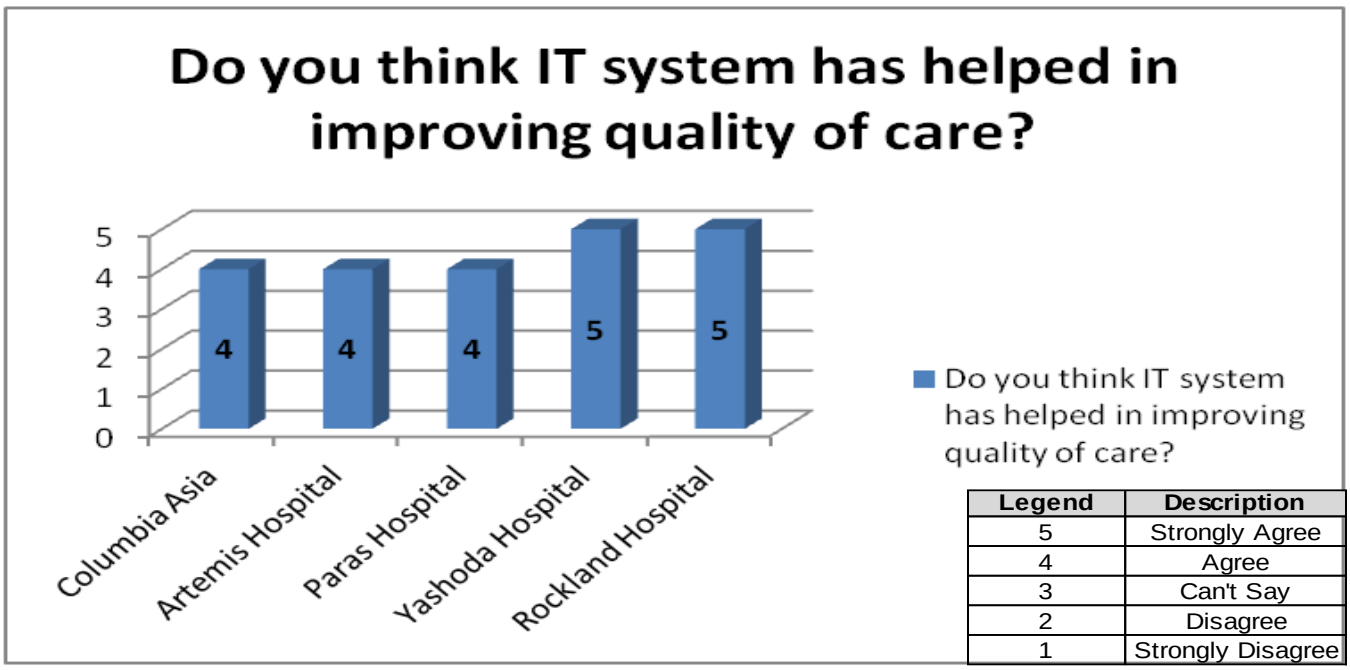


Fig. 22 (Graph V)

Interpretation

Q. Do you think IT system has helped in improving quality of care?

Answer.

- 40% of stage 4 hospitals strongly agree that HIS system has help in improving quality care.
- 60% of stage 4 hospitals agree that HIS system has help in improving quality care.

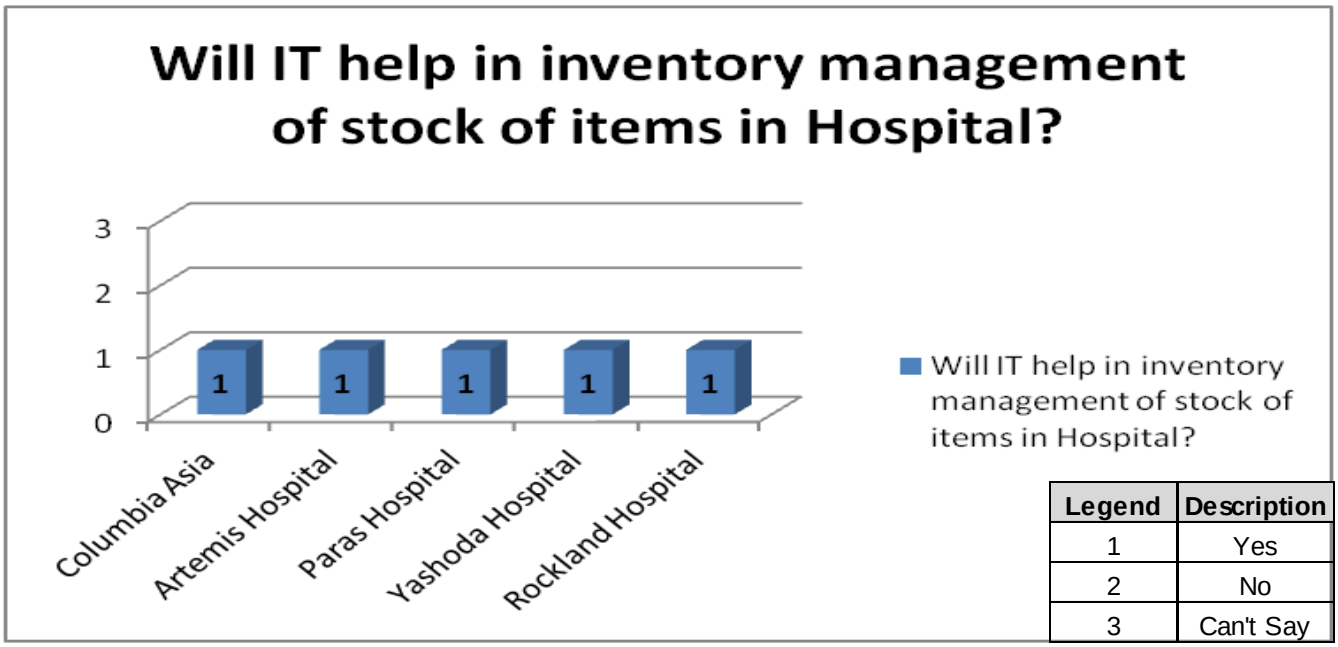


Fig. 23 (Graph W)

Interpretation

Q. Will IT help in inventory management of stock of items in Hospital?

Answer.

- 100% of stage 4 hospitals believe that IT system has helped in inventory management of stock within hospital.

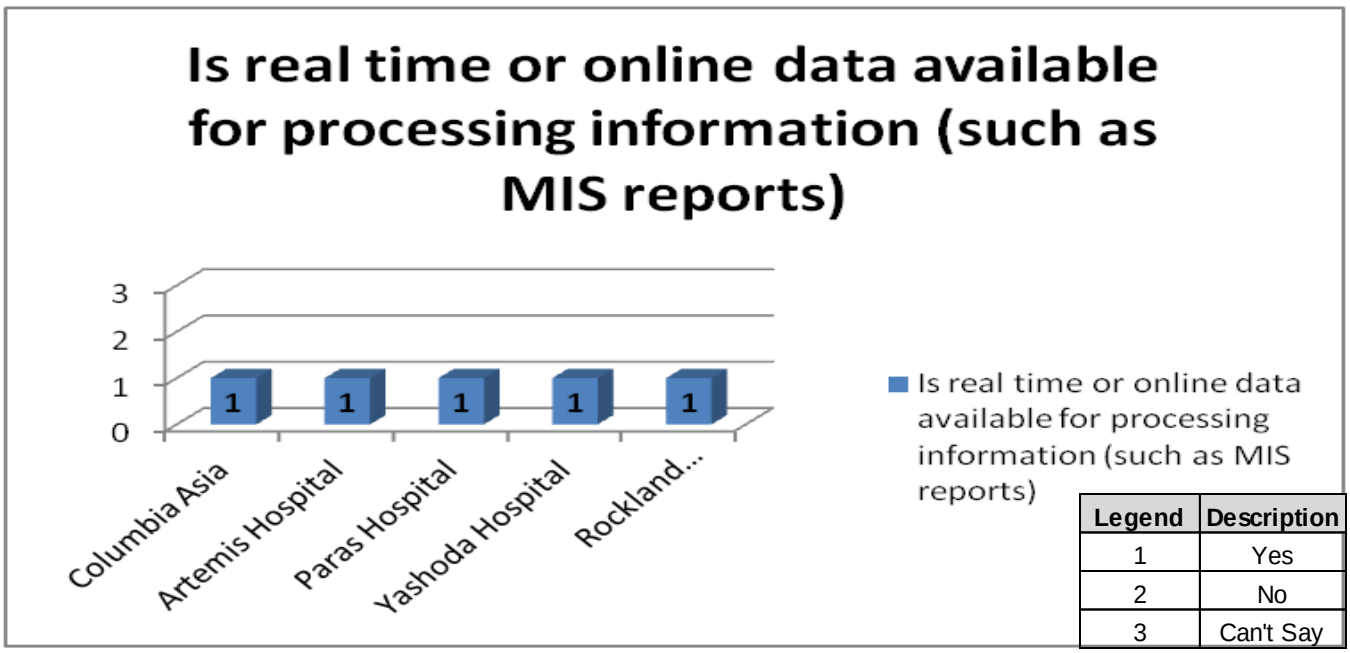


Fig. 24 (Graph X)

Interpretation

Q. Is real time or online data available for processing information (such as MIS Reports)

Answer.

- 100% of stage 4 hospitals use real time data for MIS report generation.

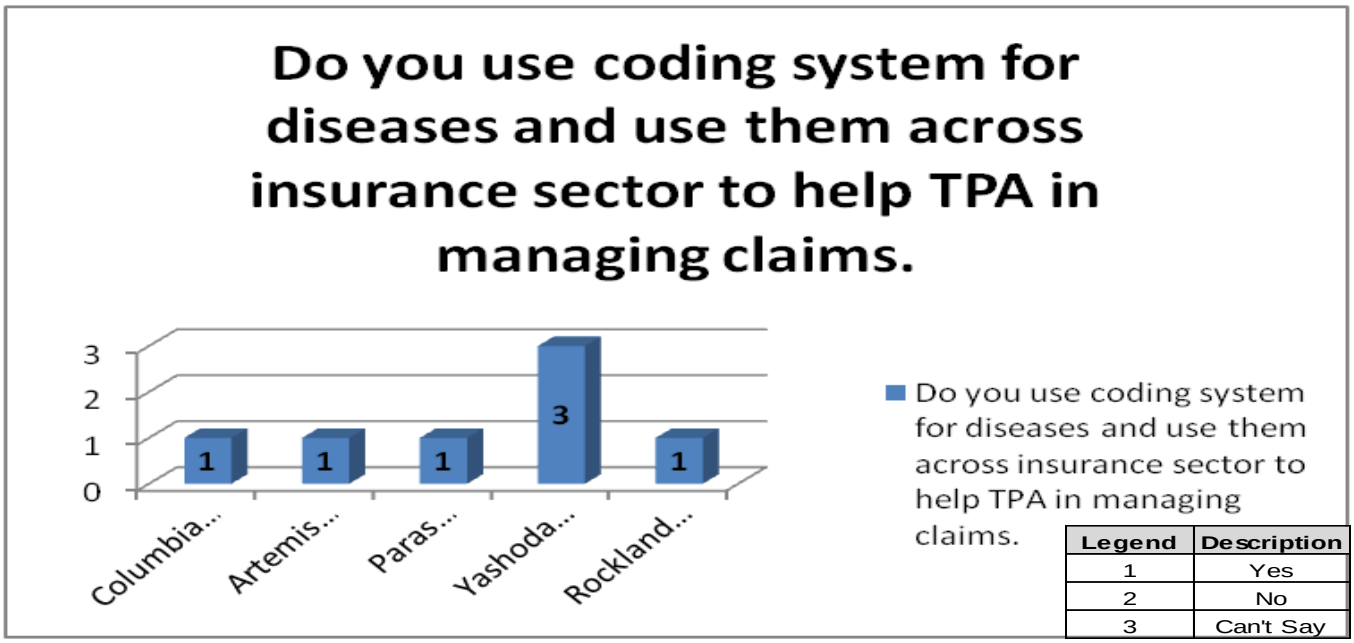


Fig. 25 (Graph Y)

Interpretation

Q. Do you use coding system for diseases and use them across insurance sector to help TPA in managing claims.

Answer.

- 80% of stage 4 hospitals use disease coding system to help facilitate the process of insurance and claim management.
- 20% of stage 4 hospitals are not sure whether they use any kind of disease coding system to help in insurance claim and settlements.

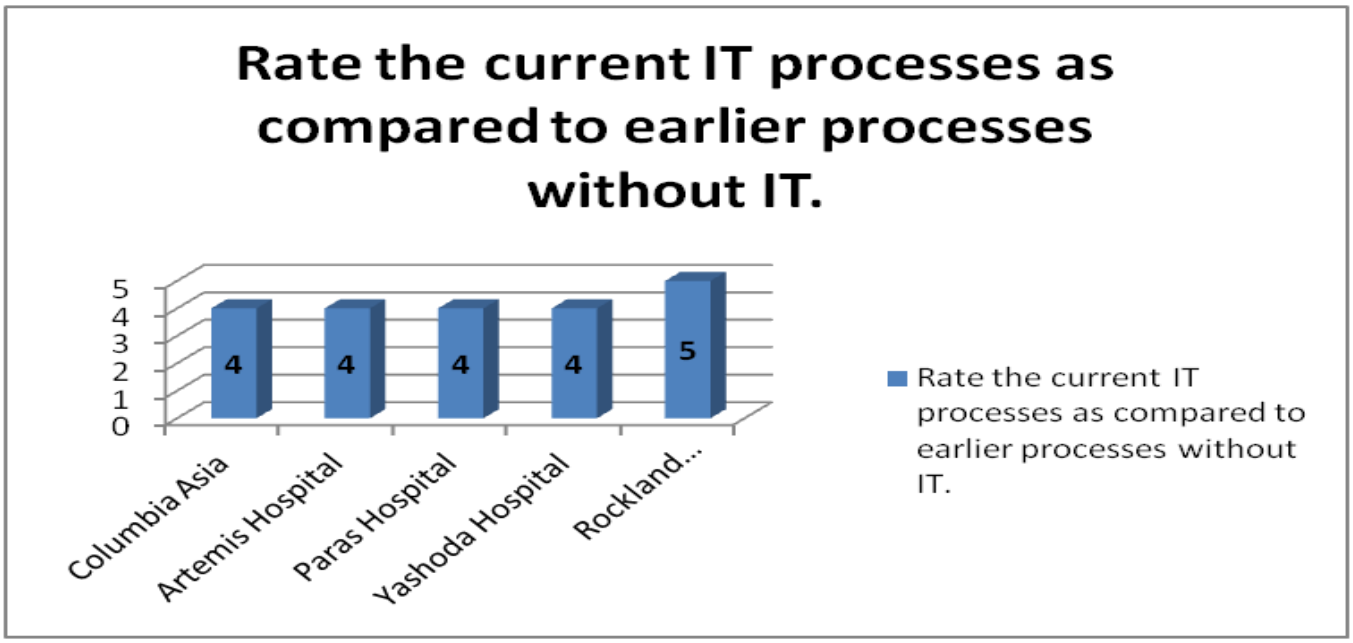


Fig. 26 (Graph Z)

Interpretation

Q. Rating questionnaire

Answer.

- Hospital has highly rated their new business process against older practices in a non IT environment in terms of efficiency.

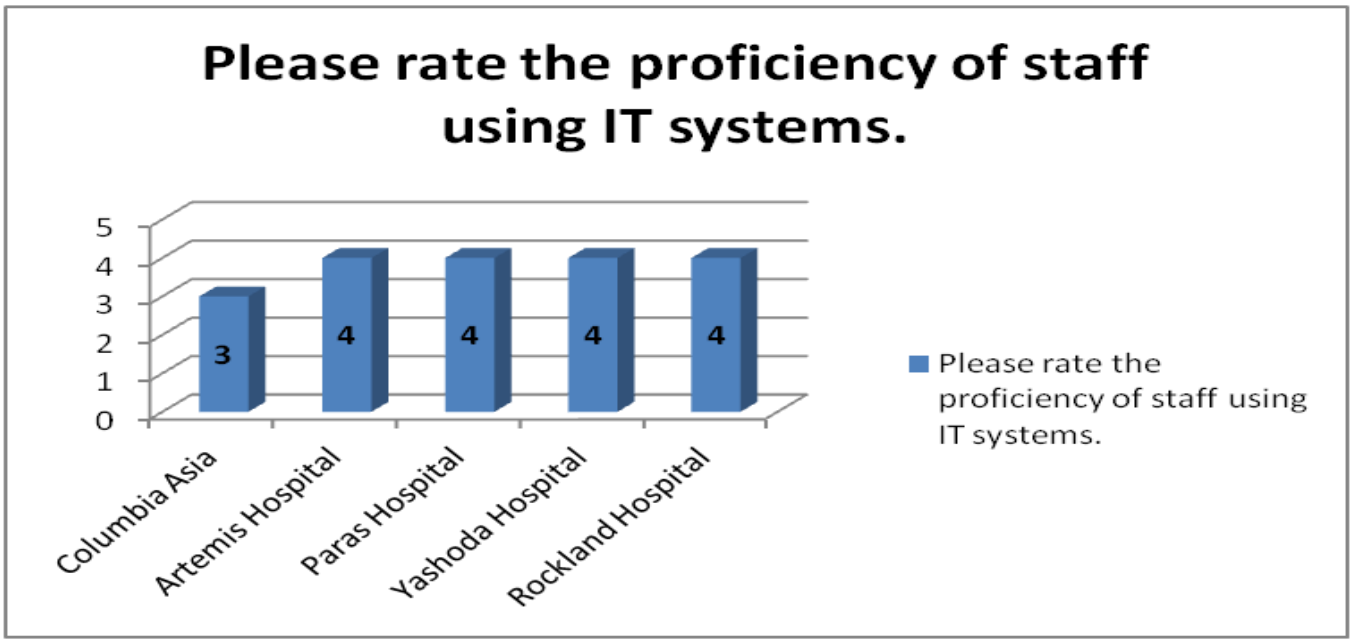


Fig.27 (Graph A1)

Interpretation

Q. Rating questionnaire

Answer.

- Hospitals rated high proficiency level of their staff using current IT systems.

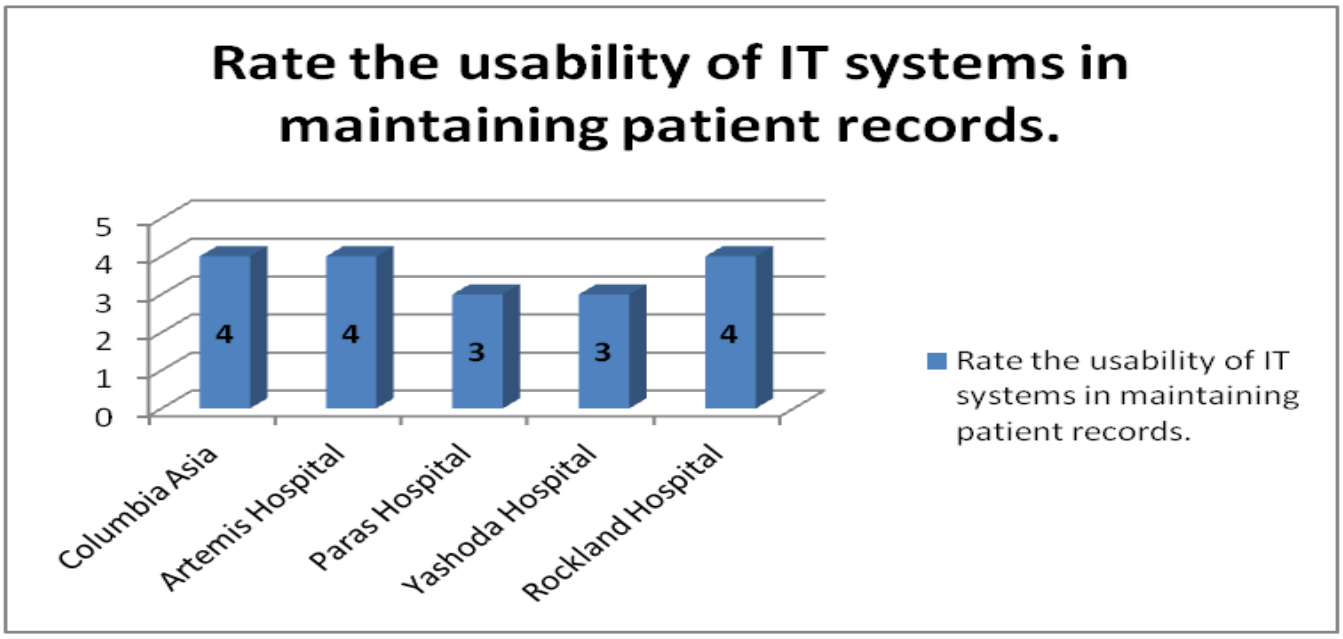


Fig.28 (Graph A2)

Interpretation

Q. Rating questionnaire

Answer.

- Hospitals rated high usability level of IT systems in maintain patient records.

Stage 5

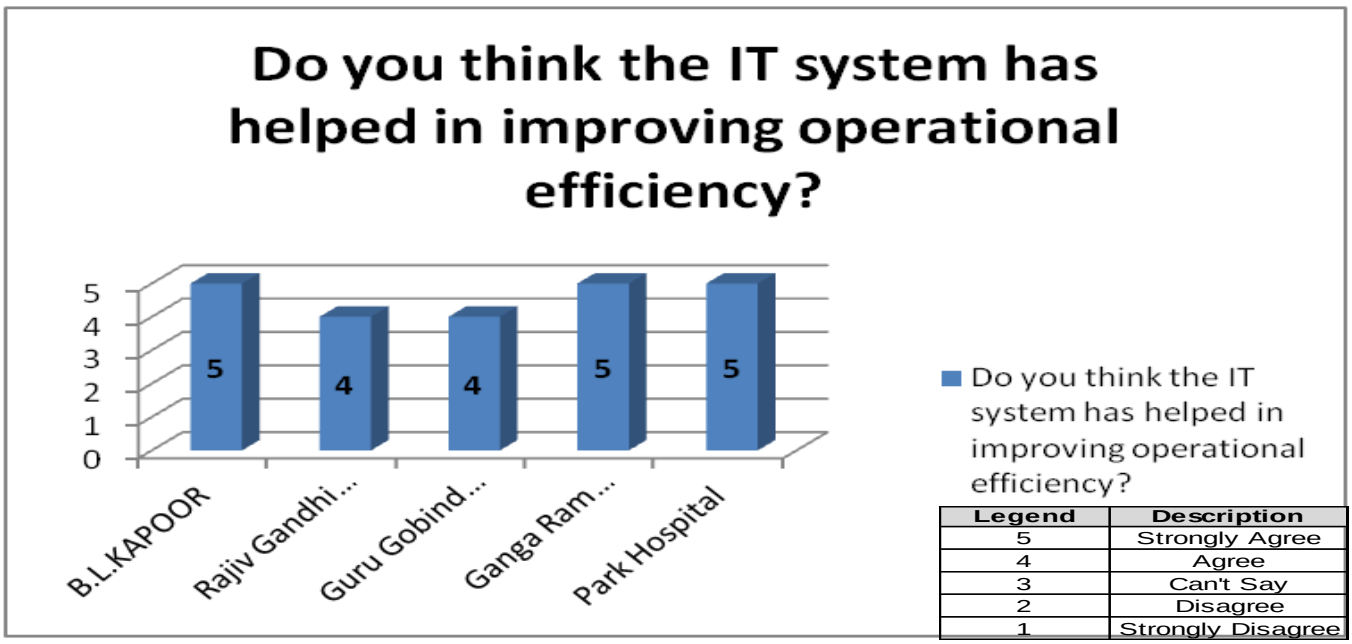


Fig. 29 (Graph A3)

Interpretation

Q. Do you think the IT system has helped in improving operational efficiency?

Answer.

- 60% of Stage 5 hospitals strongly agree that HIS system has helped in achieving operational efficiency.
- 40% of Stage 5 hospitals agree that HIS system has helped in achieving operational efficiency.

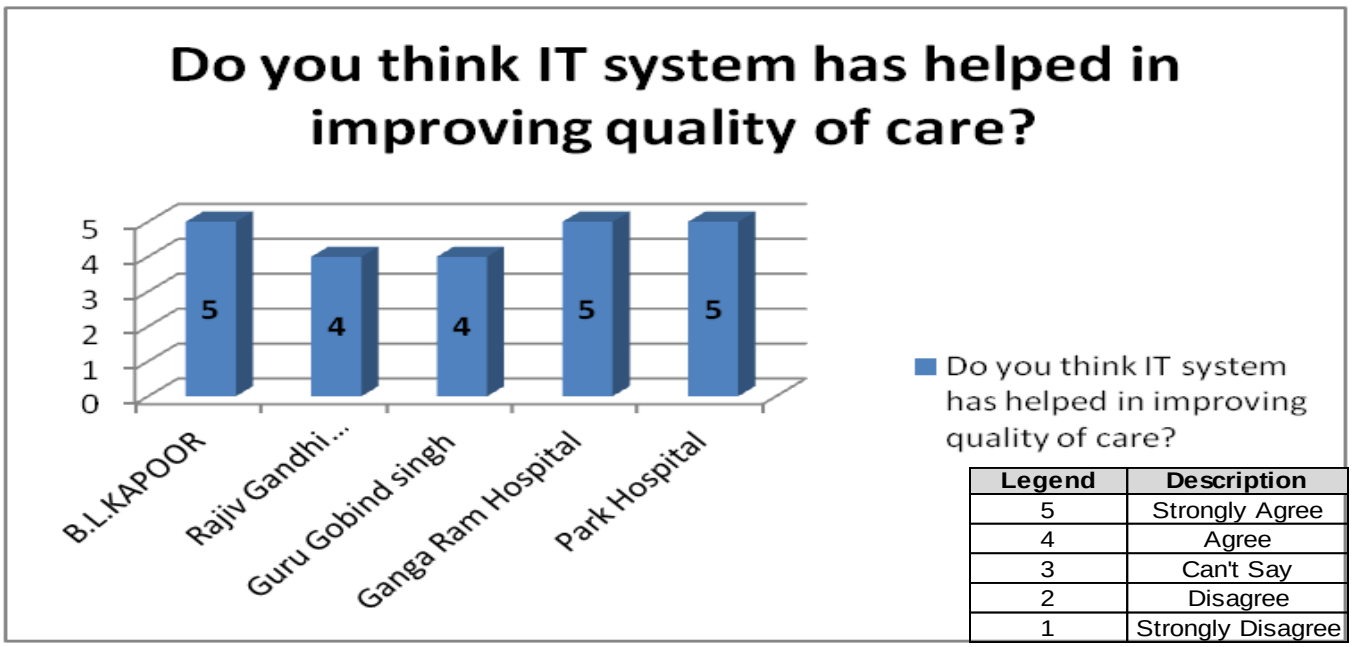


Fig. 30 (Graph A4)

Interpretation

Q. Do you think IT system has helped in improving quality of care?

Answer.

- 60% of stage 5 hospitals strongly agree that HIS system has help in improving quality care.
- 40% of stage 5 hospitals agree that HIS system has help in improving quality care.

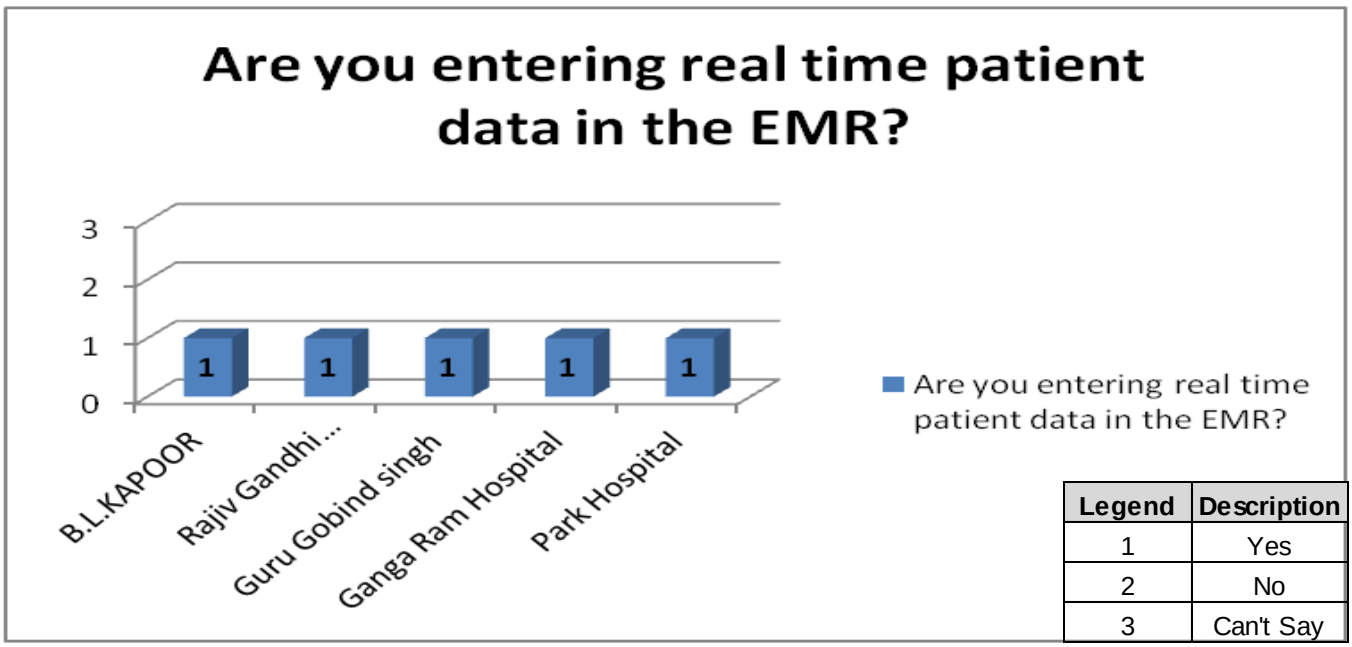


Fig. 31 (Graph A5)

Interpretation

Q. Are you entering real time patient data in the EMR?

Answer.

- 100% of stage 5 hospitals are entering real time data into the EMR system.

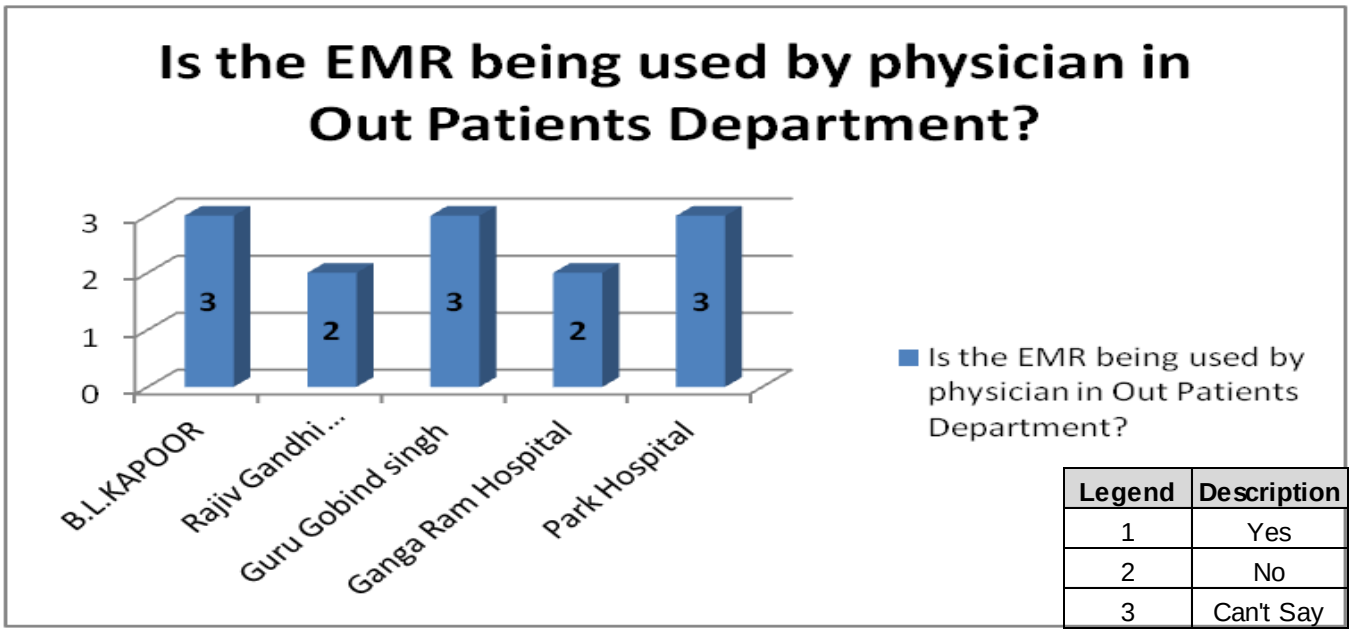


Fig. 32 (Graph A6)

Interpretation

Q. Is the EMR being used by physician in Out Patients Department?

Answer.

- 40% of stage 5 hospital's physicians do not use EMR system in the OPD.
- 60% of stage 5 hospitals are not sure whether their physicians use EMR system in OPD.

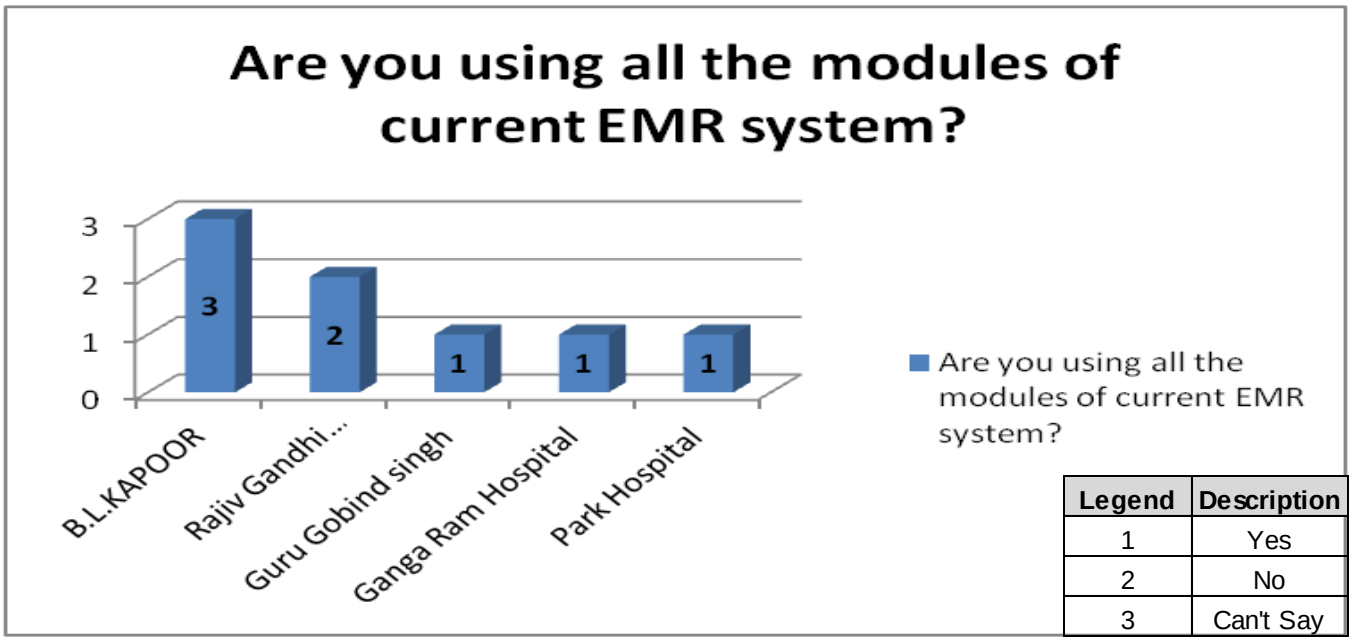


Fig. 33 (Graph A7)

Interpretation

Q. Are you using all the modules of current EMR system?

Answer.

- 60% of stage 5 hospitals agree of using all the module of the current EMR system.
- 20% of stage 5 hospitals do not use all the modules of the current EMR system.
- 20% of stage 5 hospitals are not sure of using all the modules of the current EMR system.

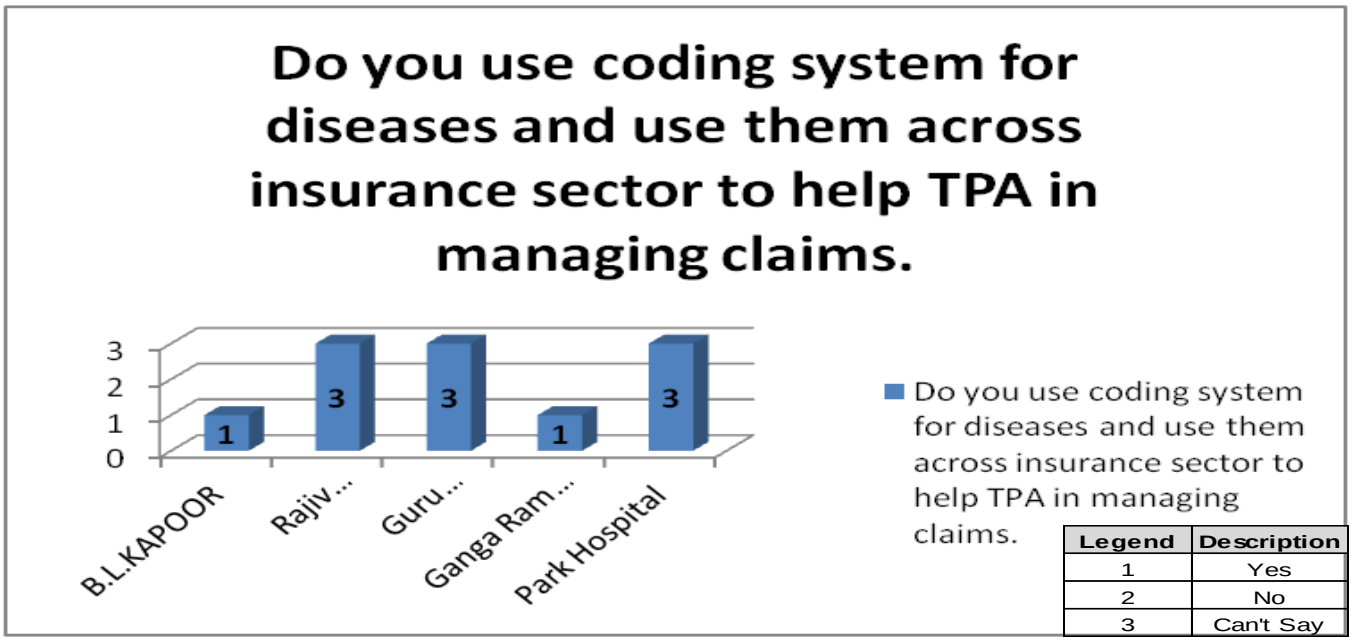


Fig. 34 (Graph A8)

Interpretation

Q. Do you use coding system for diseases and use them across insurance sector to help TPA in managing claims.

Answer.

- 40% of stage 5 hospitals use disease coding system to help facilitate the process of insurance and claim management.
- 60% of stage 5 hospitals are not sure whether they use any kind of disease coding system to help in insurance claim and settlements.

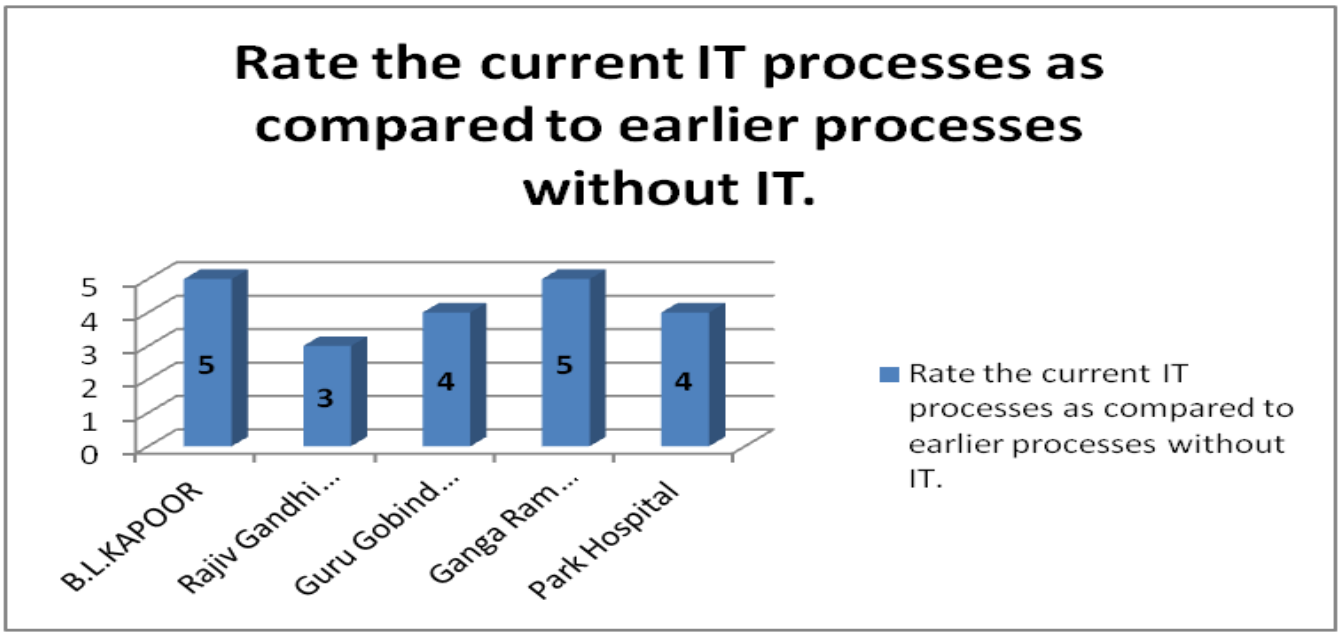


Fig. 35 (Graph A9)

Interpretation

Q. Rating questionnaire

Answer.

- Hospital has highly rated their new business process against older practices in a non IT environment in terms of efficiency.

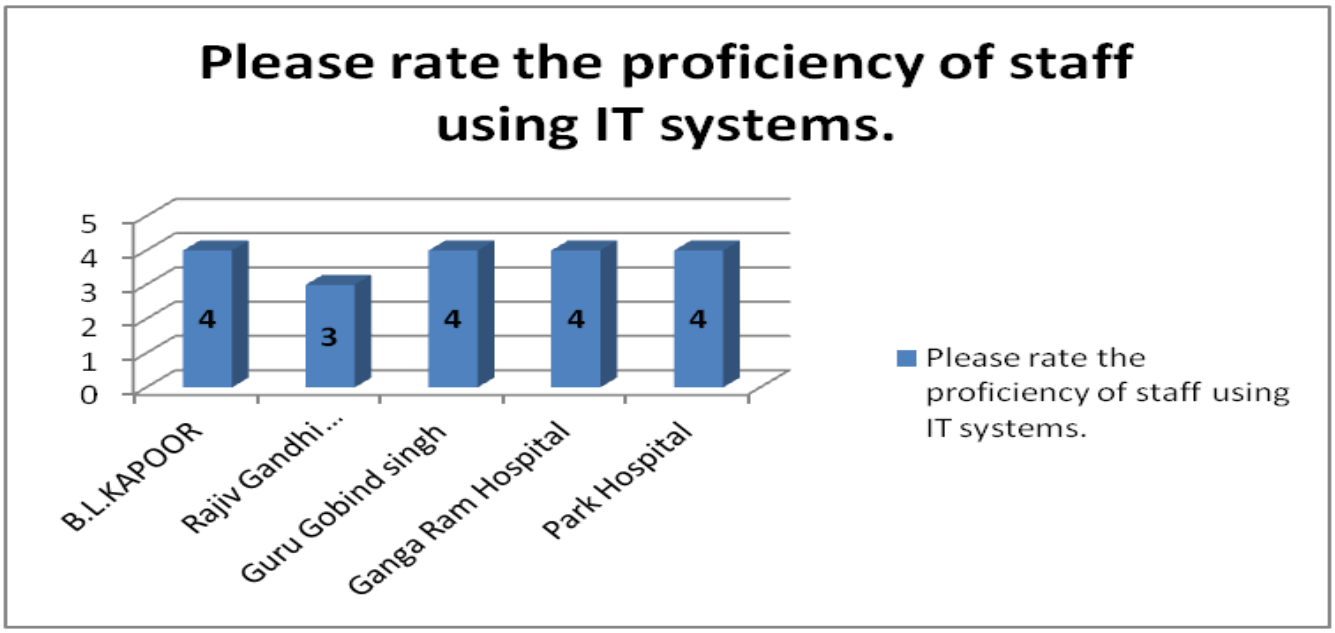


Fig.36 (Graph A10)

Interpretation

Q. Rating questionnaire

Answer.

- Hospitals rated high proficiency level of their staff using current IT systems.

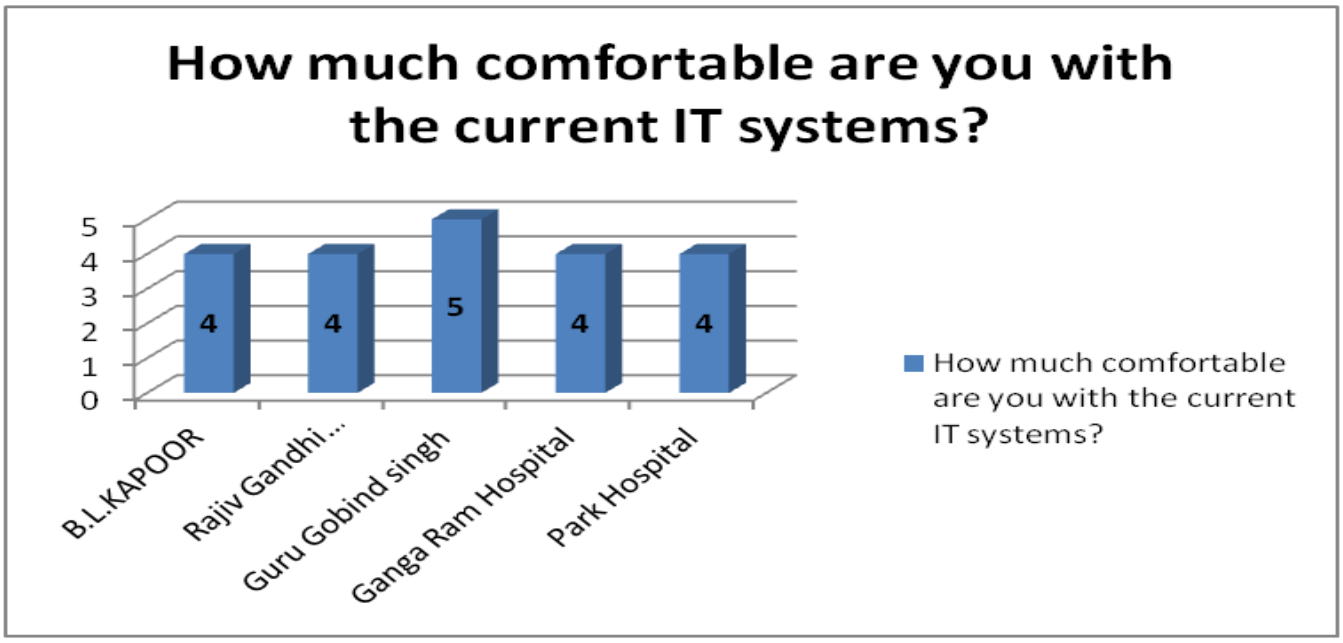


Fig. 37 (Graph A11)

Interpretation

Q. Rating questionnaire

Answer.

- Hospitals have reported high comfortableness for the usage current IT systems.

Chapter 3

8. Findings

The base of the study started with preparation of the HIT Adoption Model in context to Indian scenario and in terms of technology availability.

Based on the Technology Usage:

- In terms of usage of technology most hospital seems to be using Healthcare IT for the major purpose of administrative usage.
- The hospital seems to majorly falling in the stage 3 of the HIT Adoption Model for Indian Context.

Stage 1

- Hospitals falling under the stage 1 of the study seem to be not sure about their manual process catering their need for efficient operations within hospitals.
- Hospitals under stage 1 feels a strong need for implementing IT systems in lab and radiology department.
- Hospitals under stage 1 are still unclear about their need for procuring HIS system.

Stage 2

- Hospitals falling under the stage 2 of the study seem to be favoring manual process catering their need for efficient operations within hospitals.
- Hospital clearly understands the need to acquire HIS system to help improve their efficiency.
- Hospital is still not sure whether IT system will help in improving patient care.

Stage 3

- A very high percentage of hospital under stage 3 strongly agrees that HIS system has helped in improving quality care and has also helped in achieving operational efficiency simultaneously.
- Hospitals feels the need for clinical module in their HIS system to help aid the physician in delivering quality care to the patients.
- Despite having HIS system the hospitals still do not share information across the hospital.
- Major number of hospital uses real time data for their MIS reports for the administrative decision.
- A major number of hospitals still does not use the TPA/Insurance module of their HIS system and still rely on decade old manual process for insurance procedure in hospitals.

Stage 4

- All the hospital under this group seems to agree that IT systems have helped in achieving operational efficiency and have also improved patient care quality.
- Inventory management has been benefited in a big way by the use of IT systems in hospitals.
- Most of the hospital have seems to be using disease coding system to help them facilitate insurance process within hospital and has also helped in easy reporting.

Stage5

- All the hospital under this group seems to agree that IT systems have helped in achieving operational efficiency and have also improved patient care quality.
- All the hospitals are entering real time data for the patient which increases the chances for improved quality care and reduces the reporting errors.
- Use of EMR system in the context of OPD is still not prevalent is any of the hospital surveyed under the study.

Chapter 4

9. Conclusion

- After analyzing the primary data from the sample size of 31 hospitals it is found that highest number of hospitals lies in the stage 3 of HIT Adoption Model (Indian Context).
- It is found that hospital seems to focus more of administrative role when it comes to using IT system within the hospitals.
- As we move up in terms for stages of hospital the hospital realizes the use of IT systems has improved patient care and process efficiency and vice versa.
- One important analysis that was drawn out of the study is that despite using HIS system in most of the hospitals the systems still are used in silos and no data flow or very less among of data flow takes place among the system.
- Due to non availability or limited data sharing capability of the HIS system, hospitals are not making efficient use of IT system in the hospitals.
- Under the study it wall also reviled that the hospital even in stage 5 doesn't uses the BCMA module which is found out to be a major module in term of delivery of quality to the patient.
- Even the ERP system has found very less space in the hospital community where as it has been quite effectively used across various industries.
- CPOE module has been the major focus of the hospitals when it comes to implementing EMR.

- Even the basic feature of CDSS and PACS seems to have made very less impact in the industry and is found fewer numbers of hospitals and could be due to high operational cost attached to it.

- The department that has been prime focus for the hospital for the usage of IT systems are billing section, front office registration, laboratory and radiology department.
- Inventory management has also been the area of focus for hospital and has been benefited in a big way with the advancement of IT system within hospitals.

Chapter 5

10. Recommendations

As healthcare is fast merging with the IT industry there is also a need to provide quality healthcare service to the patients and is the utmost responsibility on the part of the healthcare provider. With the emergence of healthcare it the advancement is sure to enhance the quality of care which is beneficial to each and everyone.

Here are some of the recommendations which could further enhance the service which is already extended through technology usage in hospitals.

- Further advancement can be made in terms of quality care for the patient by the use of BCMA.
- All the IT system within and outside the hospital affecting the operation should be interconnected and flow of information should take place.
- IT Department should be seen as area of revenue center rather than a cost center.
- Advance feature such as CDSS and Full PACS systems should be incorporated with the HIS/ EMR system.
- ERP system should be implemented in hospitals to improve the efficiency of the staff and ERP system has done across different industries.
- Hospital current using HIS system in stage 3 should look to enhance the capability of IT system by using or implementing clinical module.
- Computer proficiency should be one of the main criteria for selection of the staff along with domain knowledge which is the foremost requirement.

- Proper and well planned training of staff should be organized so that they are well tuned with the system.
- Meeting and discussion should be held with the end user and stake holders to plan for further tailoring of the system as per their requirement.
- Hospital should focus on using all the module of the HIS system to enhance the productivity and efficiency of the current HIS system.
- All the hospital should use disease coding system to help in easy reporting and claim management process.
- OPD functionality/ module should be used in an EMR system.

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ANNEXURES

4th Semester Dissertation

"Level of prevalence of Healthcare IT in hospitals across Delhi and NCR"

Survey Questionnaire

Introductory Questions

1. Tell us briefly about various department/services provided by the hospital.
2. What are some of the day-to-day challenges in the hospital operations?

IT System Survey Questions

3. Briefly tell us about your IT systems?
4. What have been the 3 key benefits of the IT systems that you installed?
5. What have been the 3 key challenges of the IT systems that you installed?
    a. Do you think the current IT systems have helped to improve operational efficiency in the hospitals?
    b. Are you satisfied with the way the health records are managed currently?
    c. What are manual processes still being followed in your hospital?
    d. Did the hospital undertake an evaluation of system before procurement?
    e. What were the broad evaluation criteria for the system?
6. Has the IT system helped your business goals?
7. How you manage your servers? Or are you looking for cloud computing to go away with it?

(Basically for 5th Stage)

8. What level of adoption for the IT systems at your hospital you want to achieve ?
9. Features of HIS?

System Checklist

Sr. No.	Stages	IT Capabilities	Please Tick ✓	SW/HW Name	Vendor
1.	Stage 1	Patient Registration			
		Patient Appointment			
		Doctor/Staff Scheduling			
2.	Stage 2	Lab.			
		Radiology			
		Pharmacy			
		Billing			
		PACS (basic)			
3.	Stage 3	HIS(without clinical module)			
		Inventory Management			
		Bed Allocation			
4.	Stage 4	HIS (with clinical module)			
		Medication Orders			
		Clinical Decision Support (Drug-Drug Interaction, Allergy Information)			
5.	Stage 5	CPOE (Computerized physician order entry)			
		BCMA (Bar-coded medication admn.)			
		PACS (full)			
		EMR			
1.	Technology Usage	RFID			
2.		M-health			
3.		Finger printing			
4.		Tablets			
5.		Dicta Phone			
6.		Wi-fi			
7.		Wi-max			
8.		Medical Transcription			
9.		Voice to text			
10.		Online Applications			
11.		Cloud Technology			

Strongly Agree	Agree	Can't Say	Disagree	Strongly Disagree
5	4	3	2	1

Stage-1

Q1.	Is the current manual process meeting your needs?	Yes	No	Can't Say		
Q.2	Is the present T.A.T is satisfactory in labs for your hospitals ?	Yes	No	Can't Say		
Q3	Do you feel the need of having IT in labs and radiology?	Yes	No	Can't Say		
Q.4	Are you satisfied with your inventory management system?	Yes	No	Can't Say		
Q.5	Would you like to have pharmacy drugs management by system?	Yes	No	Can't Say		
Q.6	Are you satisfied with the manual process of ordering procedures and lab reports ?	Yes	No	Can't Say		
Please Rate on a scale of 1 to 5						
Q7	How much comfortable are you with the current IT systems?	5	4	3	2	1
Q8	Do you indent to buy HIS incoming future to meet your needs?	5	4	3	2	1

Any Comment

Thank you for your kind cooperation and support

Strongly Agree	Agree	Can't Say	Disagree	Strongly Disagree
5	4	3	2	1

Stage 2

Q.1	IS the current manual process meeting your needs?	Yes	No	Can't Say		
Q.2	Is TAT in lab is satisfactory for your hospital?	Yes	No	Can't Say		
Q.3	Do you feel the need for integrated HIS system?	Yes	No	Can't Say		
	IS TAT in pharmacy is satisfactory for your hospital?	Yes	No	Can't Say		
Q.4	Do you feel trouble managing you inventory?	Yes	No	Can't Say		
Q.5	Has IT improved patient care?	Yes	No	Can't Say		
Q.6.	Has your inventory management in pharmacy improved?	Yes	No	Can't Say		
Please Rate on a scale of 1 to 5						
Q7.	Rate the current IT processes as compared to earlier processes without IT?	5	4	3	2	1
Q8	How comfortable are you with the current IT systems?	5	4	3	2	1
Q9	How would you rate the system performance i(load handling)?	5	4	3	2	1

Any Comment

Thank you for your kind cooperation and support

Strongly Agree	Agree	Can't Say	Disagree	Strongly Disagree
5	4	3	2	1

Stage-3

Q1.	Do you think the HIS system has helped in improving operational efficiency?	5	4	3	2	1
Q2.	Do you think HIS system has helped in improving quality of care?	5	4	3	2	1
Q3.	Do you think your HIS should have feature of clinical and medication orders?	5	4	3	2	1
Q4.	Would you like to incorporate basic CDSS (such as allergy info, drug-drug interaction)	5	4	3	2	1
Q5.	Do you think connecting the whole hospital or linking them together is beneficial?	Yes	No	Can't Say		
Q7.	Do you share all the information across different systems in hospital?	Yes	No	Can't Say		
Q8.	Will IT help in inventory management of stock of items in Hospital?	Yes	No	Can't Say		
Q9.	Will IT help in Inpatient Patient Billing Process in Hospital?	Yes	No	Can't Say		
Q10.	Is real time data available for processing information (such as MIS reports)	Yes	No	Can't Say		
Q.11	Is all the modules of HIS been used by staff?	YES	NO	Can't say		
Q.12	Do you feel the need for providing patient information on the system ?	YES	NO	Can't say		
Q.13	Does your h.i.s. has tpa/insurance module ?	YES	NO	Can't say		
Q.14	Are you satisfied with G.U.I of your h.i.s.?	YES	NO	Can't say		
Please Rate on a scale of 1 to 5						
Q11.	Rate the current IT processes as compared to earlier processes without IT?	5	4	3	2	1
Q12.	Please rate the proficiency of staff using IT systems?	5	4	3	2	1
Q13.	How much comfortable are you with the current IT systems?	5	4	3	2	1
Q14.	How would you rate the performance of system in terms of usage and load handling?	5	4	3	2	1

Any Comment

Thank you for your kind cooperation and support

Strongly Agree	Agree	Can't Say	Disagree	Strongly Disagree
5	4	3	2	1

Stage-4

Q1.	Do you think the IT system has helped in improving operational efficiency?	5	4	3	2	1
Q2.	Do you think IT system has helped in improving quality of care?	5	4	3	2	1
Q3.	Do you think connecting the whole hospital or linking them together is beneficial?	Yes	No	Can't Say		
Q4	Do you share all the information across different systems in hospital?	Yes	No	Can't Say		
Q5.	Will IT help in inventory management of stock of items in Hospital?	Yes	No	Can't Say		
Q6.	Will IT help in Inpatient Patient Billing Process in Hospital?	Yes	No	Can't Say		
Q7.	Are you using all the modules of current HIS system?	Yes	No	Can't Say		
Q8.	Are you maintaining the hard copy of patient record?	Yes	No	Can't Say		
Q9.	Is real time or online data available for processing information (such as MIS reports)	Yes	No	Can't Say		
Q10.	Do you use coding system for diseases and use them across insurance sector to help TPA in managing claims.	Yes	No	Can't Say		
Q11.	Should IT be mapped for hospital processes and vice versa	Yes	No	Can't Say		
Please Rate on a scale of 1 to 5						
Q12.	Rate the current IT processes as compared to earlier processes without IT.	5	4	3	2	1
Q13.	Please rate the proficiency of staff using IT systems.	5	4	3	2	1
Q14.	How much comfortable are you with the current IT systems?	5	4	3	2	1
Q15.	Rate the usability of IT systems in maintaining patient records.	5	4	3	2	1
Q16.	How would you rate the performance of system in terms of usage and load handling?	5	4	3	2	1
Q17.	Rate your modified workflows against old practices without IT systems.	5	4	3	2	1

Any Comment

Thank you for your kind cooperation and support

Strongly Agree	Agree	Can't Say	Disagree	Strongly Disagree
5	4	3	2	1

Stage-5

Q1.	Do you think the IT system has helped in improving operational efficiency?	5	4	3	2	1
Q2.	Do you think IT system has helped in improving quality of care?	5	4	3	2	1
Q3.	Do you think connecting the whole hospital or linking them together is beneficial?	Yes	No	Can't Say		
Q4.	Do you share all the information across different systems in hospital?	Yes	No	Can't Say		
Q5	Are you entering real time patient data in the EMR?	Yes	No	Can't Say		
Q6.	Is the EMR being used by physician in Out Patients Department?	Yes	No	Can't Say		
Q7.	Are you using all the modules of current EMR system?	Yes	No	Can't Say		
Q8.	Are you also maintaining the hard copy of patient record?	Yes	No	Can't Say		
Q9.	Is real time or online data available for processing information (such as MIS reports)	Yes	No	Can't Say		
Q10.	Do you use coding system for diseases and use them across insurance sector to help TPA in managing claims.	Yes	No	Can't Say		
Q11.	Should IT be mapped for hospital processes and vice versa	Yes	No	Can't Say		
Please Rate on a scale of 1 to 5						
Q12.	Rate the current IT processes as compared to earlier processes without IT.	5	4	3	2	1
Q12	Please rate the proficiency of staff using IT systems.	5	4	3	2	1
Q13.	How much comfortable are you with the current IT systems?	5	4	3	2	1
Q14.	Rate the usability of IT systems in maintaining patient records.	5	4	3	2	1
Q15.	How would you rate the performance of system in terms of usage and load handling?	5	4	3	2	1
Q16.	Rate your modified workflows against old practices without IT systems.	5	4	3	2	1

Which community of user is using EMR the most:-

Please enlist Current Challenges faced due to EMR

Any Comment

Thank you for your kind cooperation and support

Data Collection

Data Sheets

No.1

Sr. No.	Hospital Name	Technology Usage										
		RFID	m-Health	finger printing	Tablets	Dicta Phone	Wi-fi	Wi-max	Medical Transcription	Voice to text	Online Applications	Cloud Technology
1	Columbia Hospital	no	no	no	no	no	no	no	no	no	no	no
2	GB Pant	no	no	no	no	no	no	no	no	no	no	no
3	Jaipur Golden	no	no	no	no	no	yes	yes	yes	no	yes (lab results)	no
4	Action balaji	no	no	no	no	no	yes	yes	yes	no	no	no
5	Kalyani hospital	no	no	no	no	no	no	no	yes	no	no	no
6	MGS	no	no	no	no	no	no	no	Yes(dis summary)	no	no	no
7	Deen dayal upadhaya	no	no	no	no	no	no	no	no	no	no	no
8	Maharaj Agarseen	no	no	no	no	no	no	no	no	no	no	no
9	Jeevan Mala	no	no	no	no	no	no	no	no	no	no	no
10	Jivodhaya	no	no	no	no	no	no	no	no	no	no	no
11	Ridge Heart Institute	no	no	no	no	no	no	no	no	no	no	no
12	kukreja hospital	no	no	no	no	no	no	no	no	no	no	no
13	National Heart Institute	no	no	no	no	no	no	no	no	no	no	no
14	Bl kapoor	no	no	no	no	no	yes	no	no	no	yes	no
15	Delhi Heart & Lung Institute	no	no	yes	no	no	no	no	no	no	no	no
16	Center for Sight	no	no	no	no	no	no	no	no	no	no	no
17	Rajiv Gandhi Cancer Institute	no	no	no	no	no	yes	no	no	no	no	no
18	Kalra Hospital	no	no	no	no	no	no	no	no	no	no	no
19	Guru Gobind Singh Hospital	no	no	yes	no	no	no	no	no	no	no	yes
20	Orthonova hospital	no	no	no	no	no	no	no	no	no	no	no
21	Ganga Ram Hospital	no	no	no	no	no	yes	no	no	no	yes	no
22	Artemis Hospital	no	no	no	no	no	no	no	no	no	no	no
23	Paras Hospital	no	no	no	no	no	no	no	no	no	no	no
24	Park Hospital	no	no	Yes	no	no	Yes	no	Yes	no	no	Yes
25	Bansal Hospital	no	no	Yes	no	no	no	no	Yes	no	no	no
26	Bhagat Hospital	no	no	no	no	no	no	no	no	no	no	no
27	Umkal Hospital	no	no	no	no	no	no	no	no	no	yes	no
28	Yashoda Hospital	no	no	no	no	no	no	no	no	no	no	no
29	Rockland Hospital	no	no	no	no	no	no	no	no	no	no	yes
30	Vinayaka Hospital	no	no	Yes	no	no	no	no	no	no	no	no
31	Prakash Hospital	no	no	no	no	no	no	no	no	no	no	no

Sr. No.	Hospital Name	Hospital Stage	Pvt/Gov	No. of beds	Stage 1			Stage 2			Stage 3			Stage 4				Stage 5			
					Patient Regist.	Patient Appmnt.	Doctor Scheduling	Lab.	Radiology	PACS (basic)	HIS (without clinical module)	Inventory Mgmt.	Patient Billing	Bed Allocatn.	HIS (with clinical module)	Med. Orders	CDSS(Drug-Drug Intraction, Allergy Information)	CPOE	BCMA	PACS (full)	ERP
1	Columbia Asia	4	Pvt.	90	1	1	1	1	1	1	1	1	1		1	1	1				
2	GB Pant	2	Gov.	613	1			1	1	1											
3	Jaipur Golden	3	Pvt.	120	1	1		1	1		1	1	1								
4	Action balaji	3	Pvt.	600	1	1	1				1	1	1								
5	Kalyani hospital	3	Pvt.	125	1			1			1	1	1								
6	MGS hospital	3	Pvt	110	1	1	1	1	1		1	1	1								1
7	Deen dayal upadhya	1	Gov.	500	1																
8	Maharaja Agarseen	3	Pvt	380	1	1	1	1			1	1	1			1					
9	Jeevan Mala Hospital	1	Pvt.	30	1	1							1								
10	Jivodhaya Hospital	1	Pvt.	45	1	1							1								
11	Kukreja hospital	3	Pvt.	110	1	1	1	1			1	1	1		1						
12	Ridge Heart Institute	3	Pvt.	180	1			1	1		1		1								
13	National Heart Institute	3	Pvt.	104	1	1		1	1		1	1	1	1							
14	B.L Kapoor Hospital	4	Pvt.	308	1	1		1		1		1	1	1	1	1		1			
15	Delhi Heart & Lung Institute	3	Pvt.	101	1	1	1				1	1	1	1							
16	Center for sight	3	Pvt.	4	1	1	1				1	1	1								
17	Rajiv Gandhi Cancer Institute	5	Pvt.	241	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	
18	Kalra Hospital	1	Pvt.	150	1	1															
19	Guru Gobind Singh Hospital	5	Gov.	100	1			1	1						1	1		1			
20	Orthonova	1	pvt	40	1								1								
21	Ganga Ram Hospital	5	pvt.	650	1	1		1	1					1	1			1	1		1
22	Artemis Hospital	4	pvt.	300	1	1	1	1	1				1		1	1					
23	Paras Hospital	4	pvt.	250	1	1		1	1	1	1	1		1	1	1	1				
24	Park Hospital	5	pvt.	304	1		1	1	1	1	1		1		1	1			1		1
25	Bansal Hospital	3	pvt.	50	1	1	1	1	1	1	1		1								
26	Bhagat Hospital	3	pvt.	120	1	1		1	1		1	1	1	1							
27	Umkal Hospital	3	pvt.	150	1	1		1	1	1	1	1	1	1							
28	Yashoda Hospital	4	pvt.	300	1	1		1	1	1	1	1		1	1	1	1				
29	Rockland Hospital	4	pvt.	100	1	1		1	1		1	1	1	1		1	1				
30	Vinayaka Hospital	3	pvt.	45	1	1	1				1	1	1	1							
31	Prakash hospital	3	Pvt.	100	1	1	1				1	1	1	1							
					100	78	44	61	39	22	67	67	83	22	22	22	11	11	0	6	6

No.2

No.3

Stage 1

Sr. No.	Hospital Name	Question							
		Is the current manual process meeting your business needs?	IS the present TAT is satisfactory in labs for your hospitals?	Do you feel the need of having IT in labs and radiology?	Are you satisfied with your inventory management system?	Would you like to have pharmacy drug management by system?	Are you satisfied with manual process of ordering procedure and lab reports ?	Do you intend to buy HIS in coming future to meet your needs?	How much comfortable are you with current IT systems ?
1	Deen dayal hospital	3	3	3	3	3	3	2	2
2	Jeevan Mala	3	1	1	1	3	1	3	3
3	Jivodhaya	1	1	3	3	3	1	3	4
4	Kalra Hospital	1	2	1	1	3	2	3	4
5	Orthonova hospital	3	3	1	1	2	3	3	3

No.4

Stage 2

S.No.	hospital name	Is the current manual process meeting your needs?	Is TAT in lab satisfactory for your hospitals ?	Do you feel the need for HIS system?	Is TAT in pharmacy satisfactory in your hospital?	Do you feel trouble managing your inventory?	Has IT improved patient care?	Has your inventory management in pharmacy improved?	Rate the current IT process as compared to earlier process without IT ?	How comfortable are you with current IT systems ?	How would you rate the system performance (load handling)
1	G.B. pant	1	3	1	3	1	3	2	5	4	4

No.5

Stage 3

Sr. No.	Hospital Name	Question																
		Do you think the HIS system has helped in improving operational efficiency?	Do you think HIS system has helped in improving quality of care?	Do you think your HIS should have feature of clinical and medication orders?	Would you like to incorporate basic CDSS (such as allergy info, drug-drug interaction)	Do you think connecting the whole hospital or linking them together is beneficial?	Do you share all the information across different systems in hospital?	Will IT help in inventory management of stock of items in Hospital?	Will IT help in Inpatient Patient Billing Process in Hospital?	Is real time or online data available for processing information (such as MIS reports)	Is all the modules of HIS being used by staff?	Do you feel the need for providing patient information on the system?	Does your HIS has TPA/insurance module ?	Are you satisfied with GUI of your HIS ?	Rate the current IT processes as compared to earlier processes without IT?	Please rate the proficiency of staff using IT systems ?	How much comfortable are you with the current IT systems ?	How would you rate the performance of system in terms of usage and load handling?
1	Jaipur Golden	5	5	4	4	1	1	2	1	1	1	1	1	1	5	5	4	4
2	Action balaji	4	4	5	4	1	2	1	1	1	2	2	3	1	4	3	4	4
3	Kalyani hospital	3	3	3	2	1	1	1	1	1	2	2	2	1	4	3	4	4
4	MGS hospital	4	3	1	1	2	2	1	1	2	2	2	2	1	4	4	5	4
5	Kukreja hospital	4	4	5	5	1	1	1	1	1	2	2	2	2	4	3	4	4
6	Maharaja hospital	4	4	3	3	3	3	1	1	1	2	2	3	1	4	4	4	5
7	Ridge Hospital	4	4	3	3	1	2	1	1	2	2	1	3	1	4	4	4	4
8	National Heart Institute	4	3	4	3	1	2	1	1	3	1	1	3	1	4	4	4	4
9	Delhi Heart & Lung Institute	5	5	4	4	1	2	1	1	1	1	3	2	1	5	4	4	4
10	Center for Sight	5	5	4	4	1	2	1	1	1	1	1	2	1	5	4	4	5
11	Bansal Hospital	5	4	5	5	1	2	1	1	3	1	3	3	1	4	4	4	4
12	Bhagat Hospital	4	4	4	5	1	2	1	1	1	1	3	2	1	4	4	4	4
13	Umkal Hospital	5	4	4	5	1	2	1	1	1	1	1	2	1	5	5	4	4
14	Vinayaka Hospital	5	5	4	4	1	2	1	1	1	1	3	2	1	5	4	4	4
15	Prakash Hospital	4	4	4	4	1	2	1	1	1	1	3	2	1	5	5	4	4

No.6

Stage 4

Sr. No.	Hospital Name	Question																
		Do you think the IT system has helped in improving operational efficiency?	Do you think IT system has helped in improving quality of care?	Do you think connecting the whole hospital or linking them together is beneficial?	Do you share all the information across different systems in hospital?	Will IT help in inventory management of stock of items in Hospital?	Will IT help in Inpatient Patient Billing Process in Hospital?	Are you using all the modules of current HIS system?	Are you maintaining the hard copy of patient record?	Is real time or online data available for processing information (such as MIS reports)	Do you use coding system for diseases and use them across insurance sector to help TPA in managing claims.	Should IT be mapped for hospital processes and vice versa	Rate the current IT processes as compared to earlier processes without IT.	Please rate the proficiency of staff using IT systems.	How much comfortable are you with the current IT systems?	Rate the usability of IT systems in maintaining patient records.	How would you rate the performance of system in terms of usage and load handling?	Rate your modified workflows against old practices without IT systems.
1	Columbia Asia	4	4	1	2	1	1	1	1	1	1	1	4	3	4	4	4	4
2	Artemis Hospital	4	4	1	2	1	1	1	1	1	1	1	4	4	4	4	4	4
3	Paras Hospital	4	4	1	2	1	1	1	1	1	1	1	4	4	3	3	3	3
4	Yashoda Hospital	4	5	1	2	1	1	1	1	1	3	1	4	4	4	3	3	3
5	Rockland Hospital	4	5	1	2	1	1	1	1	1	1	1	5	4	4	4	4	4

No.7

Stage 5

Sr. No.	Hospital Name	Question																	
		Do you think the IT system has helped in improving operational efficiency?	Do you think IT system has helped in improving quality of care?	Do you think connecting the whole hospital or linking them together is beneficial?	Has IT helped in improving patient care?	Do you share all the information across different systems in hospital?	Are you entering real time patient data in the EMR?	Is the EMR being used by physician in Out Patients Department?	Are you using all the modules of current EMR system?	Are you maintaining the hard copy of patient record?	Is real time or online data available for processing information (such as MIS reports)	Do you use coding system for diseases and use them across insurance sector to help TPA in managing claims.	Should IT be mapped for hospital processes and vice versa	Rate the current IT processes as compared to earlier processes without IT.	Please rate the proficiency of staff using IT systems.	How much comfortable are you with the current IT systems?	Rate the usability of IT systems in maintaining patient records.	How would you rate the performance of system in terms of usage and load handling?	Rate your modified workflows against old practices without IT systems.
1	B.L.KAPOOR	5	5	1	1	2	1	3		2	1	1	1	5	4	4	4	4	4
2	Rajiv Gandhi Cancer Institute	4	4	1	1	2	1	2	2	1	3	3	1	3	3	4	4	4	3
3	Guru Gobind singh	4	4	1	1	1	1	3	1	1	1	3	1	4	4	5	4	3	4
4	Ganga Ram Hospital	5	5	1	1	1	1	2	1	1	1	1	1	5	4	4	4	4	4
5	Park Hospital	5	5	1	1	1	1	3	1	1	1	3	1	4	4	4	5	4	4

No.8

S.No	Hospital Name	Application Name	Capability	Bespoke/Product	Vendor
1	Colombia Asia	Care21	HIS	Bespoke	
2	GB Pant	Kodak	PACS	Product	Kodak
3	Jaipur Golden	Akhil Systems	HIS	Product	Akhil
4	Action balaji	Shivam software sol.	HIS	Product	Shivam
5	Kalyani hospital	Accurate	HIS	Product	accurate
6	MGS hospital	Administrator plus	HIS	Product	admin plus
7	Kukreja hospital	Akhil Systems	HIS	Product	Akhil
8	Maharaja Agarseen Hospital	Shivam software sol.	HIS	Product	Shivam
9	Bl kapoor	Akhil emr systems	EMR	Product	Akhil
10	Delhi Heart & Lung Institute	Accurate HIS	HIS	Product	Acre
11	Rajiv Gandhi Cancer Institute	Synapse	PACS	Product	Fujifilm
12	Ganga Ram Hospital	prodigious	HIS	Product	Mtech
13	Ganga Ram Hospital	SpeedMiner	Data mining tool	Product	Mtech
14	Ganga Ram Hospital	Trak Health	Clinical Module	Product	Inter Systems.
15	Artemis Hospital	Isoft	HIS	Product	Isoft
16	Paras Hospital	Akhil HIS	HIS	Product	Akhil
17	Park Hospital	Shivam software sol.	HIS	Product	Shivam
18	Bansal Hospital	Akhil HIS	HIS	Product	Akhil
19	Bhagat Hospital	Accurate	HIS	Product	Accurate
20	Umkal Hospital	Accurate	HIS	Product	Accurate
21	Yashoda Hospital	Akhil HIS	HIS	Product	Akhil
22	Rockland Hospital	Wipro HIS	HIS	Product	Wipro
23	Vinayaka Hospital	Accurate	HIS	Product	Accurate
24	Prakash Hospital	Accurate	HIS	Product	Accurate