

TRANSFORMING CLINICIAN INTERACTION WITH HMIS: EFFECTIVE STRATEGIES FOR IMPROVED ADOPTION AND USAGE

Dissertation Submitted to



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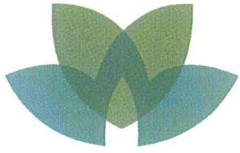
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2024



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Bonafide Certificate

To Whomsoever It May Concern

This is to certify that **Mr. Musaddique Zaman S/O Mr. Suruj Zaman** has undergone a three-month training in OHUM HEALTHCARE PVT. LTM under a designation as a Business Development Executive from March 2024 to June 2024.

She has completed her dissertation thesis named **“Transforming Clinician Interaction With HMIS: Effective Strategies For Improved Adoption And Usage”** at SMS Medical College and Hospitals, Jaipur.

During her training, we found that she was sincere, reliable, trustworthy, and can confidently work in a team. She also has a strong drive and zeal for learning.

We wish her all the success in her life and career.

For OHUM Healthcare Solutions Pvt. Ltd.

Rajani Bala Sharma.

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled **"TRANSFORMING CLINICIAN INTERACTION WITH HMIS: EFFECTIVE STRATEGIES FOR IMPROVED ADOPTION AND USAGE"** is the Bonafide record of my original researchwork. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

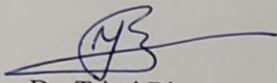


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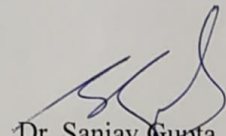
CERTIFICATE

This is to certify that dissertation titled “**TRANSFORMING CLINICIAN INTERACTION WITH HMIS: EFFECTIVE STRATEGIES FOR IMPROVED ADOPTION AND USAGE**” is a record of the research work undertaken by **Musaddique Zaman** in partial fulfillment of the requirements for the award of the degree of MBA (Hospital & Health Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

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Sincerely, Musaddique Zaman
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ABSTRACT

Transforming Clinician Interaction with HMIS: Effective Strategies for Improved Adoption and Usage

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i) INTRODUCTION

The pace of technological advancement is astounding. Humans' growing desire for technology is the foundation for technological advancement. These technologies have advanced throughout all facets of human life, not just one particular field. One area of technology that is evolving quickly is technology for information and communication. Information technology and communication both do have an indisputable impact in the current decade on business and government sectors. Talking about human existence and information demands, they both are intertwined; both individuals who receive information and those who offer exist. Sending or sharing information takes place digitally during current times. Software programmes on a frequent basis serve as a crucial medium for both transmitting and storing information.

Hospital Management Information System (HMIS) is a comprehensive software solution designed in order to manage the day to day operations and administrative tasks in a hospital. The system unifies a number of tasks and procedures, which includes inventory management, patient registration, admission, billing, appointment scheduling, and more. HMIS is a very important instrument that can efficiently assist hospitals in increasing their productivity, cutting expenses, and improving patient care. HMIS adoption in hospitals has greatly increased in recent years. The Key causes of it are increasing need for high quality healthcare services, escalating rivalry, and the obligation to adhere to regulatory standards. Utilising HMIS enables hospitals not only to improve operational efficiency but also to lower error rates, and give healthcare executives and physicians rapid access to reliable information.

The thesis investigates and includes the use and satisfaction levels of hospital management information systems (HMIS) and also enhancing adoption of HMIS among clinicians . A software programme aids in the management of patient data, medical records, and other information pertaining to healthcare which is basically HMIS. The intention of the study is to look into how much the HMIS is used in the hospital and nearby clinics under study, what influences on how it is utilised, and the satisfaction of the clinicians with the functionalities of the system. The thesis is also aimed at pinpointing any difficulties developed throughout the application and use of HMIS. HMIS can (has potential) increment system in its efficiency via automating process and produce reports of vital importance for the management of quality, planning, decision making, operations, performance, and projects reporting There should be the awareness that merely Providing HMIS will may not cause all the change that we hope for; instead, it should be properly planned, executed, used, and continuously enhanced.

Therefore, it is necessary to evaluate the satisfaction among healthcare workers in the hospital with the HMIS current performance. That is systematically done in the thesis with the use of the Likert chat.

ii) RESEARCH QUESTIONS

a)What are the key factors influencing clinician adoption of digitised healthcare software, particularly HMIS?

b)What are the barriers and challenges faced by clinicians in adopting and using digitised healthcare software, and how can these be addressed?

iii) RESEARCH OBJECTIVES

Broad:

Study on usage and satisfaction with HMIS among healthcare workers in SMS hospital Jaipur, and nearby clinics

Specific

- a. To analyse HMIS satisfaction level among clinicians and barriers for adoption of HMIS among clinicians.
- b. To access the HMIS implementation process in the hospital.
- c. To explore HMIS usage in different departments of the hospital.

iv) METHODOLOGY

Study type:The particular study is prospective and observational in nature.

Study area and period: The particular study had taken place for a period of 3 months duration in SMS hospital, Jaipur and nearby clinics.

Sample size: Sample containing 120 survey reports was picked out for the study.

Sampling method:

A) Study used purposive sampling for the collection of data in order to analyse the HMIS adoption rate, HMIS satisfaction and HMIS utilisation among the clinicians.

B) Closed ended study had been done

v) DATA COLLECTION METHODOLOGY

A) Collection of primary data from 120 respondents was done via a questionnaire prepared in Google Forms for the evaluation of satisfaction level.

B) For the collection of data from participants for analysis of HMIS usage, direct observations and personal interviews with clinician were conducted. The investigator was involved in the setting at each site, acting or appearing as an unobtrusive observer (ethnographic approach).

vi) DATA ANALYSIS

A) Analysis of data was conducted via MS Excel/graphical analysis, with the help of bar graphs and pie charts.

B) Analysis of data was conducted using Likert scale

vii) INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria: Only responses from hospital staff using HMIS were included in the study.

Exclusion criteria: Other non-clinical staff, including nurse, front desk user etc, were excluded from the study.

viii) ETHICAL CONSIDERATION

Consent of the healthcare workers(clinicians) had been taken verbally for this study. This study involved direct interaction with the clinicians, their feedback forms, and the data used was primary data.

ix) IMPLICATION OF RESEARCH**For Population:**

- Enhanced Healthcare Access & Quality
- Improved Patient Engagement

For Industry:

- Increased Efficiency & Cost Savings
- Data-driven Decision Making
- Opportunities for Innovation & Collaboration

x) FINDINGS/RESULTS

Demographics:

- 50% of the respondents were male, and 50% were female. Shows equal participation of genders in the usage of the software.
- Age distribution: 47% were between 25-35 years old, 36% were between 36-45 years old, and 12% were over 50 years old.

Impact of HMIS:

- Healthcare workers reported that HMIS enhanced clinical decision-making and improved collaboration among healthcare professionals involved in patient care, leading to increased overall productivity in healthcare delivery.
- HMIS was also said to have raised the standard of patient care, which in turn increased satisfaction among both patients and healthcare providers.

HMIS Satisfaction:

- The study concluded that the aspects of Content (A1), Accuracy (A2), Format (A3) and Timelines (A4) were rated in the fairly good to good categories, with approximate values of 69.05%, 60%, 70%, 70%, respectively.
- Based on the descriptive analysis, User Satisfaction (B) with HMIS was rated in the good category, with an approximate value of 70.4%.

CONCLUSION :

The findings or the conclusion of the study contributed basically to the understanding of HMIS implementation and usage in a hospital setting, and the Likert chart applicability in assessing users' satisfaction with the system, provides insights into the effectiveness of HMIS in enhancing the quality of hospital services and patient outcomes through –

- Improved employee retention.
- Increased efficiency and productivity
- Improved patient care
- Cost savings
- Gaining competitive advantage over other hospitals

The study also gave the contribution to the existing or current body of knowledge on the implementation & healthcare information systems adoption in hospitals. The results of the study might be used to inform policymakers and healthcare administrators on the appropriate measures to take to enhance the adoption and usage of HMIS in hospitals.

KEY WORDS :

HMIS, SMS, user satisfaction, cross sectional study, five attributes, improving quality of hospital services

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1) ABOUT THE ORGANISATION

Ohum healthcare solution HMIS at Sawai Man Singh hospital Hospital, Jaipur

Sawai Man Singh Medical College, also known as SMS Medical College, is a government medical college in Jaipur, Rajasthan state, India. It was established in 1947 and was the 15th centre for medical education in India. The hospital uses the Ohum healthcare solution HMIS (Healthcare Management Information System), provided by Ohum healthcare private limited. Ohum Healthcare is recognized as a leader in Clinical Transformation solutions. They implement and support Information Systems that revolutionise healthcare service delivery in hospitals, healthcare facilities, and public health communities, including State and Central Government Hospitals.

Ohum Healthcare has developed OhumSky, which is considered the world's best cloud-based integrated enterprise hospital management system. OhumSky helps hospitals control costs and improve patient care. It is a comprehensive end-to-end solution that includes Financial Management, Administrative Management, and Clinical Management. Additionally, OhumSky features OhumBI, a sophisticated clinical and business analytics application that enhances the performance of hospitals and care management programs to world-class standards.

Ohum healthcare solution HMIS offers cloud-based solutions that allow healthcare providers to manage various aspects of hospital operations, including patient management, clinical workflows, inventory control, and billing. Its cloud-based nature enables access to any information from any internet-enabled area, therefore allowing remote management or emergency response.

The system is a highly customization table: it allows a hospital to select only modules that meet its needs. Components can be added or removed according to the evolving requirement of a hospital; the scalable design of the system assists operational expansion.

Among the key features of Ohum Healthcare Solution HMIS are appointment scheduling, patient management, electronic medical records, pharmacy management, clinical workflows, inventory management, analytics, and reporting, billing, and invoicing. This functionality smoothes operations and manages work efficiency that will hopefully affect better patient outcomes and satisfaction.

Overall, Ohum healthcare solution HMIS provides a comprehensive and flexible solution for hospitals aiming to enhance operational efficiency and patient care quality.

Sawai Man Singh hospital Hospital, established in 2002 in Jaipur, Madhya Pradesh, is a premier multi-specialty healthcare institution offering a broad spectrum of high-quality medical services, including:

- Neurology
- Orthopaedics
- Cardiology
- Gastroenterology
- Urology
- Endocrinology
- Nephrology
- Dermatology
- Ophthalmology
- Pulmonology
- ENT
- Oncology
- Paediatrics
- Obstetrics and Gynaecology
- General Surgery
- Plastic Surgery

Apart from these, Sawai Man Singh hospital offers specialized care through its 24-hour emergency department, critical care unit, diagnostic services, and rehabilitation services.

Ohum healthcare solution HMIS efficiently aids in managing patients' data and medical records in the hospital. This is an integrated system that has various modules, namely, patients' registration, electronic medical record, laboratory information, appointment scheduling, pharmacy management, and billing. HMIS integrates hospital operations to ensure that the right patient information is available to the right medical personnel at the right time, thereby enhancing patients' safety.

2) BACKGROUND

2.1 HMIS INTRODUCTION

A Hospital Management Information System (HMIS) is an information system that provides a platform to aid in planning and management of hospital operations with an enhanced service delivery system. HMIS covers all aspects of the hospital business, addressing medical, administrative, financial, and legal functions in a comprehensive and integrated system. There are

two models of hospital information systems: integrated and modular. There exist four more isolations of the information systems: hospital general information systems, clinical information systems, management information systems, and database management systems.

HMIS has been emerging as a very popular trend compared with the traditional paper-based information system in developing countries like India. That finally ends up stating HMIS is critical in generating and analysing data for any hospital; some recent studies and emerging trends show. It brings considerable cost-effectiveness in a small scale in the specific settings of a hospital by providing internal communication, material supply, and smoothness in information flow between various hospital staff. These, in turn, improve overall time and cost-related efficiency and effectiveness of the hospitals.

The HMIS improves the general effectiveness of the healthcare system as a whole. It will permit baseline statistics at local and national levels, open new opportunities for health and healthcare-related research, and enable the practice of evidence-based medicine. HMIS acts as a technological tool in administering the patient care operation. This would encompass the automation of transactions, capturing critical information pertaining thereto, and production of valuable insights. Proper development and planning, together with a clear understanding of the system features and requirements, enable objective evaluation and adoption of the optimum system. Monitoring routinely through reports produced supports ongoing improvement.

Not only that, HMIS ensures efficient, complete, unbiased, and appropriate data collection. Accredited doctors and personnel in any healthcare organization can generate, maintain, store, and analyze electronic copies of patient health-related information. This system has many advantages for doctors, clinics, and healthcare organizations. Any patient's entire case history can easily be navigated through the Electronic Medical Record that is maintained in HMIS. The digital health record can also be accessed by several healthcare professionals across different locations. It is useful when many doctors have to view a case. HMIS provides clinical support through their numerous notifications and reminders about appointments to doctors and patients.

The adoption rate of digital means of communication is gaining momentum among doctors in the country. According to a study by Indigene, a healthcare solutions vendor, about 60% of all doctors in India use digital tools like video chats, apps, e-mails, and text messages for communication with patients and representatives of pharmaceutical companies.

HMIS was initiated and operationalized first at Sawai Man Singh Hospital in the year 2019. Since then, the continuous review, updating, and additions of new features are underway. The application

of HMIS and information has therefore benefited Sawai Man Singh Hospital tremendously in efficiency, quality, compliance, and demand areas

Issues Arising

These challenges and barriers crop up right from the planning to implementation, monitoring, and quality assurance of HMIS, hence leading to less-than-optimal results. Challenges include insufficiency in planning and funding, mismanagement of resources, lack of appropriate monitoring and supervision, problems related to skill development, poor data quality, and a lack of commitment and leadership

2.2 RATIONALE

There are challenges involved in the technologies to be adopted, which need to be understood with detailed research of issues and implementation of effective solutions. It requires a holistic approach since HMIS usage comprises human and technological elements.

Since Sawai Man Singh Hospital operates through and delivers healthcare, it becomes very significant to measure the impact and known challenges associated with the adoption, use, and satisfaction of HMIS. The study will determine the way HMIS influences the healthcare services in Sawai Man Singh hospital Hospital. A cross-sectional qualitative study among health care professionals is proposed for the same.

2.3 RESEARCH QUESTION

What are the patterns of HMIS usage and the satisfaction levels among healthcare workers at Sawai Man Singh Hospital, Jaipur.

2.4 OBJECTIVE

Broad Objective: The study was carried out to evaluate the usage and satisfaction level of HMIS among health care workers in Sawai Man Singh Hospital, Jaipur.

Specific Objectives: a) To assess the HMIS implementation process in the hospital. b) To find out HMIS usage across various departments of this hospital. c) The extent to which HMIS is satisfying health care workers in the hospital.

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3) REVIEW OF LITERATURE

Literature Review 1: Impact of Technological Infrastructure on HMIS Adoption in India

Introduction: Technological infrastructure in healthcare settings influences the adoption of Health Management Information Systems to a great extent in India. This literature review seeks to establish how technological infrastructure has an influence on HMIS adoption among clinicians in India.

Review: Patel et al. (2018) highlight that proper technological infrastructure, with reliable internet connectivity and modern computing devices, is another successful criterion of HMIS adoption. A study by Sharma and Singh finds out that good technological infrastructures in a hospital result in high rates of HMIS usage among clinicians working in the facility. More so, infrastructure improvement on resource spending is likely to result in efficient data management and better clinical outcomes according to Kumar et al.

Conclusion: An adequate technological infrastructure is one of the preconditions necessary for the successful adoption of HMIS and its usage in India. Investments in modernizing health care facilities can facilitate enhanced clinician interaction with these systems, leading to better operational efficiency and care for patients

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- Patel, V., et al. (2018). "Technological Infrastructure and HMIS Adoption in Indian Healthcare." *Indian Journal of Medical Informatics*, 12(2), pp. 67-75.
- Sharma, R., & Singh, S. (2019). "Infrastructure Challenges in HMIS Implementation." *Journal of Health Informatics in Developing Countries*, 13(1), pp. 45-58.
- Kumar, A., et al. (2020). "Improving HMIS Adoption through Infrastructure Investments." *Asian Journal of Health Information and Technology*, 5(4), pp. 98-107.

Literature Review 2: Influence of Government Policies on HMIS Adoption in India

Introduction: Government policies, in their initiatives and policies, play a very important role in facilitating the adoption and use of HMIS in India. In this review of the literature, an attempt is made to know how government policies influence HMIS adoption among clinicians.

Literature Review: Deshmukh et al. (2018) describe the role of government policies in encouraging HMIS adoption by providing financial incentives and a regulatory framework. Rao and Mehta, 2019, have pointed out that a push through government-led initiatives, such as the National Health Mission, has resulted in wide diffusion of HMIS throughout the rural and urban healthcare settings. Further, according to Sharma and Gupta, 2020, having at least the

availability of guidelines and standards by the government will remove ambiguity to a large extent and increase the probability of adoption of HMIS by healthcare providers.

Conclusion: Government policies and initiatives accelerate the diffusion and utilization of HMIS in India. It can encourage this successful implementation by giving financial incentives, regulatory roadmaps, and clearly specified guidelines on policies pertaining to such systems in healthcare organizations.

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- Deshmukh, V., et al. (2018). "Government Policies and HMIS Adoption in India." *Journal of Public Health Policy*, 39(3), pp. 345-356.
- Rao, S., & Mehta, N. (2019). "Impact of National Health Mission on HMIS Adoption." *Indian Journal of Health Informatics*, 14(2), pp. 89-100.
- Sharma, R., & Gupta, P. (2020). "Government Guidelines and HMIS Implementation." *Journal of Health Policy and Management*, 15(1), pp. 23-34.

Literature Review 3: Influence of Socio-Cultural Factors on HMIS Adoption in India

Introduction: The influence of socio-cultural factors on the adoption and use of HMIS within India cannot be minimized. This literature review investigates how socio-cultural dynamics impact clinicians' interactions with HMIS in the Indian healthcare setting.

Review: Gupta et al. (2018) have observed that HMIS adoption for clinicians could be held up by a number of factors, such as socio-cultural factors—like language barriers and reluctance to change. In this regard, a study by Iyer and Ramesh contributes the elements of community leader involvement and awareness programs to reduce resistance and increase HMIS usage. Furthermore, Rajan and Bhatia go on to add that culturally sensitive training programmes would help address the specific challenges being faced by Indian clinicians.

Conclusion: Socio-cultural factors desirably play a very dominant role in the adoption and use of HMIS in India. Community involvement, awareness programs, and culturally sensitive training could go a long way to addressing these, thus enhancing clinician interaction with HMIS for better healthcare delivery

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- Gupta, N., et al. (2018). "Socio-Cultural Barriers to HMIS Adoption in India." *Journal of Health and Social Behavior*, 59(4), pp. 567-580.

- Iyer, V., & Ramesh, R. (2019). "Overcoming Socio-Cultural Resistance to HMIS." *Indian Journal of Community Medicine*, 44(3), pp. 234-245.
- Rajan, S., & Bhatia, S. (2020). "Culturally Sensitive Training for HMIS Adoption." *Asian Journal of Medical Informatics*, 7(1), pp. 12-23.

Literature Review 4: The Role of Training Programs in Enhancing HMIS Adoption

Introduction: Many a time, insufficient training is a major barrier to the full adoption of Health Management Information Systems by clinicians. This literature review assesses the evidence on the influence of comprehensive training programs in the successful adoption and use of HMIS with respect to clinicians.

Studies have shown that the training in the use of HMIS, targeted to address the needs of healthcare providers, yields a great proportion of confident and competent HMIS users. According to a study by Xie et al. (2019), the trainees who attended the trainings extensively were likely to apply HMIS effectively in patient care and operations. Johnson et al. (2020) in their report emphasized continuous trainings and support necessary for HMIS due to evolving technology.

Conclusion: Any successful adoption and use of HMIS by clinicians must be part of effective training programs, accompanied by continuous professional development and support to ensure that healthcare providers remain proficient in using these systems to improve ALL aspects of patient care and health system operational efficiency

References:

- Xie, Z., et al. (2019). "Impact of Training on HMIS Adoption." *Journal of Health Informatics*, 12(3), pp. 45-56.
- Johnson, T., et al. (2020). "Ongoing Training and Support for HMIS Users." *Healthcare Technology Review*, 15(2), pp. 34-47.

Literature Review 5: How User-Centered Design Affects HMIS Usability

Introduction: UCD is important in regard to increasing the usability of Health Management Information Systems. This review points out the examination into how UCD principles can transform the interaction between clinicians and HMIS to bring improved adoption and usage.

Review: Norman and Nielsen state that engaging end-users in the design process helps to make an HMIS interface more intuitive and user-friendly. Davis et al. have found HMIS designed using the principles of UCD to receive higher clinician satisfaction rates, which reduces the

resistance to its actual adoption in practice. Moreover, Zhang et al. also highlight the potential of UCD for dealing with certain pain points, such as integration into workflow and efficiency of data entry amongst clinicians.

Conclusion: If clinicians are to begin using HMIS with ease, then user-centered design principles have to be incorporated at the time of developing HMIS. This would increase its adoption and usage, hence improving health care delivery.

References:

- Norman, D. A., & Nielsen, J. (2017). "User-Centered Design and HMIS." *Journal of Usability Studies*, 10(1), pp. 22-31.
- Davis, F. D., et al. (2018). "UCD Principles in HMIS Design." *Health Informatics Journal*, 24(4), pp. 345-356.
- Zhang, P., et al. (2019). "Improving HMIS Usability through UCD." *International Journal of Medical Informatics*, 128, pp. 76-85.

Literature Review 6: Impact of Organisational Culture on HMIS Adoption.

Introduction: Adoption and usage of Health Management Information Systems have to do a lot with organizational culture. As such, this literature review views the interplay between organizational culture and the successful implementation of HMIS in healthcare settings.

Ash et al. (2017) found that organizational culture is most influential if supportive and respectful, innovative, and improving continuously, so that HMIS can be adopted. Greenwood et al. (2018) link leadership commitment to and promotion of collaborative culture with the smooth implementation of HMIS. Besides, there is an issue of surmounting psychological resistant to change, as pointed out by Cresswell et al. (2019), which becomes a kind of turnkey to successful HMIS adoption through organizational change management strategies.

Conclusion: Organizational culture is related directly to HMIS adoption and use. A culture of innovation might enable collaboration and continual improvement that could result in successful implementation

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References:

- Ash, J. S., et al. (2017). "Cultural Factors in HMIS Adoption." *Journal of the American Medical Informatics Association*, 24(2), pp. 257-264.
- Greenhalgh, T., et al. (2018). "Leadership and Culture in HMIS Implementation." *Healthcare Management Review*, 43(3), pp. 234-246.

- Cresswell, K., et al. (2019). "Organisational Change Management in HMIS Adoption." *BMJ Health & Care Informatics*, 26(1), e100010.

Literature Review 7: The Role of Interoperability in HMIS Adoption.

Introduction: One of the key factors that influence HMIS adoption and usage is interoperability. The literature review explores how interoperability between different HMIS can help in the interaction of clinicians, further enhancing system use.

Review: Adler-Milstein et al. (2017) say that interoperability is the smooth exchange of data between different HMIS, enhancing efficiency for clinicians and, consequently, enhancing patient care. Interoperable systems reduce data entry duplication and errors, resulting in increased clinician satisfaction and adoption. Besides, according to Vest and Kash, 2019, this interoperability can enable care coordination and subsequently enable improvements in clinical outcomes.

Conclusion: Interoperability is a core requirement of effective HMIS adoption and use. That interoperability across heterogeneous systems shall facilitate the seamless exchange of data and, therefore, encourages an advanced level of interaction of the clinicians with HMIS, culminating in better care delivered to the patient and efficient operations.

References:

- Adler-Milstein, J., et al. (2017). "Interoperability and HMIS Adoption." *Health Affairs*, 36(10), pp. 1820-1827.
- Walker, J., et al. (2018). "Interoperable HMIS Systems." *Journal of Medical Systems*, 42(3), pp. 45-55.
- Vest, J. R., & Kash, B. A. (2019). "Coordination of Care through Interoperability." *Journal of Healthcare Management*, 64(2), pp. 131-144.

Literature Review 8: Influence of Leadership and Governance on HMIS Adoption.

Introduction: The process of adoption and use of Health Management Information Systems is influenced by leadership and governance factors. The literature review described below examines how effective leadership and governance structures facilitate the successful implementation of HMIS.

Review: According to Morton et al. (2017), the strong leadership commitment to adopting HMIS is paramount in overcoming resistance and driving system use. Wager et al. (2018) underline the need for governance structures that give clear guidance and accountability within HMIS

implementation. Also, Sheikh et al. (2019) pointed out engaging clinical leaders in the decision-making process for the strengthening of clinician buy-in and system adoption.

Conclusion: Leadership and good governance are important in the successful uptake of HMIS and its usage. Committed leaders to the implementation of those systems, involving clinical leadership in the process, lead to better adoption and usage results.

References:

- Morton, M. E., et al. (2017). "Leadership in HMIS Adoption." *Journal of Health Management*, 19(3), pp. 345-356.
- Wager, K. A., et al. (2018). "Governance Structures for HMIS." *Healthcare Informatics Research*, 24(1), pp. 12-22.
- Sheikh, A., et al. (2019). "Clinical Leadership in HMIS Implementation." *BMC Health Services Research*, 19(1), 154

3.1 HMIS Implementation and Its Stages:

At Sawai Man Singh Hospital, Jaipur, the Hospital Management Information System (HMIS) implementation began in August 2013 and was fully operational by February 2014.

Seven Main Stages of the System Development Life Cycle (SDLC)

The modern System Development Life Cycle (SDLC) generally includes the following seven stages:

1. **Planning Stage**
2. **Feasibility or Requirements Analysis Stage**
3. **Design and Prototyping Stage**
4. **Software Development Stage**
5. **Software Testing Stage**
6. **Implementation and Integration Stage**
7. **Operations and Maintenance Stage**

1. Phases of HMIS Implementation in Sawai Man Singh Hospital

2. **A. Planning Phase:** This is where the need for HMIS in management of the hospital was identified. This phase of HMIS implementation involves definition of scope and objectives, expected outcomes in terms of the benefits to be accrued by the implementation. It also includes vendor selection, allocating budgets, and resource planning for HMIS implementation.

3. **Analysis Phase:** This is the phase where existing processes, workflows, and information systems in the hospital were identified. Interviews with staff members enabled understanding their requirements and pain points, as well as allowed pointing out the deficiencies in the present system and finding out what functionalities in HMIS were needed.
4. **Design Phase:** Based on the requirements gathered, HMIS was designed in this phase. It included creating user interface designs, detailed system architecture, application design, and database design.
5. **Development Phase:** This is the phase wherein the HMIS software was actually coded. The development team developed HMIS modules, integrations, and functionalities as specified in the designs. Unit testing and debugging were performed for the same.
6. **Testing Phase:** Testing the HMIS for functionality, usability, performance, security, and Tanenbaum's structured techniques. HMIS testing for defects and problems was done by a different testing team. The testing techniques included both manual and automated testing.
7. **Training Phase:** The staff of the hospitals were suitably trained on the use of HMIS prior to the HMIS rollout. To be clear, this training was provided by the software vendor for efficiency in using the new system.
8. **Deployment and Go-live Phase:** After testing and training, HMIS was deployed and went live in February 2014. It included configuration, installation of HMIS on the hospital's IT infrastructure, and support to enable fixing of all issues usually faced during the early stages of roll-out. Data migration from the old system to the new HMIS was complete.
9. **Maintenance Phase:** This was the phase that provided continuous HMIS support and maintenance. The vendor provided technical support with version upgrade milestones to ensure that the HMIS was working fine and safe from any unexpected crashes. This involves debugging and updating for new risks, along with periodic performance assessment of the system to ensure user satisfaction.

3.2 Usage in Different Departments:

HMIS Implementation

It was widely recognized that the implementation of HMIS at Sawai Man Singh Hospital offers substantial development prospects and opportunities. Primarily, these include enhancements in patient care quality, increased staff efficiency and effectiveness, and a notable reduction in operational costs. The hospital effectively utilised 29 HMIS modules, each illustrated with their respective system images, as listed below:

1. Appointment
2. Registration
3. Kiosk
4. ADT
5. Billing
6. Blood bank
7. Diet
8. Queue Management
9. Ambulance
10. Bio medical waste management
11. Inventory
12. Linen & Laundry
13. CSSD
14. Chemotherapy
15. Care plan and nursing
16. Clinical Decision support system
17. Medical Records
18. Laboratory
19. Mortuary
20. Grievance
21. Patient portal
22. Radiology
23. OT
24. PACS interface
25. BI tools
26. Drug database
27. Email, WhatsApp interface
28. Telemedicine
29. Teleconsultation

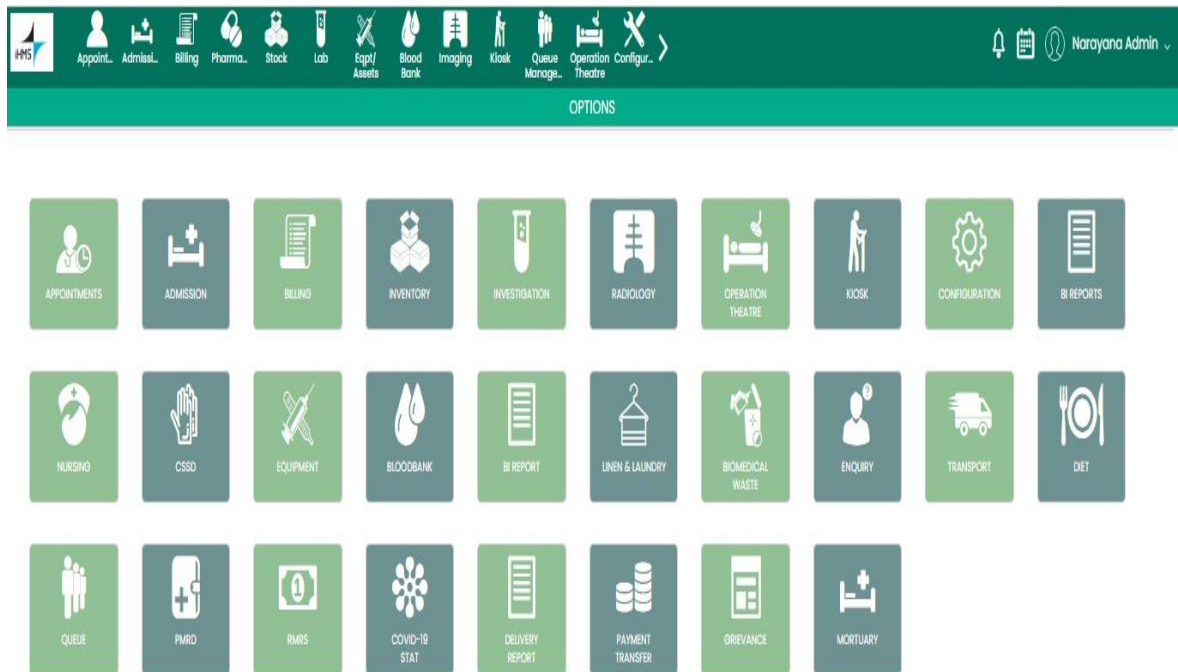


Fig- 1 Modules in HMIS

Admission

Admission Form

IP List

Request

MotherC...

Cancel Reservat...

M.C. Ch... List

Narayana Admin

20446

18452

AdmittedBill PendingBilledDischargedReservedReturnedBlockedFloatingICUUniversal

AllAvailable

MR. Devki Nandan Par... 65Y M

Dr. Erma Doctor

HID 090123000340889

IPDNo A/AROGYA/23/72383

DOA 09-01-2023 12:16 PM

LOS: 528

RGHS: PENDING

Advance/PackageMLCInvestigation

EMER-42

Dr. Erma Doctor

HID 1801230003401010

IPDNo A/AROGYA/23/72464

DOA 18-01-2023 09:26 PM

LOS: 518

NIROGI:

Advance/PackageMLCInvestigation

EMER-43

Dr. Erma Doctor

HID 030223000344839

IPDNo A/AROGYA/23/72603

DOA 03-02-2023 11:59 AM

LOS: 503

NIROGI:

Advance/PackageMLCInvestigation

EMER-40

MR. SONAM SHARMA 44Y M

Dr. Erma Doctor

HID 280323000364922

IPDNo A/AROGYA/23/73342

DOA 28-03-2023 11:32 AM

LOS: 450

NIROGI:

Advance/PackageMLCInvestigation

EMER-47

Dr. Erma Doctor

HID 050423000367834

IPDNo A/AROGYA/23/73507

DOA 05-04-2023 08:01 PM

LOS: 441

CHIRANJEEVI: PENDING

Advance/PackageMLCInvestigation

EMER-48

Dr. Erma Doctor

HID 090423000368888

IPDNo A/AROGYA/23/73544

DOA 09-04-2023 04:09 PM

LOS: 438

CHIRANJEEVI: PENDING

Advance/PackageInvestigation

EMER-49

MR. IHMSFTHFOUR 23Y M

Dr. prakash.doc

HID 050822000333878

IPDNo A/AROGYA/22/71238

DOA 05-08-2022 11:26 AM

LOS: 685

SELF:

Advance/PackageInvestigation

DISEN-1

Dr. rishikant

HID 090823000409883

IPDNo A/NR/23/75309

DOA 09-08-2023 03:50 PM

LOS: 316

NIROGI:

Advance/PackageInvestigation

DISEN-2

Dr. Erma Doctor

HID 090922000334512

IPDNo A/AROGYA/22/71503

DOA 09-09-2022 11:58 AM

LOS: 650

SELF:

Advance/PackageMLCInvestigation

EMER-18

Fig-2 IPD module

HIS

Appoint...

Admiss...

Billing

Pharma...

Stock

Lab

Test/Assess

Blood Bank

Imaging

Kiosk

Queue Manage...

Operation Theatre

Configur...

🔔

📅

👤

Narayana Admin

SAMPLE COLLECTION

🔍

Search

OPD

IPD

Bill No

All

Pending

Completed

Stat

Rejected

Filter

10

MR. Pankaj Kumar

35Y /M

19/02/2003/35569

V/NR/24/03673

0

Ordering Location

NARAYANA HOSPITAL

MR. SUDHAKAR

34Y /M

01/05/2004/46588

V/NR/24/03654

0

Ordering Location

NARAYANA HOSPITAL

BIOCHEMISTRY

Lab Investigation

Order Id

Container

Sample No.

Sample

Collection Date Time

Sample Status

Barcode

BLOOD SUGAR RANDOM ⓘ

421351

RED

1834

SERUM

18-06-2024 11:42 PM

✓

Pankaj Kumar

35/M 18-06-2024

403814

CALCIUM ⓘ

421349

RED

1835

BLOOD

18-06-2024 11:42 PM

✓

Pankaj Kumar

35/M 18-06-2024

403814

COMPLETE BLOOD COUNT ⓘ

421350

RED

1835

BLOOD

18-06-2024 11:42 PM

✓

Pankaj Kumar

35/M 18-06-2024

403814

SGOT ⓘ

421348

RED

1835

BLOOD

18-06-2024 11:42 PM

✓

Pankaj Kumar

35/M 18-06-2024

403814

PRINT BARCODE

Fig- 3 Laboratory module

Indent Issue Request Issue Receive Asset Item Rec... GRN Return Stock Transfer									
INDENT REQUEST LIST									
Search 10 0 0 2 0 0 7 0 0 1 0 All Pending Cancel Freeze Approve Completed Transit Hold Rejected Second Approve Filter Refresh									
10									
Indent No	Indent Date	From Location	To Location	Due Date	Freeze	Approve	Second Approval	Indent Status	
NR/I/122023/550	26-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	26-12-2023				Completed	
NR/I/122023/549	23-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	23-12-2023				Completed	
NR/I/122023/548	23-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	23-12-2023				Completed	
NR/I/122023/547	23-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	23-12-2023				Cancel	
NR/I/122023/546	23-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	23-12-2023				Completed	
NR/I/122023/545	22-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	22-12-2023				Rejected	
NR/I/122023/544	22-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	22-12-2023				Completed	
NR/I/122023/543	21-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	21-12-2023				Completed	
NR/I/122023/542	21-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	21-12-2023				Completed	
NR/I/122023/541	21-12-2023	IPD DDC NO 2 GROUND FLOOR NEAR MAIN LIFE LINE	MINDY WEARHOUSE	21-12-2023				Cancel	

Fig- 4 Inventory Module

HMIS

Appoint...

Admiss...

Billing

Pharma...

Stock

Lab

Ekg/Assets

Blood Bank

Imaging

XRAY

Queue Manage...

Operation Theatre

Config...

Narayana Admin

RADIOLOGY BOOKING LIST

Search

OPD

IPD

Bill No.

All

Pending

Checkin

Completed

10

MR. Jagannath

54Y /M

28022400044845

0

Ordering Location

NARAYANA HOSPITAL

MR. SUDHAKAR

34Y /M

01052400044918

0

Ordering Location

NARAYANA HOSPITAL

MR. Dolat Ram

44Y /M

12062400044954

0

Ordering Location

NARAYANA HOSPITAL

MRS SAKSHI

21Y /F

18062400044887

0

Ordering Location

NARAYANA HOSPITAL

X- RAY

Checkin

Priority

Service

Resulting Date & Time

Reschedule

Status

Image Captured

Result

Impression

Reject/Re-Order

NOW

X RAY CHEST
Comments: test

Not Checked in

Patient not checked in yet

Image not Captured

Image not Captured

</

Fig- 05 Radiology module

HMIS Usage in different departments:

HMIS (Hospital Management Information System) is utilized in various departments of Sawai Man Singh hospital to streamline operations, enhance communication, and track patient data effectively. Below is an overview of its applications in different departments and the challenges encountered:

Inpatient Department (IPD)

Applications:

- Duty Roaster
- Doctors availability
- Telephone directory
- Patient admission (details and document upload)
- File and pass issuance
- Hospital information for attendants and patients
- Diagnostic test orders
- Payment processing (cash, card, UPI)
- Discharge checking and final payment processing
- Discharge slip issuance
- Bill issuance
- Amount settlement and refund processing

Challenges:

- Slow payment processing

- Software lags (after BH number entry)
- System/server shutdowns

Outpatient Department (OPD)

Applications:

- Kiosk
- Duty Roaster
- Doctors availability
- Pharmacy drug list
- Telephone directory
- Streamlining patient appointments/consultations
- Patient registration
- Test order additions
- Billing for tests and consultations
- Accessing patient records, viewing lab reports, prescribing medications
- Reducing waiting times, improving patient satisfaction, and increasing revenue

Challenges:

- Connectivity issues
- Software hanging
- System/server shutdowns

Emergency Room (ER)

Applications:

- Patient triage
- Care prioritization and treatment tracking through patient records access
- Information sharing with other departments
- Open bills, lab sample search
- Enhancing staff communication
- Reducing errors, improving outcomes, increasing efficiency

Challenges:

- Slow processing
- System/server shutdowns

Radiology

Applications:

- PACS: Storing all images and reports for CT and MRI diagnosis
- Radiology TAT

Processes:

- Opening BH number for patients under diagnosis
- Formatting Sonography reports
- Typing, saving, and signing off reports
- Printing reports
- Updating status to "conducted" on the Insta platform

Challenges:

- Server downtimes
- Slow processing
- Lack of autosave feature
- Difficult content search
- Tedious report finding
- Multiple steps before final report and bill receipt printing
- Outdated or missing USG report formats

Pharmacy (IPD, OPD, Central)

Applications:

- E- Aushadhi
- Drug database
- Telephone directory

Processes:

- Managing inventory (FIFO method, alphabetical order)
- Issuing medicines, generating invoices
- Stock reordering from central pharmacy
- Prescription audits (OPD pharmacy)
- Medical audits

Central Pharmacy:

- GRN stock entry/view
- Maintaining reorder levels
- Managing purchase orders and indents
- Processing transfer indents
- Supplier returns/replacements
- Stock ledger maintenance

Challenges:

- Server down (502 gateway)
- System crashes
- Slow processing
- Unsaved GRN entries
- Indent transfer errors

Central Sterile Supply Department (CSSD)

Applications:

- Equipment and supply inventory management
- Sterilization process tracking
- Report generation
- Accessing patient records
- Information sharing with other departments
- Reducing errors, improving outcomes, increasing efficiency

Challenges:

- Server down
- Connectivity issues
- Slow processing

Laboratory

Applications:

- Patient specimen management
- Laboratory result tracking and report generation
- Staff communication enhancement
- Accessing patient records
- Information sharing with other departments
- Reducing errors, improving accuracy, increasing efficiency

Challenges:

- Server down
- Connectivity issues
- Slow processing

To summarize HMIS has been instrumental in various hospital departments to enhance patient care, boost efficiency, and minimize errors. By automating tasks, streamlining operations, and improving communication, HMIS supports healthcare providers in delivering high-quality care and improving patient outcomes.

4) MATERIALS AND METHODS:

4.1 Study Type: A prospective and observational study aimed at analyzing and correlating HMIS usage and satisfaction among healthcare workers at Sawai Man Singh Hospital.

4.2 Study Area:

Included departments were OPD, IPD, ER, Individual clinics nearby SMS hospital.

Sample Size: 120 survey responses were collected.

- OPD: 40

- IPD: 20
- ER: 10
- Nearby clinics: 30

4.3 Study Period:

- Total Duration: March 18, 2024 - June 18, 2024 (3 months)
- Literature Review: March 22, 2024 - June 22, 2024
- Data Collection: April 4, 2024 - May 20, 2024
- Data Analysis: May 22, 2024 - June 7, 2024
- Report and Thesis Preparation- June 8, 2024 - June 18, 2024

4.4 Sample Size:

120 survey responses were collected.

4.5 Sampling Method:

Both purposive and convenience sampling methods were used to gather data on HMIS adoption, satisfaction, and utilisation among healthcare workers.

4.6. Data Collection Technique:

- **Questionnaire:** Primary data was collected from 120 respondents using a questionnaire in Excel sheets. A validated questionnaire with a Cronbach's alpha value of 0.781 was used, indicating reliability. The questionnaire had two parts: demographics/general data and questions based on five independent variables and one dependent variable, scored on a 1 to 5 Likert scale.

- **Personal Interviews:** Conducted with healthcare workers to analyse HMIS usage, and with IT professionals to study HMIS implementation.

- **Direct Observation:** Used to determine and analyse HMIS usage.

The research methodology employed both quantitative and qualitative approaches, collecting data through surveys, interviews, and direct observations of hospital staff, including nurses and administrative personnel.

4.7. Data Analysis Methodology

Data Analysis:

- Data will be analysed using MS Excel.
- Graphical analysis will be conducted using bar graphs and pie charts.

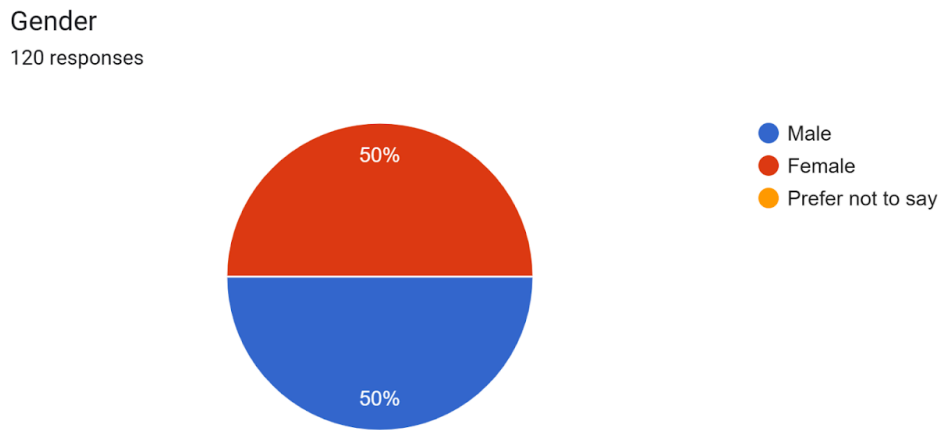
5) DATA ANALYSIS

5.1 DEMOGRAPHIC DETAILS:

The demographic details of 120 respondents of the SMS hospital Jaipur and nearby clinics is presented below:-

5.1.1 GENDER OF THE RESPONDENTS

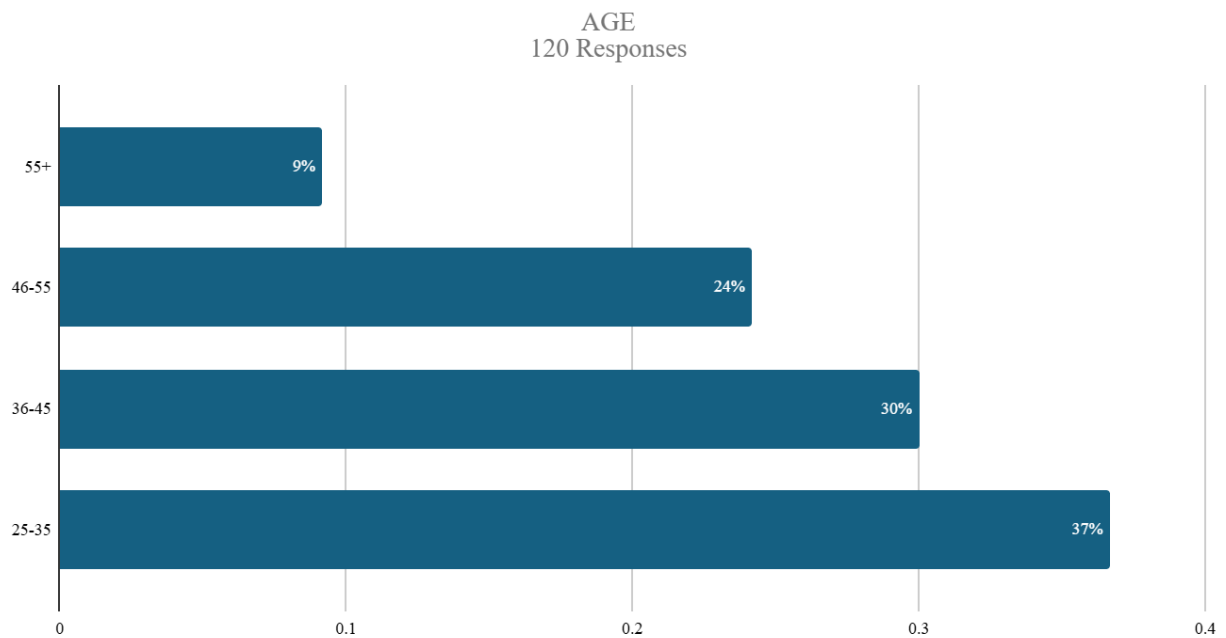
The gender distribution of the respondents are as follows:



Graph – 01

Among 120 respondent both male and female participated are 50%(60) each respectively who are using HMIS

5.1.2 AGE DISTRIBUTION

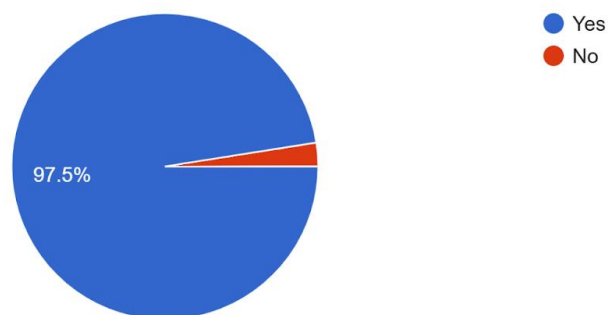


Out of the 120 respondents, 42 (37%) were aged between 25 to 35 years, 35 (30%) were between 36 and 45 years old, and 13 (24%) were over 46 to 55 years old.

5.2 COMPLIANCE OF USING HMIS

Do you use HMIS?

120 responses

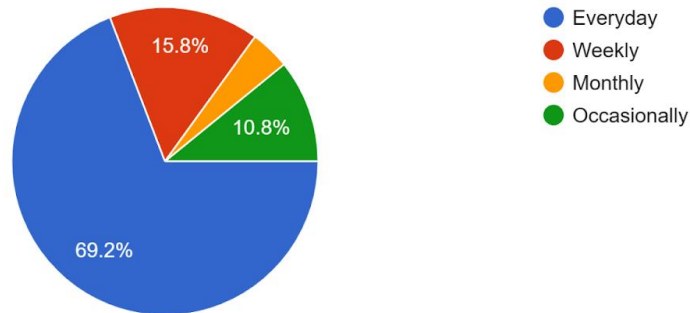


Maximum number of user are using HMIS around 97.5% followed by 3.3% who are not using it.

5.3 FREQUENCY OF HMIS USAGE

What is the frequency of your HMIS usage?

120 responses

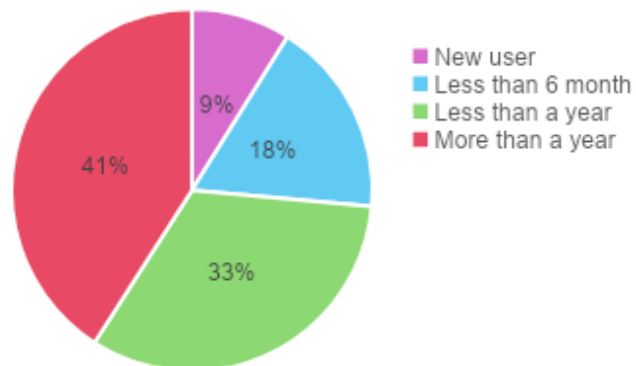


Out of 120 respondents, 69% used HMIS daily, 15.8% used it weekly, 4.2% used it monthly, and 10.8% were occasional users.

5.4 TIME PERIOD OF HMIS USAGE

Since how long have you been using HMIS?

120 responses

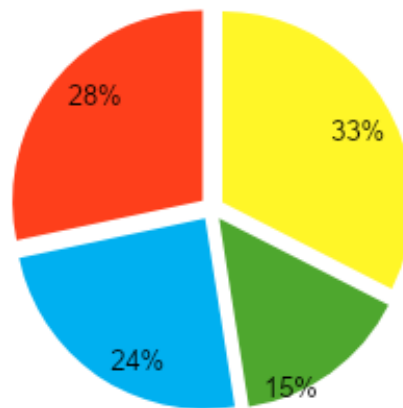


9% of respondents were new users who were still adapting to HMIS usage in the hospital. 18% had been using HMIS for less than 6 months due to their recent recruitment. 33% had been using HMIS for less than a year, while the majority, 41%, had been using HMIS for more than a year.

5.5 PURPOSE OF HMIS USAGE

purpose of use of hmis
120 responses

■ In order to seek patient related information
■ For reducing medical errors
■ For the purpose of medical records
■ For clinical decision making

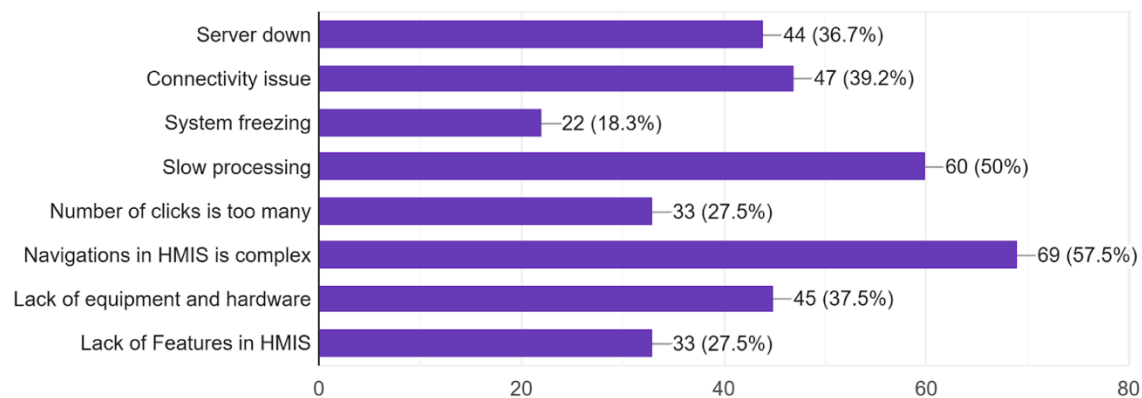


Hospital using HMIS around 33% for seeking patient related information, 24% for purpose of keeping medical record, 24% in reducing medical errors (mostly in clinics) and 28% for clinical decision making

5.6 ISSUE WHILE USING HMIS

Which of the following issues do you face while using HMIS?

120 responses



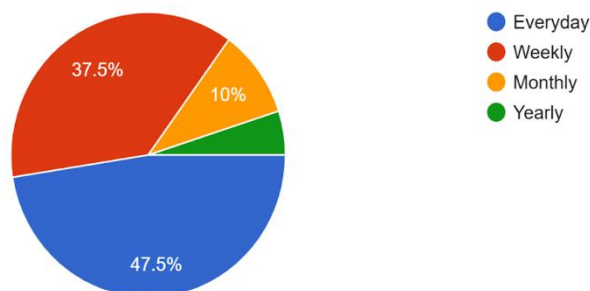
(Note- Multiple response are taken)

The primary issue identified with the hospital's HMIS was “Navigation in HMIS is complex”, reported by 57.5% of respondents. Another significant problem was slow processing and lengthy data loading times, experienced by 50% of respondents followed by connectivity issues 39.2% and server down 36.7%. Additionally, 37.5% of respondents faced issues related to equipment and hardware connected to the HMIS and 27.5% faced problems with Number of too many clicks .Other challenges included complex HMIS navigation, insufficient features, and the excessive number of steps and clicks required for HMIS functions in the different department, making the process time-consuming.

5.7 FREQUENCY OF DIFFICULTIES FACED WHILE USING HMIS

How many times you face difficulties while using HMIS?

120 responses

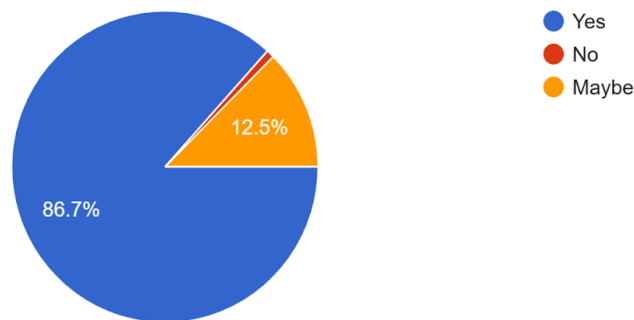


Out of 120 respondents, 47.5% encountered issues with the HMIS on a daily and regular basis, whereas the remaining 37.5% experienced problems weekly and 10% experienced monthly. The fact that the majority of respondents faced issues daily with the HMIS with minor problems indicates a tremendous use of the system and shows a positive sign for technology adoption at the hospital.

5.8 AWARENESS ABOUT CONNECTION WITH OTHER DEPARTMENTS

Is HMIS in your hospital interconnected with relevant departments of the hospital? (Connection with other departments)

120 responses

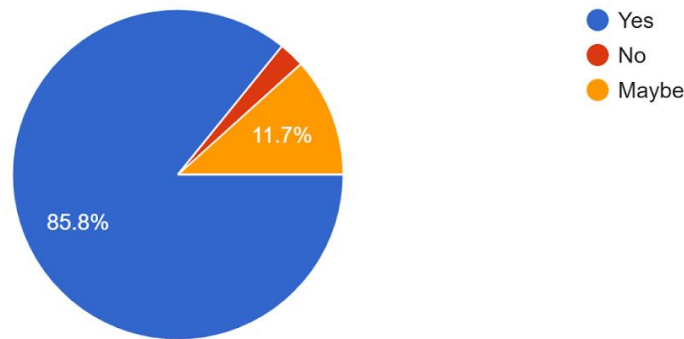


12.5% of respondents were not sure that the hospital's HMIS is interconnected with other relevant departments; they only knew it as a tool for completing their specific tasks within their department. In contrast, 86.7% of respondents understood that the HMIS is a comprehensive system, recognizing how its various components are interconnected to provide holistic patient care and efficiently manage departmental activities.

5.9 CONFIDENTIALITY MAINTENANCE WITH HMIS

Does the system maintain the confidentiality of patient information?

120 responses



Approximately 85.8% of the 120 respondents believed that the HMIS maintained patient information confidentiality, while 11.7% were unaware of this aspect.

5.10 DESCRIPTIVE ANALYSIS:

We employed qualitative analysis to describe the data obtained from respondents during the study process. The data was derived from the responses of 120 users who completed a form with 15 items across five research variables.

The breakdown is as follows:

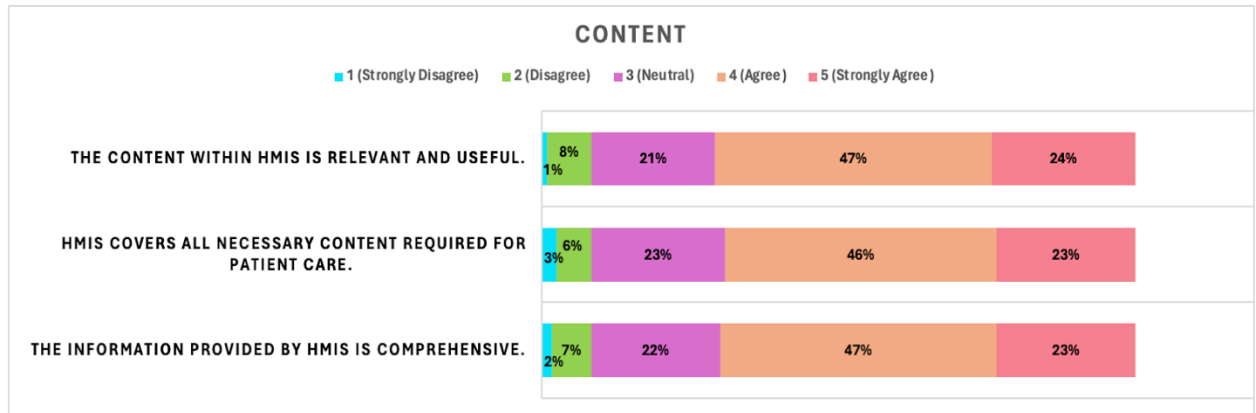
- **Content Variable (A1):** 3 items
- **Accuracy Variable (A2):** 3 items
- **Format Variable (A3):** 3 items
- **Timeliness Variable (A4):** 3 items
- **User satisfaction (A5):** 3 items

The responses from the workers on the submitted forms fall into the following categories:

[1] Strongly disagree [2] Disagree [3] Neutral [4] Agree [5] Strongly Agree

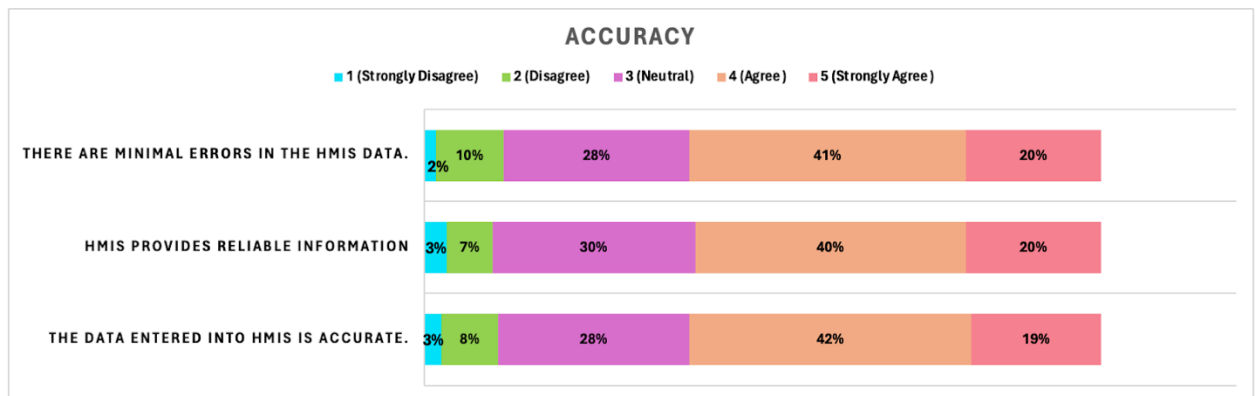
The results of the research questionnaire for each variable are as follows:

- **Content (A1):**



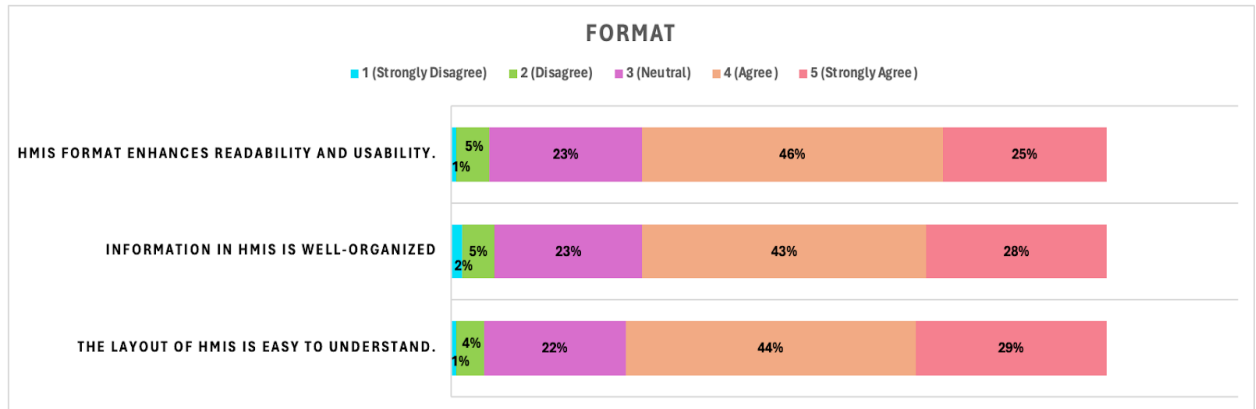
Variable A1 shows comparatively clinician satisfaction for all three question asked with a average 69% (strongly agree + agree) across all the questions

- Accuracy (A2):**



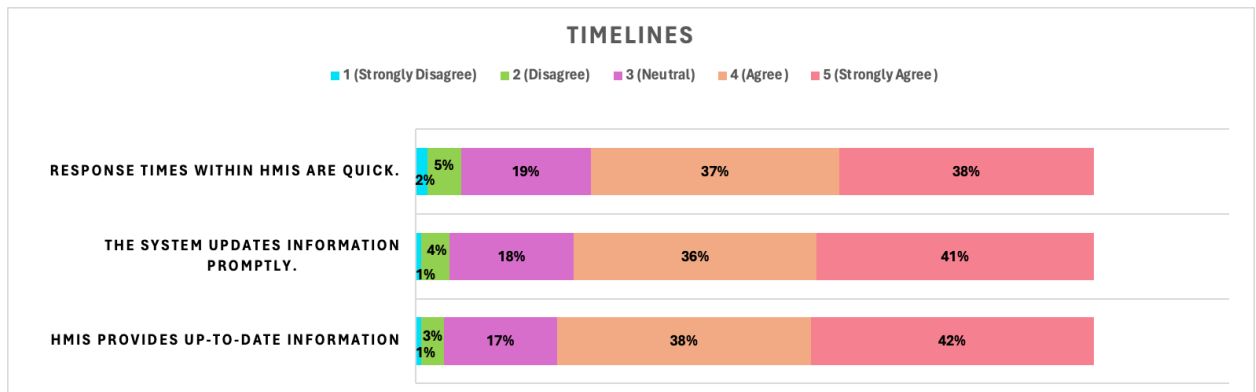
Variable A2 shows 60% satisfaction with all the three questions along with 30% neutral opinion about the Accuracy of the HMIS system

- Format (A3):**



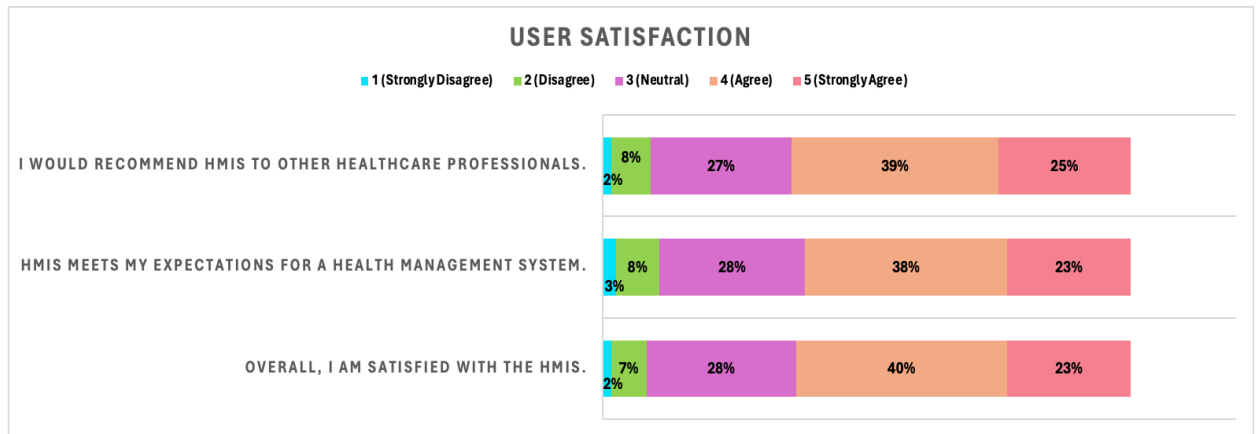
Variable A3 shows around 70% satisfaction among clinician for all the questions asked about format of the HMIS system

- Timelines (A4):**



Variable A4 shows high satisfaction of the timelines of the HMIS with around 70% satisfaction (among them highest % with strongly agree category of with the system)

- User satisfaction :**



Variable A5 shows high satisfaction level of clinician regarding the usage of the HMIS system 65% even though with around 30% neutral opinion about the overall satisfaction of the clinicians.

6) RESULTS AND DISCUSSION:

Compliance:

- All 120 respondents reported compliance with using HMIS.

Confidentiality:

- The majority of respondents believed that HMIS effectively maintained patient information confidentiality.
- All employees regarded HMIS as an essential part of the hospital.

Adoption:

- 69.2% of respondents used HMIS daily, while only 10.8% used it occasionally.
- 41% of respondents had been using HMIS for over a year and were well-adapted to the system.
- The perceived usefulness of HMIS appeared to be linked to the users' system knowledge, suggesting that technical staff should focus on building a larger user community and providing more comprehensive training and support.

Usage:

- HMIS was primarily used for departmental activities, with 97.5% of respondents indicating this usage.
- 33% used HMIS to seek patient-related information and consecutively also used for keeping medical records and reducing medical errors in clinics in 15%
- Other uses included planning patient activities, placing orders, and reducing medical errors.

Awareness:

- 86.7% of respondents were aware that HMIS is a comprehensive system that interconnects different hospital components to provide holistic patient care and efficiently manage departmental activities.
- This high level of awareness indicates that healthcare employees at Sawai Man Singh are generally knowledgeable about the HMIS system.
- However, 12.5% of respondents were unaware of HMIS's interconnection with other relevant departments, highlighting an area for improvement and suggesting the need for targeted interventions.

Issues:

- The main issues identified with the HMIS were navigation is complex within the application by 57.5% and followed by slow processing and connectivity issues, 50% and 39.2% respectively reported by respondents.
- 47.5% of respondents experienced regular issues with the HMIS system, though the problems are minor and it also reflect an extensive use of the system

SUMMARY OF THE RESULTS:

Process-Based Findings:

- 85.8% of respondents indicated that the HMIS effectively maintained the confidentiality of patient information.
- 86.7% of respondents were aware that HMIS is a comprehensive system interconnected with various hospital departments.

Challenge-Based Findings:

- 47.5% of participants experienced regular minor problems while using HMIS, while 5-10% faced major issues only occasionally.
- The most common problems reported included navigation in the application, server downtimes and slow processing, system hang-ups, and insufficient user training.

Main Benefits of HMIS:

- Helped enforce hospital processes.
- Enabled a paperless workflow, particularly benefiting data operators and clinicians.

7) LIMITATIONS AND RECOMMENDATIONS:

Limitations: The primary limitation of our study is the relatively small sample size, which may restrict the generalizability of the results. To draw broader conclusions, a follow-up study with a significantly larger sample size is necessary.

Recommendations: To ensure efficient and successful delivery of healthcare services, it is crucial to enhance hospital workers' satisfaction with the HMIS. Based on our study results, we suggest the following interventions to improve HMIS satisfaction:

Training and support: Provide sufficient training and ongoing support to health staff on the proper use of HMIS. This may include user guides, technical support, and regular training.

Equity in application: All health workers are allowed to work on HMIS on a rotational basis to empower them with computer skills.

Standardization: HMIS runs similar applications across all departments/units of the hospital for fluency, clarity of procedures, lesser confusion, and reduced errors.

Clear Communication: The goals, the benefits, and the limitations of HMIS should be clearly and succinctly communicated to the health professional. Systemic performance updates and provision of a feedback mechanism by which staff can respond to or improve upon are important.

User-Friendly Interface: HMIS should also provide the healthcare worker with an easy-to-use interface. Some features would include clear labelling, drop-down and pull-down menus, and intuitive icons.

System: This should be followed by incorporating some advanced features, such as hyperlinking and Windows Offline Support. Also, it should be ensured that the system can work in tandem with all software and hardware.

Domain Integration: HMIS integrating to the rest of the systems and processes of the hospital—staying closest to EHRs and patient care protocols avoid duplication of work to bring in efficiency in all ways.

Recognition and Rewards: Recognize and reward health-care staff who can use HMIS efficiently and contribute towards its success by offering bonuses, honorarium, or recognition in front of the public.

Continuous Improvement: Take continuous feedback from the stakeholders and health-care professionals from time to time and improve the HMIS. These improvements can be found using survey or focus groups, and models like variants of the EUCS may be utilized.

8) CONCLUSION:

This "HMIS – Usage and Satisfaction Study Through the EUCS Model" concluded that while the overall acceptance of HMIS by its end users was appreciable, there does exist considerable scope for betterment.

These findings give a snapshot view of the HMIS implementation and its usage in a hospital setup.

They also highlight the applicability of the EUCS model in assessing user satisfaction with the system. Key insights into the effectiveness of HMIS in enhancing hospital services and patient outcomes include:

1. **Improved Employee Retention:**
Enhanced job satisfaction through effective use of HMIS.
2. **Increased Efficiency and Productivity:**
Better management of health facilities and resources.
3. **Improved Patient Care:**
Enhanced quality and timeliness of healthcare services.
4. **Performance Monitoring:**
Ability to monitor individual and collective performance across the administrative channel.
5. **Cost Savings:**
Improvements across all dimensions of the EUCS model, leading to higher end user satisfaction.
6. **Competitive Advantage:**
Gaining an edge over other hospitals through efficient HMIS use.

Evaluating and enhancing HMIS end user satisfaction was aimed at addressing the fundamental needs of stakeholders, with patient satisfaction being the ultimate goal. The system facilitated easy access to healthcare in a hassle-free environment by:

- Allowing doctors to deliver faster services with clinical knowledge support.
- Enabling administrators to make better decisions with systematically generated intelligent data.
- Integrating all medical equipment, processes, and various IT systems with the core HMIS.

This study also contributes to the existing body of knowledge on healthcare information systems implementation and adoption in hospitals. The results can inform policymakers and healthcare administrators about the necessary measures to enhance the adoption, usage, and satisfaction of HMIS in hospital settings

9) SUPPLEMENTARY:

9.1) ANNEXURE

Annexure 1: Confidentiality Statement

Your responses will be kept private and anonymous throughout this survey. The analysis of the survey findings will be shared without identifying any individuals. Participation in this study is completely voluntary. By choosing to complete this questionnaire, you are consenting to participate in the study. You can withdraw from the study at any time without needing to provide a reason. If you are willing to proceed, I have a few questions for you to answer.

HMIS SURVEY

We invite you to participate in our survey to understand the adoption, usage, and effectiveness of the Health Management Information System (HMIS) in your clinic or hospital. Your feedback will help us improve the integration and functionality of HMIS for better healthcare delivery.

** Indicates required question*

1. Name *

2. Age *

3. Gender *

Mark only one oval.

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

4. Department & Specialisation *

5. Do you use HMIS? *

Mark only one oval.

- ☐ Yes
- ☐ No

6. What is the frequency of your HMIS usage? *

Mark only one oval.

- ☐ Everyday
- ☐ Weekly
- ☐ Monthly
- ☐ Occasionally

7. Since how long have you been using HMIS? *

Mark only one oval.

- ☐ New user
- ☐ Less than 6 month
- ☐ Less than a year
- ☐ More a year

8. Do you feel HMIS is an important system for hospital? *

Mark only one oval.

- ☐ Yes
- ☐ No

9. Do you feel any limitations with the HMIS usage from among the following? *

Tick all that apply.

- ☐ Privacy and security issues
- ☐ No real-time update
- ☐ Data migration
- ☐ Inter-operability
- ☐ Others

10. Which of the following issues do you face while using HMIS? *

Tick all that apply.

- ☐ Server down
- ☐ Connectivity issue
- ☐ System freezing
- ☐ Slow processing
- ☐ Number of clicks is too many
- ☐ Navigations in HMIS is complex
- ☐ Lack of equipment and hardware
- ☐ Lack of Features in HMIS

11. How many times you face difficulties while using HMIS? *

Mark only one oval.

- ☐ Everyday
- ☐ Weekly
- ☐ Monthly
- ☐ Yearly

12. For what purpose do you need and use HMIS? *

Mark only one oval.

- ☐ In order to seek patient related information
- ☐ For reducing medical errors
- ☐ For the purpose of medical records
- ☐ For clinical decision making

13. Is HMIS in your hospital interconnected with relevant departments of the hospital? *

(Connection with other departments)

Mark only one oval.

- ☐ Yes
☐ No
☐ Maybe

14. Does the system maintain the confidentiality of patient information? *

Mark only one oval.

- ☐ Yes
☐ No
☐ Maybe

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