Dissertation Report

To assess the acceptance level of Hospital Management Information System (HMIS) among the various Staff working in different hospitals of Delhi/NCR region

At

Karexpert Technologies Private Limited

Submitted by

Dr. Prabha Tiwari

Of

Post-Graduate Diploma in Management
(Hospital and Health Management)
PGDM 2020-22 Batch
as a partial fulfilment of the PGDM Program
Guided by

Industry Mentor
Mr. Manohar Kumar

Faculty Mentor
Dr. Sidharth Mishra

(Feb-April 2022)

Date: 27/June/2022

Dissertation Completion Certificate

This is to certify that Dr. Prabha Tiwari, student of IIHMR Delhi has completed her dissertation at KareXpert Technologies Private Limited, located in (**Gurugram, Haryana**), in the Product Delivery Department from **1 February 2022** to **30 April 2022** . Her guide/mentor during the project was Mr. Manohar Kumar, Senior Account Manager.

She has completed following projects:

Project Title: **To assess the acceptance level of Hospital Management Information System (HMIS) among the various Staff working in different hospitals.**

She has successfully carried out the project/s designated to her during STP/internship and her approach to the project/s has been sincere, scientific, and analytical.

Manohar Kumar

KareXpert
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Seal and Authorized Signatory

TO WHOMSOEVER IT MAY CONCERN

This is to certify that_____student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at_____from_____to _____.

The Candidate has successfully carried out the study designated to him during internship training and his/her 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/her future endeavors.

Dr. Sumesh Kumar
Associate Dean, Academic and Student Affairs
IIHMR, New Delhi

Mentor
IIHMR, New Delhi

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In the first Place I would like to thank IIHMR Delhi for giving me an opportunity to work on this project, I would also like to thank my Mentor Dr. Sidharth Mishra (Associate Professor) of IIHMR Delhi for having given me his guidance for the project.

I would also like to thank Ms.Nidhi Jain (Founder & CEO | KareXpert) and MR. Manohar Kumar (Account Manager | KareXpert) for giving me this wonderful opportunity to do my Dissertation in the KareXpert Technologies.

I would also like to acknowledge Mr. KK Singh (CIO- Digital Healthcare Implementation) | KareXpert) for giving me this amazing opportunity.

I acknowledge my deep sense of gratitude and helping me in completing this Dissertation successfully.

Executive Summary

This is my report based on my Dissertation that I have successfully completed in the KareXpert Technologies, as a requirement of my PGDM Programme. This includes various things like Understanding organizations process flow, utilization, issues and problems, changes required to be made, tasks completed by us, attending meetings, Communicating with the UAT & QA team. This Industry Training gave me a lot of practical exposure. this study revealed that the most common causes of HIS implementation problems were end user profiles, Human concerns were the most common challenges that developed. Some of the causes could include end user training, a lack understanding the system, a lack of understanding about the benefits of the HIS system, or heavy workloads, as their primary responsibility is to treat patients. The study is Observational as to learn day to day teams' activity and participate in the workflow. Objective of the study was To Understand and perform Implementation of platform and to understand client requirements. Methodology used here is observational study by understanding various workflows of the implementation process of digital healthcare platform .According to the study major Findings were that After a significant period of installation, there were clients where the system was found not to be fully utilized. Lack of technical, lack of training, high initial cost, high initial physician time, technology and technical matters, fundamental problems such as lack of computer skills, complex tasks, complex functions, ethical issues such as certification, security, privacy, and confidentiality all might contribute to a failed HIS implementation. With the development of the information age, a new era of medical information is opening, and the direction of the development of healthcare services from telemedicine to digital health is rapidly changing. In addition, various technologies are being developed together, and the term collectively referring to the age of healthcare is constantly changing many problems may be faced during the implementation of HIS projects due to various reasons and if those reasons cannot be identified and/or cannot be avoided, most of the projects may fail. Hence before delivering any HIS testing the whole system will ensure the system is free of bugs, glitches and has fulfilled the client's business requirements The correct hospital workflow was difficult to comprehend because it differed significantly from the general process already existing in the HIS. Recommendations from the study for the smooth process of Implementation, Training of end-users is essential for a successful HIS implementation. This should include continuing education of physicians, nurses, and department secretaries. Training should link information systems to actual clinical scenarios. Also, the End users should be involved in the implementation process and features of benefit should be provided to them.

Abbreviations

CIO- Chief Information Officer

CEO- Chief Executive Officer

CDS- Clinical Decision Support System

EHR – Electronic Health Record

EMR – Electronic Medical Record

FD- Fresh Desk

HIMS- Hospital Information System

HER- Hospital Electronic Record

HIS- Hospital Information System

HIT- Health Information Technology

IOT- Internet of Things

IT- Information Technology

QA- Quality Assurance

SAAS- Software as a Service

UAT- User Acceptance Testing

UHC- Universal Health Coverage

VP- Vice President

Chapter I: Organization Profile- Karexpert Technologies

1.1 Organization Profile

KareXpert, a Jio Platform funded venture, based in Gurugram, Haryana, has built an AI-led, Cloud-based Digital Healthcare Platform. This platform brings all the healthcare modules together as a pre-integrated stack at a fraction of cost. This includes Advanced HIMS, EMR/EHR, LIMS, RIS/PACS, Pharmacy, Telemedicine, Medical IoT, Advanced BI, Connected Ambulance, and many more.

Vision-

Aim to make access to quality healthcare a reality for everyone, we are on our path to digitally transform hospitals

Mission-

Building HealthCare Cloud to enable "Easy Access & Quality Care for ALL"

1.2 KareXpert Journey

2016- Xcloud Development Seed Funding

2+ years of development Digital Platform & Healthcare BRDs

2018- Symphony Healthcare Platform Development

2+ Years of development Healthcare Platform with PoC using Xcloud

Funded by Reliance Jio Series A

2020- Developed E2E Digital Healthcare

HIMS

EMR/EHR

Pharmacy

LIMS

RIS/PACS

ER

Advanced BI

AI read

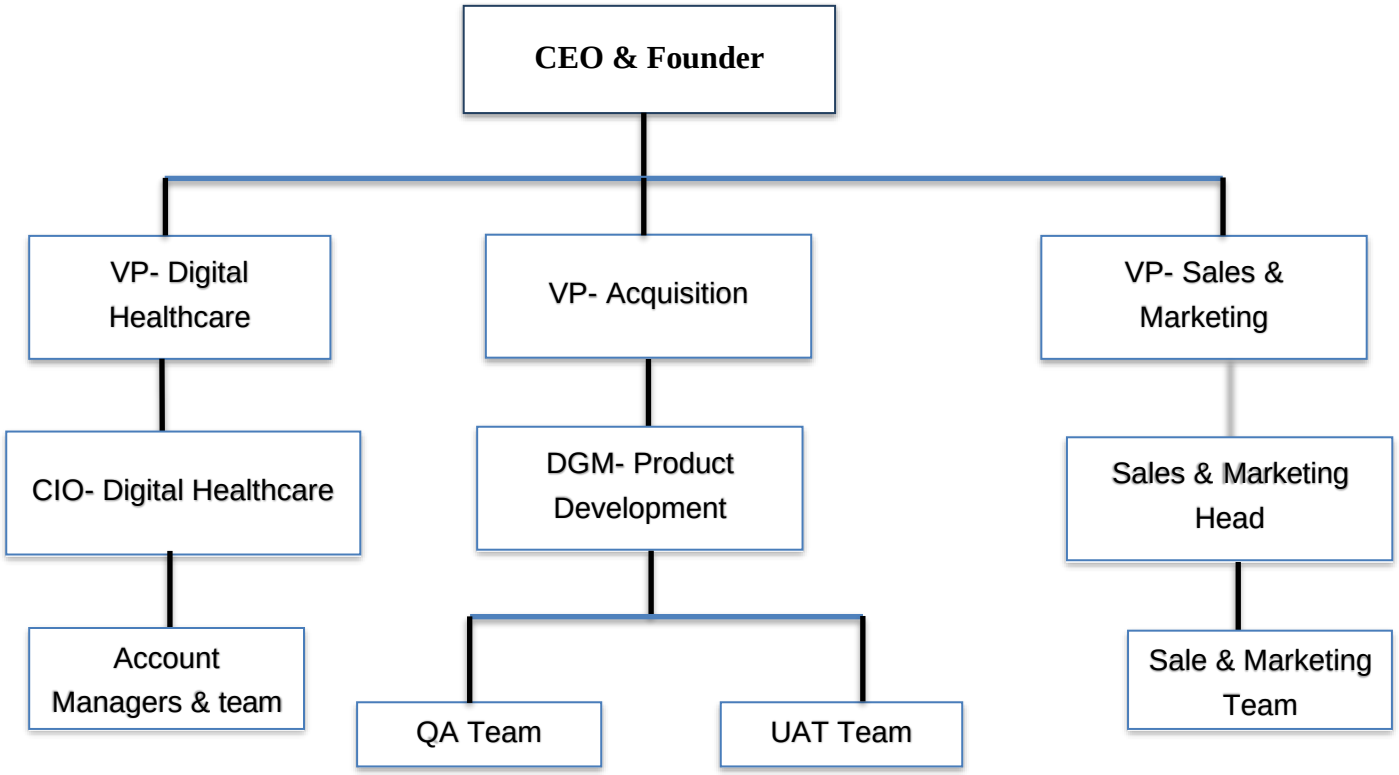
2021- Field Trial

100 employees low burn rate

80% healthcare experts with computer science

Name of the Organization	KareXpert Technologies Private Limited
Founder & CEO	Ms. Nidhi Jain
Founded on	Year 2014
Operations Started on	Year 2018
Company size	51-200 employees
Industries	Hospital & Health Care
Type	Privately Held
Headquarters	Gurugram, Haryana
Website	https://www.karexpert.com

1.3 Organization chart For KareXpert



1.4 Specialties

- Healthcare Cloud, Cloud
- BigData, IoT
- Telecom
- Digital Healthcare
- Software
- Software, karexpert, UHC
- Health, Medical, Hospital
- Doctor
- Patient
- Health Analytics
- HMIS
- HER
- HIS
- homecare, and remote care

1.5 Services Provided

SaaS- Digital Healthcare Platform

(Corporate & Large Hospitals, Government Healthcare, International Healthcare)

- **AI-Ready Technologies (System of Intelligence)**
  AI/ML ready healthcare platform, brought to clients in partnership with global AI providers like Intel, Microsoft, etc.
- **Simple & Easy to Use (System of Interaction)**
  User-friendly & intuitive UI/UX platform which enables any stakeholder to start using our system with minimal training
- **Single Data Lake (System of Records)**
  Data in place with a single data lake and be AI-ready
- **Pre-Integrated out of the box**
  Every feature and module come pre-integrated out of the box. Client can Start using them right away

1.6 KareXperts Healthcare Modules (Services Provided)

50+ Healthcare Modules developed

- Digital Healthcare Platform
- Advanced HIMS
- EMR/EHR
- Telehealth
- LIMS
- RIS/PACS
- ERS
- Advanced BI
- Medical AI
- Blood Bank

Key Customers

- Centre for Sight- Mahindra Group of Hospitals
- JHM- Group of Hospitals, South Africa
- Paras Hospitals
- HCL Healthcare
- Reliance Industries Limited- Group of Hospitals
- Tata Steel- Group of Hospitals
- VNPT, Teleco Health Cloud & Jio India
- Kingsway Hospitals

Chapter II: Process Flow of Implementation of KareXpert Digital Healthcare Platform

2.1 Introduction

Healthcare information technology (HIT) has been defined as "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of healthcare information, data, and knowledge for communication and decision making".

KareXperts Provides Existing legacy solutions causing broken patient journeys, loss of revenue, poor operating efficiency, and substantial hidden costs. It also affects the ability of the hospital to give a higher quality of care to patients and make it more affordable.

- KareXpert is empowering many new providers who want to provide virtual care to patients targeting different specialties.
- KareXpert platform becomes really handy for them as it comes as an out of the box solution for them without any upfront cost.
- While the recipe across providers varies, common among these new business models are delivery of hyper-coordinated care, better collaboration among stakeholders, and the use of Big Data and advanced analytics.
- Such models intend to reorient traditional healthcare towards a more integrated healthcare to provide high-quality, accessible and affordable care.
- These technologies have enabled the facilitation of many different business models like virtual care, remote care, home care etc

2.2 Objective

- ✓ To understand the process flow of the implementation of the digital health platform

2.3 Methodology

Study Location- KareXpert Hospital Information System

Study Duration- 1 month (15/02/22 – 15/03/22)

Study Design- Observational Study

Methods of Data Collection- Secondary Data of module workflow videos

2.4 Features of the Modules

- Entails the use of electronic or computer support to enter physician orders including medication orders using a computer or mobile device platform.
- Computerized physician order entry systems were originally developed to improve the safety of medication orders, but more modern systems allow electronic ordering of tests, procedures, and consultations as well.
- These are usually integrated with a clinical decision support system (CDS), which acts as an error prevention tool through guiding the prescriber on the preferred drug doses, route, and frequency of administration,
- A patient portal is a secure online application that provides patients access to their personal health information and 2-way electronic communication with their care provider using a computer or a mobile device.
- **Symphony**- Platform Contains a collection of golden workflows
  Workflows is a collection of Digital (D) or Physical (P) interactions

2.5 Steps in the Implementation

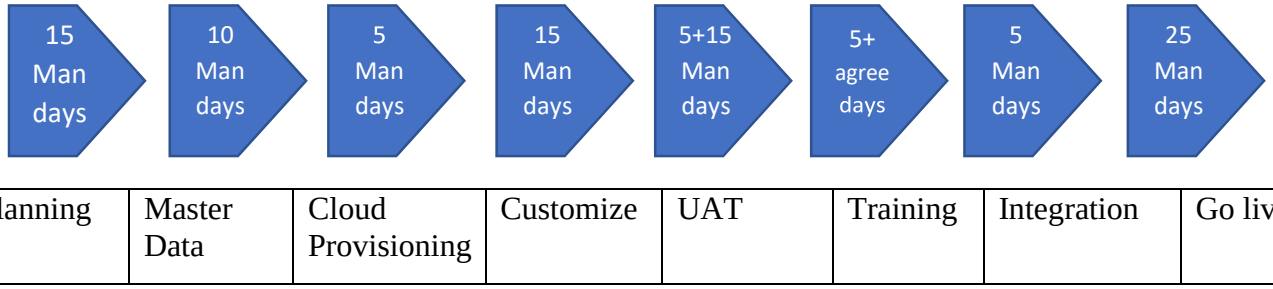


Fig 2.1 Steps to go live

Step1- Planning (15 Man Days)

Step 2- Master Data (10 Man Days)

Step 3- Cloud Provisioning (15 Man Days)

Step 4- Customize (15 Man Days)

Step 5-UAT (5+15 Man Days)

Step 6- Training (5+agreed Days)

Step 7- Integration (5 Man Days)

Step 8- Go Live (25 Man Days)

2.6 Task Performed in the Process of Implementation

- Attending Client Meetings

  During the meeting client requirements and other enhancement is discussed. Also, client basic concerns are Resolved and plan about the training of the staff is made and dates are fixed for the training.

- Testing UAT platform and finding bugs

  Before handling the client UAT platform team checks for any bugs or config required by testing multiple time different scenarios and on various categories of patient

- Giving demo & Training session to the Client
- Uploading Required Masters in the Platform
- Config mapping of the Platform before handling to the client

Modules covered in Testing UAT Platform

- ✓ Appointment
- ✓ Queue Management
- ✓ Registration
- ✓ OP Billing
- ✓ IP Billing
- ✓ ADT
- ✓ EMR
- ✓ Pharmacy
- ✓ OT
- ✓ Patient portal

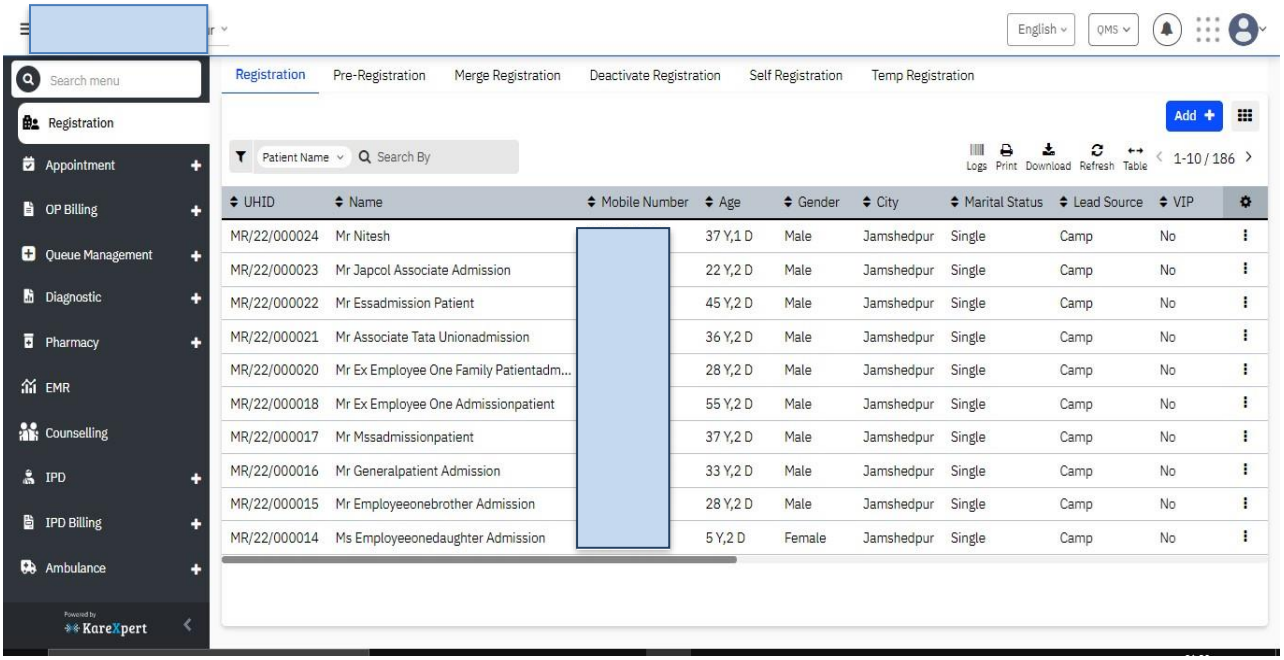


Fig 2.2 KareXpert Platform

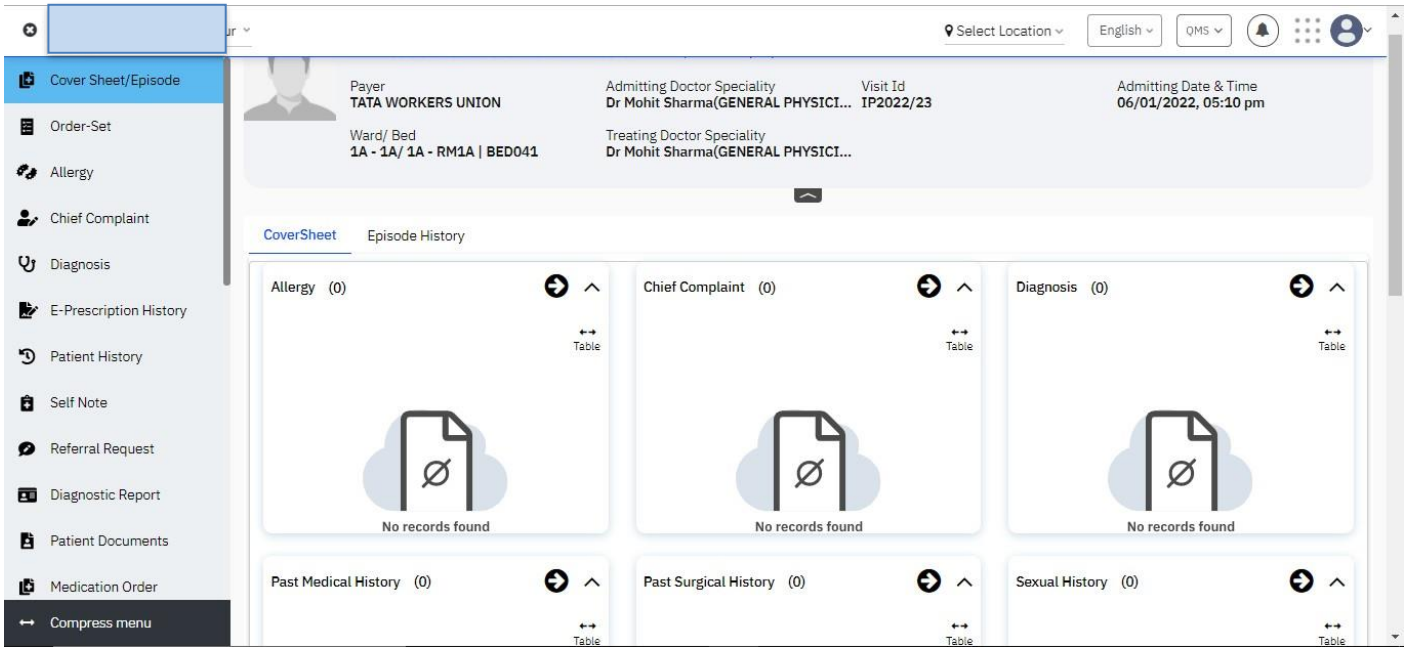


Fig 2.3 KareXpert EMR Module

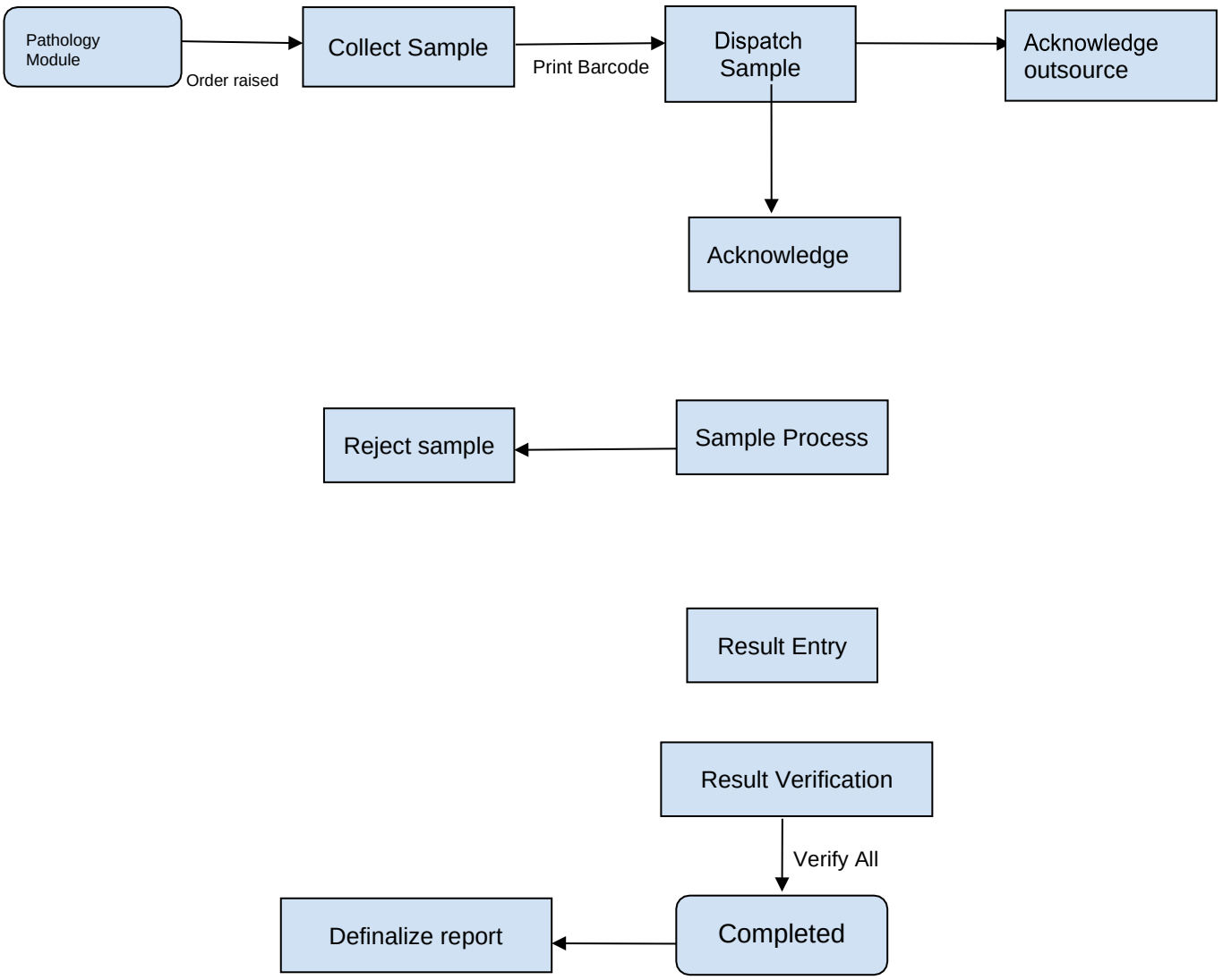


Fig 2.4 Diagnostic Module Workflow

2.7 Cloud Based Service Used in Karexpert- Saas

SAAS

Digitalization of the healthcare industry has set the premise for using Software -As-A-Service (SAAS) to run EMR, making the maintenance process of EMR technology automatic and amplifying usability while alleviating the burden on in-house IT staff. Moreover, EMR adoption via cloud-based data management solutions improves scalability, makes data integration seamless, and facilitates faster reporting.

Integration of SAAS EMR solutions in healthcare units comes with a gamut of benefits.

- Improved Data Security
- Greater Collaboration Among Stakeholders

- Quality Healthcare for Patients
- Agility in Operations

SAAS in EMR features customized templates for healthcare institutions, which helps to streamline the medical records. Besides leading to faster implementation, the software comes with an insurance e-Claim and TPA module, which reduces the time taken in claims processing while creating unified and efficient workflows during a patient's visit.

Cloud-based solutions such as SAAS have brought about a paradigm shift in the functioning of the healthcare system. It is forecasted that SAAS's speedy adoption in the healthcare sector shall give shape to quality patient-centric & doctor-friendly healthcare solutions that are the need of the hour.

2.8. Conclusion

- Data Tested was helpful for UAT release

Data After testing was submitted to the team lead for analysis and further Procedure. The data was presented in Excel sheet with Assigned filters and colour codes respectively.

10X Competition

	Competitors	**KareXpert**
Pricing Model	Capex	SaaS
Deployment	On-Premises	Cloud
Scalability	Single tenant	Multi-tenant
Solution Suit	Silo Product	Platform Based
Integration Model	Buy & integrate	Pre-Integrated
AI Ready	No	Yes
Single Data Lake	No	Yes
Mobile, Tab	Patient App	Super App
Software Architecture	Monolithic	Microservices
Security & Privacy I HIPPA , GDPR	No	Yes
Single window Shopping	No	Yes

Implementation Time	6 Months	12 weeks
Managed Services	No	Yes

- First Asian health tech company to offer the largest solution portfolio to hospitals to help them streamline patient data, improve operational efficiency and optimize cost
- To enable the digital transformation of 100,000 hospitals in India and across the globe in the next five years
- USP lies in its integrated, SaaS-based, and platform-based approach that enables seamless digitalisation of hospitals

Built an xCloud in-house no-coding engine to bring the 3X speed for new features

Cloud adoption has taken a quantum leap in the last decade, and companies across industries are moving their operations from legacy IT systems to the cloud. From manufacturing and retail to e-commerce and entertainment, every sector has benefited immensely from the agility and scalability offered by the cloud. When it comes to a mission-critical sector such as healthcare, cloud-based solutions can be a true game-changer by enabling providers to deliver quality, accessible and coordinated care to patients

- KareXpert is empowering many new providers who want to provide virtual care to patients targeting different specialties.
- KareXpert platform becomes really handy for them as it comes as an out of the box solution for them without any upfront cost.
- While the recipe across providers varies, common among these new business models are delivery of hyper-coordinated care, better collaboration among stakeholders, and the use of Big Data and advanced analytics.
- Such models intend to reorient traditional healthcare towards a more integrated healthcare to provide high-quality, accessible and affordable care.

Increase in Engaged hospital staff

- Hospitals can Enable Hyper Collaboration
  Achieve higher operational efficiency with hyper-coordinated workflows for every stakeholder
- Achieve higher Operational Efficiency
  higher operational efficiency, with few errors and minimal human intervention in most of the menial task around data capturing, patient onboarding and data storing
- Can Create Digital Twin of Your Hospital (Plan Vs. Actual)
  A digital twin of your hospital and extend your reach remotest of patients at a lower cost

Chapter III: **Dissertation on "To assess the acceptance level of Hospital Management Information System (HMIS) among the various Staff in Hospitals of Delhi/ NCR region**

Part A – Dissertation Overview

Abstract

Background: The acceptability of hospital staff in the use of hospital management information system (HMIS) can explain the nemesis of any HMIS success and implementation project in hospitals. The aim of this study was to observe the level of acceptance of HMIS among different hospital staff working at various Hospitals in Delhi/NCR.

Objectives- The main objective of this study is to evaluate hospital management information systems (HMIS) acceptance and satisfaction, through exploring the influential factors that might increase or decrease acceptance and satisfaction levels among different healthcare professionals**.**

Materials and methods: The study used objective quantitative survey methods to collect data directly from different types of HMIS users. This cross-sectional study was conducted for 3 months in a different hospital of Delhi/NCR by using a questionnaire. Our study participants were hospital staff from different hospitals of Delhi/NCR who are using HMIS currently. Sample size was 200.

Results: Majority (89.7%) of the participants agreed that they were using HMIS system and (10.3 %) were not using HMIS system. Majority of the participants responded that the HMIS system of the hospital was easy to use while 48.5% responded that the system acceptability was average. However, 1.5% of participants responded that the system was difficult to use. Most of the participants preferred HMIS system over paper-based system. Most of the participants responded that HMIS saves time, is cost effective and improves quality of care and efficiency in the Hospital.

RECOMMENDATIONS: Training of end-users is essential for a successful HMIS implementation and acceptance. This should include continuing education of physicians, nurses, and department secretaries. Training should link information systems to actual clinical scenarios. Also, the End users should be involved in the implementation process and features of benefit should be provided to them.

Keywords: Administrator; hospital administration; hospital management information system; nurse

Introduction

Hospital Management Information System is important for managing the overall condition, efficacy and proper safety of distribution of health services. Proper usage of HMIS will improve health-care quality, minimize medical errors, reduce the expenses on health care, improve management practices and improve economic care.

HMIS manages routine activity of hospitals like administration, Supply chain Management, Procurement, LIS/ MIS, RIS and Telemedicine. They are very critical for running a Multispeciality Hospital. HMIS can store patient's information and other medical data like lab reports, radiology reports, treatment; follow-up and other clinical decisions. The HIMS can improve the performance of the hospital in financial terms and in patient satisfaction. However, despite these advantages, utilization of HIMS is still quite less in hospitals. The acceptability of hospital staff in the use of HMIS is an emerging research area it can explain the fate of HMIS development and implementation project in any healthcare setting.

Engaging doctors and other hospital staff including nurses, front desk staff, billing personnel, pharmacist and providing strong institutional support is the key to successful implementation and operating HMIS in the hospitals. These techniques could provide a positive attitude, reduce resistance towards HMIS and increase the acceptance level by hospital staff. Due to this, it is essential to access the level of HMIS acceptance among the hospital staff and identify the factors which cause resistance among the users.

Much research had been done to assess job satisfaction, stress level measurement, etc among the workers working in a hospital. Very few observational studies have been conducted with them, globally. With this background, we intended to do this is it observational for baseline assessment and further overall improvement in the acceptance of HMS among hospital staff. This study will help us to know the acceptance levels of HMIS and identify needs/ barriers to improve our HMIS in hospitals for a better outcome.

Currently adoption of HMIS is at the transitional stage between paper and electronic state. When adapting a traditional process to the new electronic era, unique opportunities and challenges are faced by Hospital staff, patients and other stakeholders. The acceptability of hospital staff in the use of hospital information management system (HIMS) can explain the success of project in different hospitals. The aim of this study was to observe the level of acceptance of HMIS among the staff working at various hospitals in Delhi/ NCR region.

Hospital Management Systems

According to Shortliffe & Cimino (2006) Hospital management information systems (HMIS) is a comprehensive and integrated information system designed to manage the administrative, financial

and clinical aspects of a hospital and it encompasses paper-based information processing as well as data processing and storage equipment. HMIS comprises of hardware, software and people who handle the systems. Tan (2005) states that HMIS automates management reporting to support administrative and patient care applications and to reduce time and effort spent on the part of health knowledge workers such as doctors, pharmacists and nurses. Furthermore, HMIS comprises hardware, software and people to operate them in order to ease the management and flow of information among health care stakeholders.

Winter et al.(2001) defines HMIS as a socio-technical subsystem of a hospital that comprises all information processing actions, human and technical actors in their respective roles within the system. According to Tan (2005) HMIS automates routine management reporting to support administrative and patient care applications; designs health office systems and processes to reduce time and effort expenditure on the part of health knowledge workers such as doctors, pharmacists and nurses. Berg(2001) states that HMIS is used for master index, patient management, billing insurance management ,pharmacy, radiology, accounts management, order entry, operation theatre, depending with specific hospital and further says that there functionalities may increase.

Work plan: -

The study would be primarily covering the data regarding the HMIS acceptance among the staff of various Hospitals.

The study would involve the analysis of primary data obtained from survey through online portal (Google form) and to identify various barriers to acceptance and would involve recommending various strategies that could be adopted in order to overcome the barriers.

Challenges of implementing HMIS

With the demand for more efficient services in health institutions most of the hospitals are finding it necessary to implement new systems which brings with them the challenges which must be dealt with or will limit the HMIS implementation. This means that requirements of HMIS will also change and utilize the power of the technology to meet the ongoing needs of the hospitals.

Lack of top management support- Most projects fail due to disagreements among the senior managers of the hospital. According to Turbit (2005) Project implementation needs top management involvement to ensure that the right combination of business and IT is done to resolve any conflicts that might arise.

Poor skills sets among users- Burke et al. (2001)points out that poor skills set among HMIS users is a hindrance to project implementation. In adequate skilled staff in a hospital leaves them grappling with the system challenges during and after implementation. When an hospital is moving from old technology to new technology the skills of its staff need to be upgraded too Turbit (2005)

Resistance to change - Burke et al. (2001) defines it as refusal to see benefits in a new HMIS because of what individuals are used to (works for them).A case study by Gupta (2000) revealed that the main hurdle experienced by most firms is resistance to change. He further stated that resistant was due to employees' reluctance to learning new techniques or the IT department reluctant to change due to its attachment to the current systems.

Insufficient Software evaluation- Turbit (2005) states that hospitals need to go through all the processes of the intended software system and ensure that it fits well with their processes

e.g. from patient registration to discharge this will greatly help to increase the acceptance level of the system.

Poor Communication- Burke et al.(2001) reiterates that for any information system implementation to succeed constant communication with the affected personnel both technical and other users. He also adds that this should start before you reach implementation stage. Communication is very crucial in implementation of HMIS

Lack of change management program- Lorenzi & Riley (2003) defines change management as the process of assisting individuals and organizations migrate/ move from the old ways of doing things to the new ways of working. She adds that the need for change management starts early when the project has been conceptualized.

Security Issues- According to Kendall & Kendall (2008) security considerations must be included when system implementation is done. They are; physical security which involves controlling access to physical computer resources, logical security which entails controlling software access and user rights for the system users and building procedures to prevent persons from misusing computer hardware and software which is known as behavioral security.

Benefit Realization - Another significant cause for HMIS implementation failure is the unrealistic expectation of benefits on investment. According to Berg (2001) many hospitals end up overstating the returns that a given system will offer but underestimate other expenses that are related to the project e.g. cost of planning, consulting fees, training, testing. When this happens, the project does not stand a chance of achieving the return on investment that was anticipated.

Objectives

To assess the acceptance level of Hospital Management Information System (HMIS) among the various Staff working in hospitals of Delhi/ NCR region.

Review Of Literature

S. No.	Title	Author	Year of Publication	sample size	Sampling	Study Outcome
1	The acceptance level of Hospital Information Management System (HIMS) among the nursing officials working in a teaching hospital	Mahesh Mahla , Shweta Talati , Anil Kumar Gupta , Ritesh Agarwal , Shailesh Tripathi , Sudip Bhattacharya	**2021**	**256**	**Purposive Sampling**	The acceptance level of HIMS among the nursing officials working in a teaching hospital was good.
2	THE ANALYSIS OF ACCEPTANCE OF HOSPITAL INFORMATION MANAGEMENT SYSTEM (HIMS) USING TECHNOLOGY ACCEPTANCE MODEL METHOD	Erma Setiawati, Rina Trisnawati	**2019**	**150**	**Convenience Non Random Sampling**	This study determined the acceptance of Hospital Management Information Systems related to accounting transactions using the Technology Acceptance Model (TAM). Study found that the perceived Usefulness influences Behavior Intention to Use, and Behavior Intention to Use has an effect on Actual Technology for HMIS acceptance.

3	Hospital Information Systems (HIS) Acceptance and Satisfaction: A Case Study of a Tertiary Care Hospital	Mohamed Khalifa, Osama Alswailem	**2015**	**4000**	**Purposive Sampling**	Availability of computers in the hospital was one of the most influential factors which facilitated direct and immediate data entry and information retrieval processes. Users believed that HIS might frequently slow down the process of care delivery and increase the time spent by patients inside the hospital especially during slow performance and responsiveness phases.
4	Assessment of implementation of the health management information system at the district level in southern Malawi	Ansley Kasambara, Save Kumwenda, Khumbo Kalulu, Kingsley Lungu, Tara Beattie, Salule Masangwi, Neil Ferguson,Tracy Morse	**2017**	**20**	**Purposive Sampling**	HMIS was useful for the development of District Implementation Plans and planning for other projects. To reduce data inconsistencies, HMIS indicators should be revised and data collection tools should be harmonised.
5	Barriers to Health Information Systems and Electronic Medical Records Implementation. A Field Study of Saudi Arabian Hospitals	Mohamed Khalifa	**2013**	**158**	**Purposive Sampling**	Human barriers as well as financial barriers are the two major categories of barriers and challenges in the way of successful implementation of EMRs.
6	**Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions**	Albert-Boonstra Manda-Broekhuis	**2010**		**Purposive Sampling**	The study considers barriers to EMR as perceived by physicians. Eight main categories of barriers, were identified. A) Financial, B) Technical, C) Time, D) Psychological, E) Social, F) Legal, G) Organizational, and H)

						Change Process. All these categories are interrelated with each other.By adopting a change management perspective, we develop some barrier-related interventions that could overcome the identified barriers.

Methodology

A total of 200 hospital users were observed during the study period, which includes patients of different hospitals of Delhi/NCR who are currently using HMIS.

STUDY SETTING	8 Hospitals of Delhi/ NCR region where HMIS is used
STUDY APPROACH	Cross sectional Study
STUDY PERIOD	February 2022- April 2022
SAMPLING	Random sampling
METHOD OF DATA COLLECTION	Survey through online portal, Google forms
TOOLS USED	Quantitative Questionnaire, MS Excel
INCLUSION CRITERIA	8 Hospitals where HMIS is used currently in Delhi/NCR region.
EXCLUSION CRITERIA	Hospitals outside of Delhi NCR region

Quality Control Measures

Quality control concerns the testing of samples to identify if they are within the designation for the resultant or not. The motive of the testing is to determine the essentiality for corrective action to obtain a qualitative and potential outcome.

For clarity, all the questions were pilot-tested, and the standard version of the questionnaire was developed and distributed.

Pilot program

In the pilot study, 10-15 people were taken to evaluate data efficiency, measurement tools, and to access the quality of responses obtained. After getting the results from the pilot study, the researcher has modified survey questions and excluded the people who participated in the pilot study from the next study.

Questionnaire and Measurement Techniques

We assessed a total of 16 questions to 200 people aged 15-60 years in a survey through online questionnaire (Google Form). These individuals were working in Hospitals in Delhi-NCR region where HMIS software was used. They were given Google forms to fill the questionnaire. In this survey –

- Survey Consisted of four demographic questions.
- Other twelve questions were related to use of HMIS in Hospitals.

The Researcher maintained the privacy and confidentiality of all surveyors. A consent was taken for all the users before participating in the survey.

Results

Most 38.7% of our participants belonged to the age group of 15-30 years. It terms of usage, a total of 65% of participants responded that the HMIS system of the hospital was very important in carrying out hospital functions, while 25% responded that the system was important.10% of participants responded that the system was moderate to carry out daily hospital functions. Only 5% of the users felt that the system was not important for carrying out hospital functions.

Majority (89.7%) of the participants agreed that they were using HMIS system and (10.3 %) were not using HMIS system.

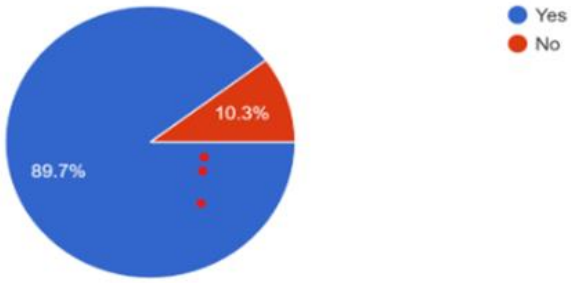


Fig1- No. Of Participants using HMIS SYSTEM

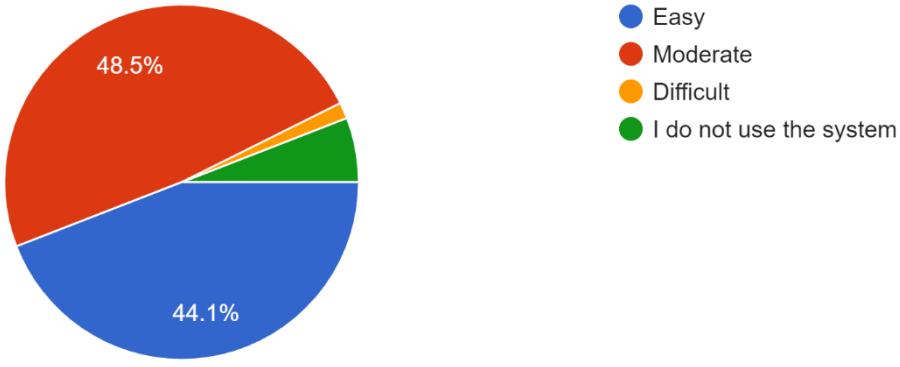


Fig 3- Acceptance Level of HMIS

Majority of the participants (71.8%) found HIMS system easy to use for everyone. A total of 41.8% of the participants found that the HIMS is moderate to work with. 5% of users find it difficult to work on HMIS and 10% of participants do not prefer to use the system.

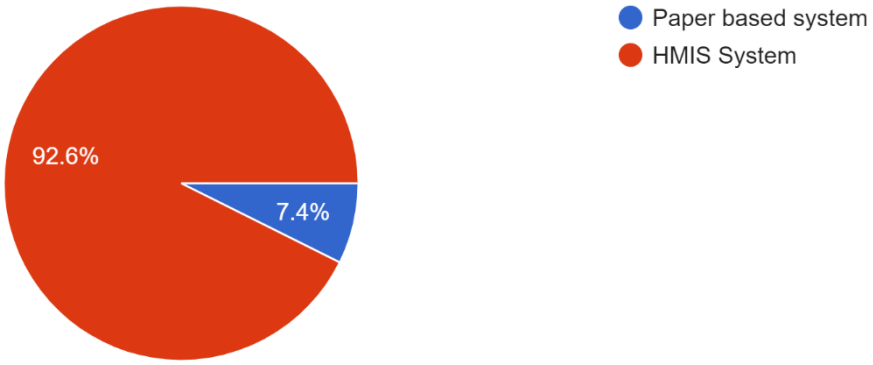


Fig 4- Paper based system vs HMIS SYSTEM

Most 92% of our respondents answered that they preferred HMIS system and only 8% of users preferred paper based system. Most of the users in this 8 % were doctors. This shows that doctors are still hesistant in using HMIS and they prefer previously used paper based system. 99% of the users felt that HMIS saves time and Majority of the users 96% found HMIS to be cost effective.

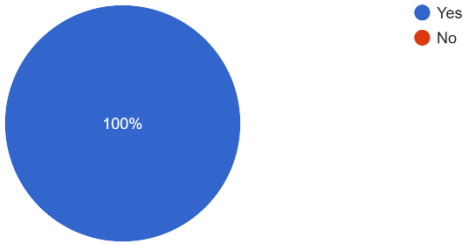
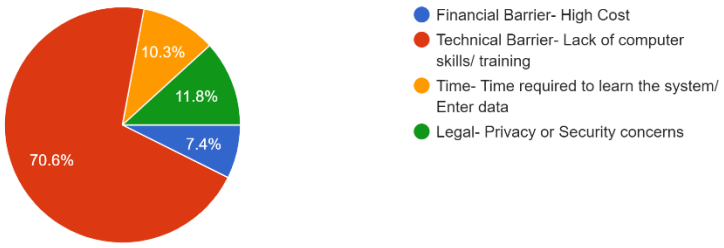


Fig 5- HMIS improves quality of Care and Efficiency in Hospitals

99 % of the participants responded that the HMIS improves the quality of care and efficiency in the Hospital. Majority of the participants (70%) felt that technical barrier was biggest barrier in acceptance of HMIS. 11% of the participants felt that it requires a lot of time to learn the system. 12 % of the users reported privacy or security concerns. Lack of computer skills and training posed to be the biggest challenge in acceptance of HMIS.

Fig 6- Barriers in acceptance of HMIS



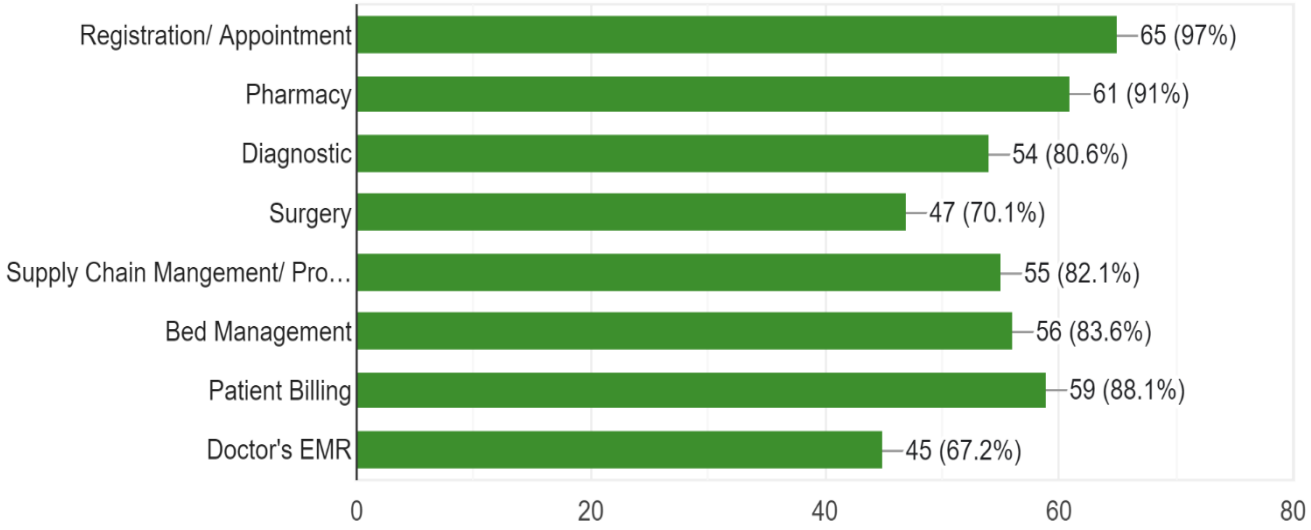


FIG 7- Areas covered by HMIS in Hospitals

HMIS covers almost all areas of the Hospitals. Use of HMIS in Doctor's EMR was found to be around 70%. Other departments were successfully using HMIS for their daily operations. Majority (59.8%) of the participants agreed that sometimes this HIMS induces stress, while 25% agreed that this HIMS never induces stress while working.

Discussion

This study was conducted to assess the level of acceptance of HMIS among hospital staff working at various Hospitals in Delhi/ NCR region by using a questionnaire.

Our study revealed that most of the participants were using HMIS system. Most of them agreed that HMIS was important to carry out hospital functions. Among all the participants, 50 % of the users used the HMIS system for 75 % of their duty hours and 15 % of users used HMIS for 25% of their duty hours. This may be due to multiple reasons such as the difference in their job profiles, distribution of their working place, differences in their technical knowledge and experience and proper training of the Hospital staff. However, we must identify

the root causes of lack of proper training of HMIS and how to improve the technical knowledge of computers within users with further qualitative studies In the study by Khalifa *et al Lack of computer availability was the main reason* for suboptimal utilization of HMIS.

In our study, The acceptance of HMIS among the hospital staff was found to be good. Similar results were seen in a study by Manla in 2021,acceptance level of HMIS among nursing staff working in teaching hospital was good.

Regarding human capability (knowledge and skills) and system compatibility, it was observed that nearly half of the participants agreed that their system is compatible with their capability (knowledge and skills). It reflects that half of the participants were still not capable (knowledge and skills) to handle the system. Hence, this is a big concern as it will affect the acceptance level among the staff so we have to find out the causes and we need to rectify this problem. A similar finding was observed in a study conducted by Alipour and Zarei (2017) in Iran. That study revealed that the level of computer knowledge and skills had more dominant role in the acceptance of HIS among the nurses.

In the a study by Khalifa human barriers and financial barriers are major categories of barriers and challenges in successful implementation and acceptance of EMR. In the study by Boonstra Change Management was main barrier in acceptance of EMR.

Our study revealed that approximately 10% of the participants responded that the HIMS system is difficult in use. It is also a concern to us, this is because the hospital staff plays an important role in using HIMS system. Accurate data entry is important not only for the patients but also for the hospitals to avoid any kind of future litigation. It is most important that the HIMS system should be easy to use, as a complicated HIMS system can adversely affect staff acceptance toward HMIS system usage. A similar finding was observed in a study conducted in Iran, it was observed that image in using HIS and perceived ease of use of HIS had a more dominant role in the acceptance of HMIS.

Regarding system efficiency, most of the participants ranked the existing HMiS system average to an efficient category. In contrary to our findings, a systematic review conducted by Huryk (2010) found that overall HIMS system was not efficient at all and it led to user dissatisfaction.

As per their overall experience, most of the participants graded the HIMS average on 5-point Likert scale. Many of them responded that they were satisfied with features in the HMIS. Among all age groups, it was found that the young age (15-30) group participants responded that they were satisfied with the HIMS.

In other studies, it was found that variables such as age, working experience with computers and knowledge about computers are significantly associated with user acceptance level. However, in our study, it was found that knowledge of computers and Proper training were essential factors which influenced user acceptance level.

CONCLUSION

Our study concluded that the overall user acceptance for HMIS is good although there is a lot of scope for improvement. Most of the participants were using HMIS system and it was important to carry out hospital functions. Most of the participants used HMIS in their duty hours. Regarding human capability (knowledge and skills) and system compatibility, majority of the participants (71.8%) found HIMS system easy to use for

everyone. A total of 41.8% of the participants found that the HIMS is moderate to work with. 5% of users find it difficult to work on HMIS and 10% of participants do not prefer to use the system.

It was observed that nearly half of the participants agreed that their system is compatible with their capability However, lack of proper training of HMIS and to improve the technical knowledge of computers within users is required. It is most important that the HIMS system should be easy to use, as a complicated HIMS system can adversely affect staff acceptance toward HMIS system usage. Proper training of the hospital staff for HMIS may be conducted with the help of the IT department so that in future, the user acceptance increases. Equal opportunity for HMIS handling should be given to all staff on a rotation basis so that they become digitally empowered and a 24 × 7 call center can be incorporated in the IT department to fix any shutdown problem. With the development of the information age, a new era of medical information is opening, and the direction of the development of healthcare services from telemedicine to digital health is rapidly changing. In addition, various technologies are being developed together, and the term collectively referring to the age of healthcare is constantly improving many problems which were earlier faced during the implementation of HMIS projects.

Limitations of the Study

•This study is limited to state of Delhi, India. All the data I have collected from Delhi only using purposive sampling technique within the city, for which it cannot represent the entire hospital staff in general. As I have taken all healthcare staff of a hospital, there are people who are directly serving patients and people from administrative role as well. Therefore, it is difficult to identify the perception, as some are very much familiar with the use of HMIS where some are not at all.As I have a limited time duration for data collection, it affected the reach to maximum healthcare staff. In addition to that, I faced problem like knowledge deficit. Many professionals despite of using technology in healthcare setup, they are not very familiar with the HMIS system. Though I addressed this issue by explaining them about HMIS and its use still it limited my survey to few participants. Therefore, I believe it is an unfinished story, which needs timely revision and testing to understand more in depth. As we are embedding technology more day by day, there can be more insight into this topic. It enhances the scope of the study over a wide range increasing sample size and widening the geographical region.

References

1. Setiawati, E., Trisnawati, R. and Diana, U., 2019. THE ANALYSIS OF ACCEPTANCE OF HOSPITAL INFORMATION MANAGEMENT SYSTEM (HIMS) USING TECHNOLOGY ACCEPTANCE MODEL METHOD. *Riset Akuntansi dan Keuangan Indonesia*, 4(2), pp.186-195.
2. Khalifa M, Alswailem O. Hospital Information Systems (HIS) Acceptance and Satisfaction: A Case Study of a Tertiary Care Hospital. Procedia Computer Science. 2015;63:198-204.
3. Kasambara A, Kumwenda S, Kalulu K, Lungu K, Beattie T, Masangwi S et al. Assessment of implementation of the health management information system at the district level in southern Malawi. Malawi Medical Journal. 2017;29(3):240.
4. Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. BMC Health Services Research. 2010;10(1).
5. Clifford G. Shortliffe Edward H, Cimino James J: "Biomedical Informatics; Computer Applications in Health Care and Biomedicine". BioMedical Engineering OnLine. 2006;5(1).
6. Khalifa M, Alswailem O. London, U.K: Elsevier B.V; 2015. Hospital information systems (HIS) acceptance and satisfaction: A case study of a Tertiary Care Hospital. In: Procedia Computer Science; pp. 198–204

7. Alipour J, Zarei A. Health information technology acceptance factors by caregivers in nursing home facilities in Iran Health information technology acceptance factors by caregivers in nursing home facilities in Iran. *Bir J Med Sci.* 2017;16:506–12.
8. Huryk LA. Factors influencing nurses' attitudes towards healthcare information technology. *J Nurs Manag.* 2010;18:606–12