

**ASSESSING THE IMPACT OF ELECTRONIC HEALTH RECORD (EHR)
SYSTEMS ON CLINICAL WORKFLOW IN A MULTISPECIALTY HOSPITAL
SETTING**

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of
Master of Business Administration (MBA)
in
Hospital and Health Management

By

Archana Sharma

Under the Supervision and Guidance of

Mr. S.P. Chatterjee

2024



MAXWELL
HOSPITAL

(Multi Speciality & General Hospital)



SHCO -2022-0638

CERTIFICATE

This is to certify that Archana Sharma in partial fulfillment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur has successfully completed her internship at Maxwell Hospital, Jaipur during March 14- June 13, 2024.

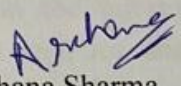
Place: Jaipur

Date: 26/06/2024

Managing Director
Maxwell Hospital, Jaipur

DECLARATION BY STUDENT

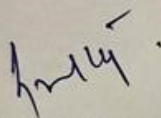
I hereby declare that this dissertation titled "Assessing the impact of Electronic Health Record (EHR) Systems on Clinical Workflow in a multispecialty hospital setting" is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution 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 Information derived from the published or unpublished work of others has been duly acknowledged in the text.


Name: Archana Sharma

Date: 4/7/2024

CERTIFICATE

This is to certify that the dissertation titled “**ASSESSING THE IMPACT OF ELECTRONIC HEALTH RECORD (EHR) SYSTEMS ON CLINICAL WORKFLOW IN AMULTISPECIALITY HOSPITAL SETTING**” is a record of the research work undertaken by **ARCHANA SHARMA** in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

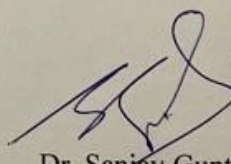


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ABSTRACT

Title: Assessing the Impact of Electronic Health Record (EHR) Systems on Clinical Workflow in a Multispecialty Hospital Setting

Background: The advent of Electronic Health Records (EHR) has significantly transformed healthcare documentation and information management. EHR systems are designed to streamline patient care, enhance data accuracy, and improve healthcare delivery. However, their impact on clinical workflows, particularly in multispecialty hospital settings, remains a complex and multifaceted issue. This study aims to investigate the influence of EHR systems on clinical workflows in a multispecialty hospital setting, focusing on time spent on documentation, communication, and collaboration among different specialties, patient consultation, and quality of care.

Objectives: The primary objectives of this study are:

1. to evaluate the time spent on documentation and data entry tasks with the EHR system.
2. to assess the impact of EHRs on communication and collaboration among different specialties.
3. to explore the influence of EHRs on patient interaction and quality-of-care delivery.

Methods: This cross-sectional study was conducted at Maxwell Hospital, Jaipur, an 85-bed multispecialty hospital known for its comprehensive range of medical services and advanced infrastructure. The study population included healthcare providers (doctors, nurses, and administrators) from various specialties who use EHR systems. A self-administered questionnaire was used to gather quantitative data on workflow changes related to EHR use. The questionnaire also assessed time spent on documentation before and after EHR implementation, the frequency with which EHR facilitates access to patient information, communication and collaboration using the EHR system, and clinician satisfaction with EHR usability and efficiency. Data was collected over three months, from March to June 2024. Approximately 20 clinicians were recruited using stratified random sampling to ensure proportional representation from different specialties. Data was analyzed using the statistical software EXCEL, with descriptive statistics summarizing participant demographics, EHR use patterns, and workflow metrics. Bivariate analysis will be conducted to identify potential associations between EHR use and workflow outcomes.

Results: The study aims to provide quantitative data on the impact of EHR systems on clinical workflows in a multispecialty setting. It was found that EHR implementation enhanced clinical workflow efficiency by reducing time spent on documentation, improving access to patient information, and facilitating better communication and collaboration among healthcare providers. Additionally, the study finds an increased level of clinician satisfaction with EHR usability and efficiency.

Conclusion: Understanding the impact of EHR systems on clinical workflows is crucial for maximizing their potential benefits in healthcare settings. This study contributed to the growing body of knowledge on EHRs, offering evidence-based recommendations for optimizing clinical workflows and enhancing overall healthcare delivery in multispecialty hospitals. The findings will help hospitals identify areas for improvement in EHR design and workflows, assist clinicians in understanding the time implications and

communication patterns associated with EHR use, and support healthcare policymakers in evaluating the impact of EHR implementation on clinical workflows across specialties.

Keywords: Electronic Health Records (EHR), Clinical Workflow, Multispecialty Hospital Healthcare Providers.

1. Introduction

Electronic Health Records (EHRs) have revolutionized healthcare documentation and information management. They offer a centralized platform for capturing patient data, facilitating communication and collaboration among healthcare providers, and potentially improving the quality of care delivery. However, the impact of EHR systems on clinical workflows, especially in multispecialty hospital settings, is complex and requires in-depth investigation. This study aims to explore how EHRs influence clinical workflows within a multispecialty hospital environment using the experiences of clinicians and the administrative workforce who regularly use EHR Systems for their work in the hospital.

1.1 Purpose of the Research: The primary purpose of this research is to assess the impact of EHR systems on clinical workflows within a multispecialty hospital environment. By focusing on various dimensions of clinical workflow—such as time spent on documentation, communication and collaboration among different specialties, patient consultation, and quality of care—this study aims to provide a comprehensive understanding of how EHR systems influence day-to-day clinical activities.

1.2 Problem Being Investigated: The integration of EHR systems into clinical practice, while intended to streamline operations and improve patient care, has presented several challenges. Issues such as increased documentation time, disruption of established workflows, and the need for significant changes in communication patterns among healthcare providers have been reported. These challenges can lead to decreased efficiency and clinician satisfaction, ultimately affecting the quality of patient care. Investigating these problems within the context of a multispecialty hospital is crucial for developing strategies to optimize EHR use and improve overall healthcare delivery.

1.3 Context and Importance of the Problem: Multispecialty hospitals, with their diverse range of medical services and complex organizational structures, provide an ideal context for studying the impact of EHR systems on clinical workflows. In these settings, efficient workflow and effective communication are critical for delivering high-quality patient care. The findings of this study are significant not only for the hospital under investigation—Maxwell Hospital in Jaipur—but also for other similar healthcare institutions aiming to enhance their EHR implementation strategies. Understanding the specific challenges and benefits of EHR systems in a multispecialty context can inform policy decisions, training programs, and system designs that better support healthcare providers.

1.4 Aims and Objectives of the Study: The study has several specific aims and objectives:

1. **Evaluate Time Spent on Documentation:** Assess how the implementation of EHR systems affects the time healthcare providers spend on documentation and data entry tasks.

2. **Assess Impact on Communication and Collaboration:** Investigate how EHR systems influence communication and collaboration among different medical specialties within the hospital.
3. **Explore Influence on Patient Interaction and Quality of Care:** Examine the effects of EHR use on patient interaction and the overall quality of care delivery.
4. **Provide Evidence-Based Recommendations:** Offer actionable insights and recommendations for optimizing EHR use to enhance clinical workflows and improve healthcare delivery.

By addressing these objectives, this research aims to contribute to the growing body of knowledge on EHR systems and provide practical guidance for healthcare providers and administrators to improve the efficiency and effectiveness of clinical workflows in multispecialty hospital settings.

2. Review of Literature

2.1 Introduction

Electronic Health Records (EHR) are comprehensive digital repositories that efficiently store patients' health information, allowing healthcare providers to access, manage, and share data. The significance of EHR in transforming healthcare delivery cannot be overstated. Real-time access to patient information enhances care coordination among various healthcare professionals, fostering a more integrated and patient-centred approach. Decision support tools embedded within EHR systems empower healthcare providers with critical insights, facilitating informed and timely decision-making.

Clinical workflow involves the structured enactment of a series of steps to perform a clinical activity. This exploration will delve into the advantages of EHR, examining how improved data accessibility, enhanced patient care, and increased efficiency contribute to the quality of healthcare delivery. This comprehensive review encapsulates the multifaceted impact of EHR systems on healthcare, drawing from a broad range of studies to provide a nuanced understanding of their benefits and challenges.

During this review process, it became evident that over the past decade, there has been a rapid shift from predominantly paper-based documentation to predominantly digital documentation. Most hospitals and ambulatory care providers worldwide now utilize at least a basic electronic health record (EHR). This shift was driven by the anticipation of significant improvements in quality and efficiency, as well as the potential to utilize digital data from EHRs to bolster clinical research, enhance quality of care, contribute to public health initiatives, and more. However, despite the huge potential of EHR and its extensive implementation, most studies reveal mixed results regarding the actual impact of EHR systems on healthcare quality and provider satisfaction.

While most clinicians appreciate the enhanced data accessibility and the ability to track patient history comprehensively with the use of EHR systems, others are of the view that issues such as usability, interoperability, and data accuracy must be addressed to realize these benefits fully. Nurses are, in most cases the front-line person who uses EHR, be it patient data entry or retrieving old patient records. The nurse practitioners agreed that EHR enables the review of a patient's history even before seeing the patient and makes clinicians' work more efficient. Also, they can check side effects and clarify notes with physicians before administering medication. However, EHR has become more complex over time, and completing EHR documentation makes them exhausted.

2.2 Benefits of EHR Systems

Numerous studies highlight the potential advantages of EHR systems. These advantages consist of:

1. **Enhanced Patient Safety and Quality of Care:** EHRs are linked with decreased medical mistakes, improved adherence to clinical standards, and better management of chronic diseases. Research has demonstrated that EHRs can support evidence-based decision-making and aid in preventive care measures.

2. Improved Data Accessibility and Coordination: EHR systems allow for real-time access to patient data, which is vital for coordinated care, particularly in multi-provider environments. This accessibility is crucial for timely and accurate clinical decisions, reducing unnecessary tests and procedures.

3. Cost Reduction: By streamlining administrative tasks and reducing paperwork, EHRs can help healthcare organizations save on costs. Additionally, enhanced efficiency in care delivery can result in shorter hospital stays and reduced overall healthcare expenses.

2.3 Challenges and Limitations

Despite the documented benefits, the literature also points out several challenges and limitations linked with EHR systems:

1. Usability Concerns: Many healthcare providers report usability issues with EHR systems, including complex interfaces, cumbersome data entry processes, and inadequate training. These issues can lead to frustration and decreased productivity among healthcare providers.

2. Interoperability: One of the main challenges with EHR systems is the lack of interoperability among different systems. This limitation hampers seamless data exchange and coordination across different healthcare settings, impacting the quality-of-care delivery

3. Data Accuracy and Integrity: Concerns about data accuracy and integrity are common, with some healthcare providers questioning the reliability of the information stored in EHR systems. Errors in data entry, outdated information, and inconsistencies can compromise patient safety and care quality.

Clinicians' Perceptions of EHR Understanding healthcare providers' perceptions of EHR systems is crucial to enhancing their design and implementation. The literature indicates mixed reactions among healthcare providers:

1. Positive Views: Some healthcare providers appreciate the improved data accessibility and the ability to comprehensively track patient history. They acknowledge the potential of EHRs to support better clinical decisions and enhance patient outcomes.

2. Negative Views: Conversely, other healthcare providers express concerns about increased administrative burdens, disrupted workflows, and the impersonal nature of electronic documentation. These negative perceptions can impact the overall acceptance and effective use of EHR systems.

2.4 Impact on Specific Healthcare Outcomes

1. Clinical Outcomes: Research has shown varied effects of EHR on clinical outcomes. Some studies indicate enhancements in chronic disease management, preventive care, and patient follow-ups. However, other studies suggest no significant change or even negative impacts due to issues such as alert fatigue and workflow disruptions.

2. Patient Satisfaction: Patient perspectives on EHRs are also diverse. While some patients value the transparency and involvement in their care facilitated by EHRs, others are concerned about privacy and the perceived depersonalization of care due to healthcare providers focusing more on computer screens than on patient interactions.

2.5 User Satisfaction and Workflow Efficiency

1. User Satisfaction: The satisfaction levels among users of EHR systems are influenced by factors such as system design, ease of use, and the extent of training provided. Studies suggest that more user-friendly interfaces and comprehensive training programs can enhance user satisfaction.

2. Workflow Efficiency: The impact of EHR on workflow efficiency varies. Some studies report improved efficiency due to better data management and streamlined processes, while others highlight increased time spent on documentation and administrative tasks, potentially detracting from patient care.

2.6 Implementation Challenges

1. Change Management: Implementing EHR systems necessitates significant organizational change, which may be met with resistance from staff. Effective change management strategies, including stakeholder engagement and continuous support, are vital for successful EHR adoption.

2. Training and Support: Adequate training and ongoing support are essential to ensure that users are proficient in using EHR systems. Insufficient training can lead to underutilization and misuse of the system, impacting its effectiveness.

2.7 Gaps and Future Research Directions

1. It was found that longitudinal studies with mixed methods are required to assess the long-term impacts of EHR on healthcare quality. This approach can provide insights into how EHR usage evolves and its sustained effects on clinical practice, but it was lacking in the review.

2. Many studies highlight usability issues with EHR systems, but there is a gap in understanding how specific design features impact user satisfaction and efficiency. More research is needed to identify best practices in EHR design that enhance usability and meet the needs of diverse healthcare providers.

3. studies exploring innovative interoperability solutions and their practical implementation in healthcare settings are needed.

2.8 Overview of some of the research done during the literature review on the use of EHRs in hospital settings:

1) A Qualitative Analysis of the Impact of Electronic Health Records (EHR) on Healthcare Quality and Safety: Clinicians' Lived Experiences

Author	Year	Objective	Summary	Outcome	Limitations	Linkage	Methodology
Soumya Upadhyay, Han-fen-Hu	2022	to explore the lived experiences of clinicians, to assess the role of EHR in improving the quality	the opinions of different groups of clinicians (physicians, hospitalists, nurse practitioners, nurses, and patient safety	The clinicians had a positive overall experience with using EHR. Clinicians' personal experiences further reveal	Since the study relies on semi-structured interviews, there is a potential for interviewer and respondent	nurses were found to be more positive about the efficiency improvements brought by EHR, whereas other clinicians	semi-structured interviews with clinicians were conducted from October 2018 to May 2019. The transcripts were coded using Qualitative Research Software

		and safety of healthcare.	officers) of varying health organizations using semi-structured interviews to assess the role of EHR .	varied opinions about the efficacy of EHR and underscore the difficulties in implementing EHR. Revamping the EHR and enhancing its implementation process could be potential strategies to improve its efficacy.	bias. The personal experiences and perspectives of the clinicians may not fully represent the broader clinician population.	found EHR to be time-consuming. Thus different job roles had different perception of the EHR.	(QSR Nvivo version 12) to derive themes and summarize concepts.
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2) The influence of electronic health record use on collaboration among medical specialties

Author	Year	Objective	Summary	Outcome	Limitations	Linkage	Methodology
☐ Janita F. J. Vos, ☐ Albert Boonstra ☐ Arjen Kooistra, ☐ Marc Seelen & ☐ Marjolein van Offenbeek	2020	To study collaboration among healthcare professionals using EHRs	Study on how EHR facilitates and constrains collaboration in five outpatient clinics.	EHR systems have the potential to significantly enhance collaborative practices in healthcare settings by providing accessible, shared, and comprehensive patient information. However, their actualization requires overcoming technical, organizational, and behavioral challenges.	The study was conducted in five outpatient clinics of a single Dutch hospital, which may limit the generalizability of the findings to other settings, especially those with different healthcare systems, cultures, and EHR implementations.	By identifying specific affordances and constraints of EHR systems, the study provides insights into how technology can support or hinder collaborative practices.	The relatively small sample size limits the generalizability of the findings to all settings

3) A comparison of physician pre-adoption and adoption views on electronic health records in Canadian medical practices

Author	Year	Objective	Summary	Outcome	Limitations	Linkage	Methodology
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Norm Archer , Mihail Cocosila	2011	To find the EHR perceptions of physicians already using EHR systems compared with those not using one, through the lens of theoretical model	There are not many differences in how physicians who already use EHR systems and those who do not yet use them perceive the adoption and use of these systems.	Improving EHR design, emphasizing their relevance to physicians, and providing evidence of their user-friendliness and effectiveness is key to increasing the success of new EHR implementations from a behavioral perspective.	The relatively small sample size limits the generalizability of the findings to all healthcare settings	The study investigates behavioral intention to continue using or adopt EHR systems, which is a crucial precursor to actual technology use.	an online cross-sectional survey where Data was collected both from physicians using EHRs and those not using EHRs, and analyzed with structural equation modeling (SEM) techniques.
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4) Exploring association between certified EHRs adoption and patient experience in U.S. psychiatric hospitals

Author	Year	Objective	Summary	Outcome	Limitations	Linkage	Methodology
Xuejun Hu , Haiyan Qu , Shannon H. Houser , Huoliang Chen , Xianzhi Zhang , Min Yu ,	2020	to examine the relationship between certified EHR adoption and patient experience across psychiatric hospitals in the United States.	Positive associations were identified between certified EHR adoption and five patient perception measures namely recommend hospital, overall hospital rating, discharge information, care transition and responsiveness of hospital staff.	The implementation of certified EHRs in psychiatric hospitals is linked to positive enhancements in patient satisfaction across these measures.	The design of the study limits establishing a direct cause-and-effect relationship between the adoption of certified EHR and improved patient experience as it is cross-sectional and only demonstrates associations, not causality.	This study provides evidence suggesting that certified EHR adoption in psychiatric hospitals is positively associated with patient experience, which is a crucial component of quality of care.	A cross-sectional study design where data were drawn from the American Hospital Association (AHA) Annual Survey Database and Hospital Compare datasets.

3. Research Methodology

3.1 Key research question:

What is the Impact of Electronic Health Record (EHR) Systems on Clinical Workflow in a Multispecialty Hospital Setting?

3.2 Research design:

This study employs a cross-sectional study design to evaluate the impact of Electronic Health Records (EHR) on Clinical Workflow in a Multispecialty Hospital Setting. The data collection period spans three months, April to June 2024, during which a digital questionnaire is administered to the respondents.

3.3 Setting:

This study is conducted at Maxwell Hospital, Jaipur, a multispecialty hospital and prominent healthcare facility in the region, known for its comprehensive range of medical services and state-of-the-art infrastructure. The hospital is equipped with modern facilities and advanced technology to provide high-quality healthcare services to patients. It is an 85-bed hospital offering various specialties and super-specialties, including cardiology, orthopedics, nephrology, urology, gastroenterology, and more, with a team of experienced doctors and medical staff.

3.4 Study population:

Healthcare providers (doctors, nurses) and administrators working in the hospital across specialties who frequently use electronic health records.

Inclusion Criteria:

- Clinicians (physicians, nurses, physician assistants, administrative staff) working in various specialties at Maxwell Hospital.
- Must have used the EHR system for at least 3 months.
- Willing to participate and provide informed consent.

Exclusion Criteria:

- New clinicians and administrative staff who are not familiar with the EHR system.
- Individuals unwilling to participate in the study.

3.5 Sample Size:

A sample size of 18 clinicians (physicians, nurses, physician assistants) and administrative staff was recruited. The sample is aimed at proportional representation from various specialties to ensure comprehensive insights.

3.6 Sampling Technique:

Stratified random sampling is used to ensure representation from different clinical specialties within the hospital.

3.7 Study Tools:

A self-administered online questionnaire in the form of Google Docs is used to collect quantitative data on workflow changes associated with EHR use. The questionnaire consisted of 21 questions covering the following factors:

- Changes in time spent on documentation before and after EHR implementation (measured in minutes per patient encounter).
- Frequency of EHR use to access patient information compared to previous methods.
- Frequency of communication and collaboration using the EHR system (e.g., messages sent/received per week).
- A standardized clinician satisfaction scale regarding EHR usability and efficiency.

3.8 Data Collection Procedure:

Recruitment- Clinicians (physicians, nurses, physician assistants) and administrative staff were invited to participate through online messaging app.

Consent- Informed consent was obtained from all participants before data collection.

Distribution- Questionnaires were distributed electronically through an instant messaging app.

3.9 Operational Definitions:

- **Electronic Health Record (EHR) System:** A digital version of a patient's paper chart, available in real-time and securely to authorized users, containing comprehensive patient data including medical history, diagnoses, medications, treatment plans, and test results.
- **Clinical Workflow:** The sequence of processes through which a patient receives care, including registration, consultation, diagnosis, treatment, documentation, and follow-up.
- **Workflow Metrics:** Measures used to evaluate the efficiency and effectiveness of clinical workflows, such as time spent on documentation, patient throughput, and communication times.
- **Error Rates:** The frequency of errors in patient records or clinical documentation, serving as an indicator of quality and safety in patient care.
- **Pre-Implementation Period:** The timeframe before the EHR system is operational, used as a baseline.
- **Post-Implementation Period:** The period after the full deployment of the EHR system during which the impact on clinical workflows is assessed.

3.10 Data Analysis Plan:

Data was analyzed using statistical software, EXCEL. The analysis includes descriptive statistics for summarizing participant demographics, EHR use patterns, and workflow metrics.

3.11 Ethical Considerations

The study adhered to ethical principles including informed consent, confidentiality, data security, and participant anonymity.

3.12 Implications of Research

This study aims to provide quantitative data on the impact of EHR systems on clinical workflows in a multispecialty hospital setting. The findings can inform strategies to optimize EHR use, improving efficiency and clinician satisfaction. The results will be beneficial for:

- **Hospitals:** Identifying areas for improvement in EHR design and workflows and improved training programs for hospital staff for efficient use of EHRs.
- **Clinicians:** Understanding the time implications and communication patterns associated with EHR use.
- **Healthcare Policymakers:** Evaluating the impact of EHR implementation on clinical workflows across specialties.

4. Results

In this study, the percentage distribution of respondents is shown in (Figure no.4.1). Most respondents were in the age group of 25-40 years working in different departments of Maxwell Hospital, Jaipur.

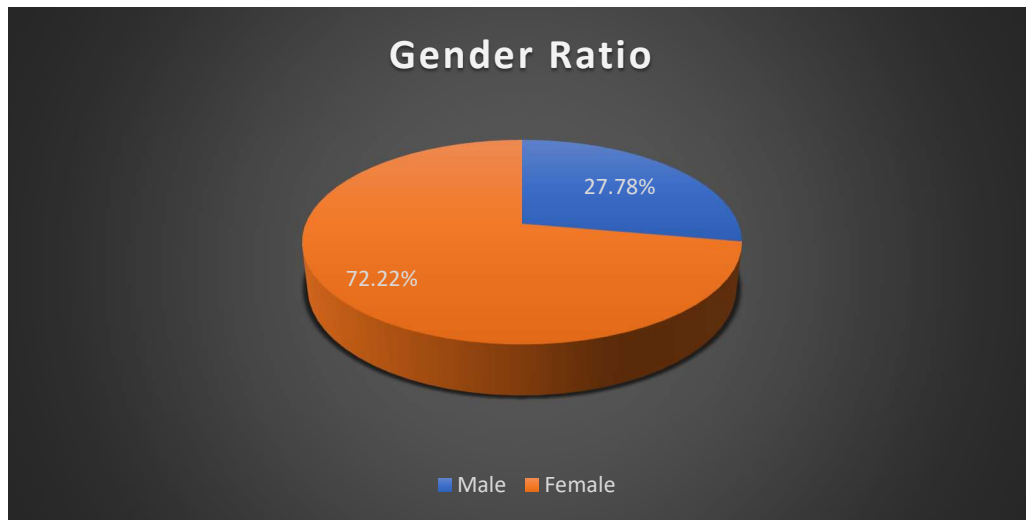


Figure 4.1: Percent distribution of respondents as per gender

Around 72% of the respondents were female and rest male. The gender ratio suggests that data is a little skewed as most of the feedback forms are filled by nurses and administrative staff where the majority are female employees.

The percentage distribution of respondents according to their job roles can be seen from the (Figure 4.2)

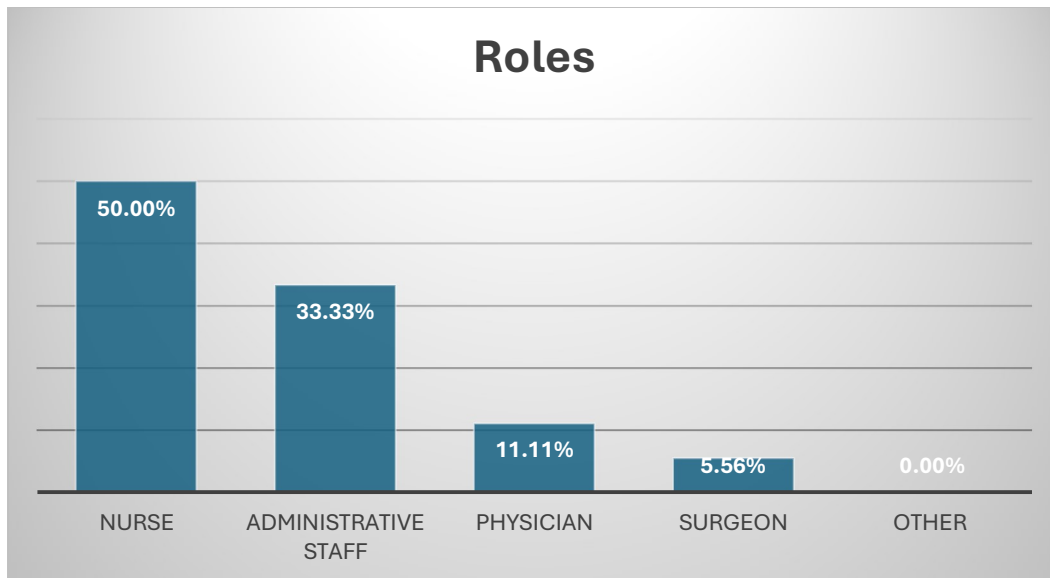


Figure 4.2: Percent distribution of respondents according to job roles

The study primarily focuses on three objectives. The first objective is to evaluate the time spent on documentation and data entry tasks with the EHR system. The following questions helped in assessing that:

How often do you use the EHR system for documentation and data entry?

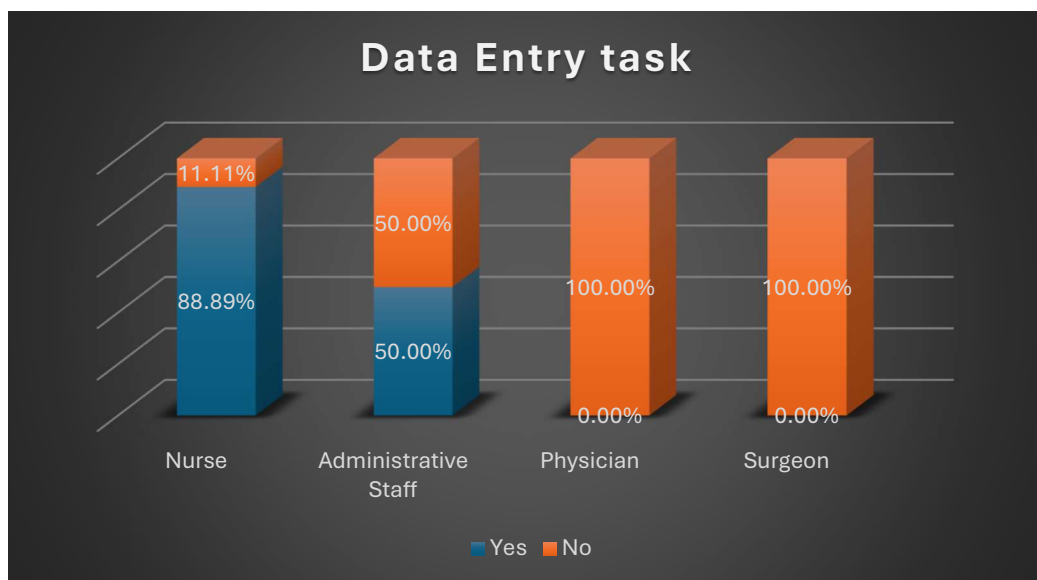


Figure 4.3: Percent distribution of data entry task done

Around 89% of the nurses were actively involved with the data entry of patient information in their electronic health records and 50% of administrative staff did the data entry task. Doctors were not involved in data entry.(Figure no.4.3)

What is the observation as to the time spent on documentation and data entry increased or decreased with the implementation of the EHR system compared to paper records?

It was observed that all the doctors who participated were in view that the documentation and data entry time decreased with the use of EHR, while one-third of the nurses (around 66%) and 83% of the administrative staff agreed on the same. (Figure no. 4.4)

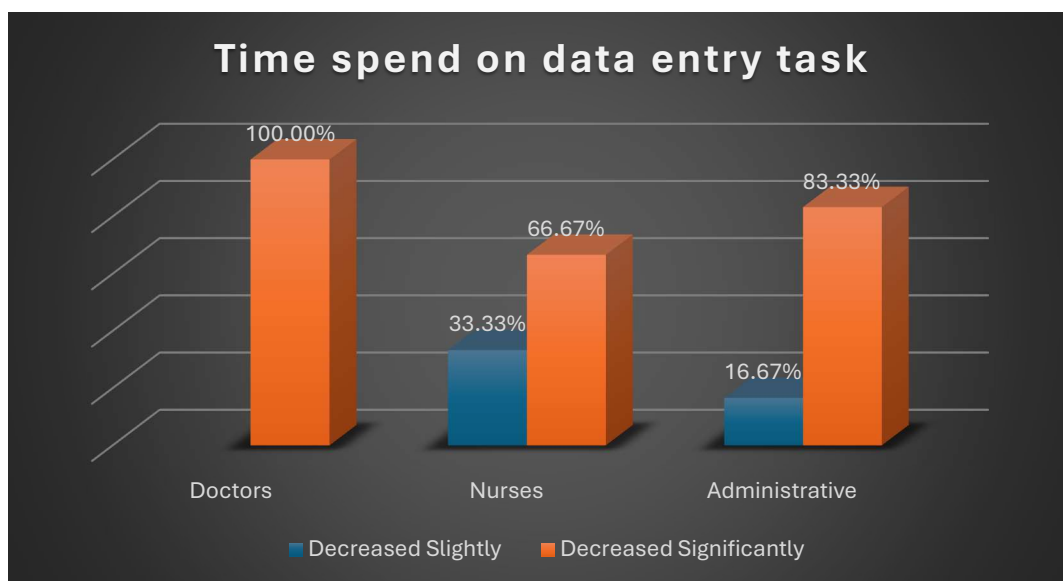


Figure 4.4: Percent distribution of time spent on data entry task in comparison to paper records

How would you rate the ease of use of the EHR system for documentation and data entry?

Most doctors (88%) found the EHR system Easy to use. Nurses (55%) found the system to be Easy to use and the rest nurses were neutral about it. Also, almost all the administrative staff found it Easy to use.

The second objective of the study was to assess the impact of EHRs on communication and collaboration among different specialties which was covered through the following questions:

How has the EHR system affected communication with colleagues from different specialties?

In the study, it was found that around 66% of doctors and 33% each of nurses and administrative staff agree that there has been significant improvement in communication with colleagues from different specialties after the introduction of EHR systems. However, 46% administrative staff mentioned worsening of the communication. (Figure no. 4.5)

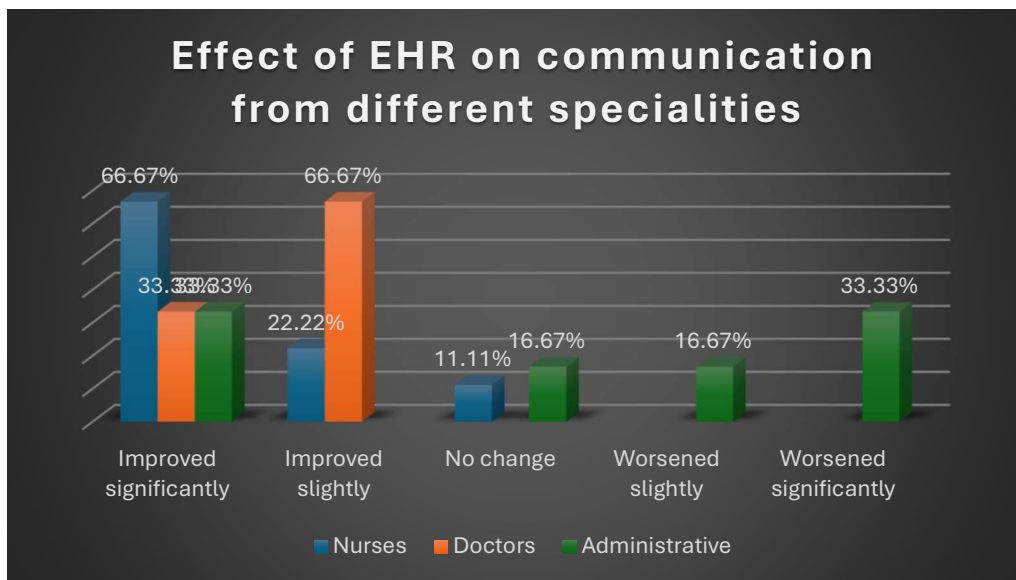


Figure 4.5: Percent distribution on EHR system effect on communication with colleagues from different specialties

Do you find it easier to collaborate with other healthcare providers using the EHR system compared to previous methods?

It was seen that two-thirds of doctors and nurses agreed on easier collaboration compared to previous methods which were mostly paper-based. However, administrative staff had mixed reviews. While most had agreed or were neutral on collaboration using EHR, 33% disagreed.

How often do you use the EHR system to communicate with other specialties?

All the doctors and nurses use EHR systems multiple times a day, while most administrative staff (83%) use EHR Systems multiple times a day or daily for communication with other specialties.

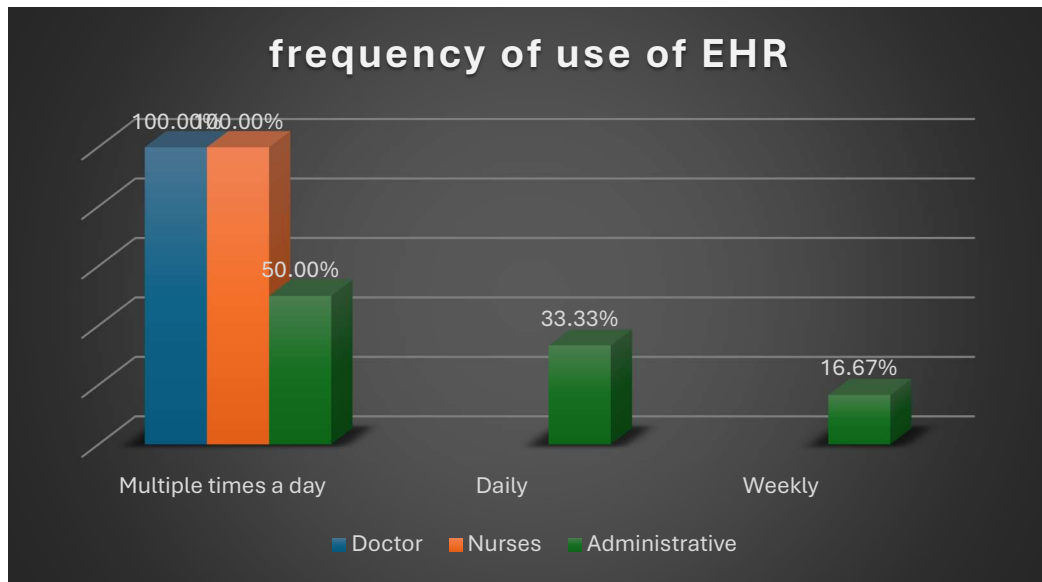


Figure 4.6: Frequency of use of EHR system to communicate with other specialties

- The third objective of this study was to explore the influence of EHRs on patient interaction and quality-of-care delivery. Following questions covered the objective:

How has the EHR system impacted the amount of time you spend with patients during consultations?

Around 66% of doctors (physicians and surgeons) agreed that the time they spent with the patients during consultations have reduced. Whereas only 55% nurses agreed that the time has reduced.

Do you feel the EHR system has improved the quality of care you deliver?

Around 50% doctors, 67% nurses and 78% administrative staff agrees that the introduction of the EHR system has improved the quality of care delivered to the patient. (Figure no. 4.7).

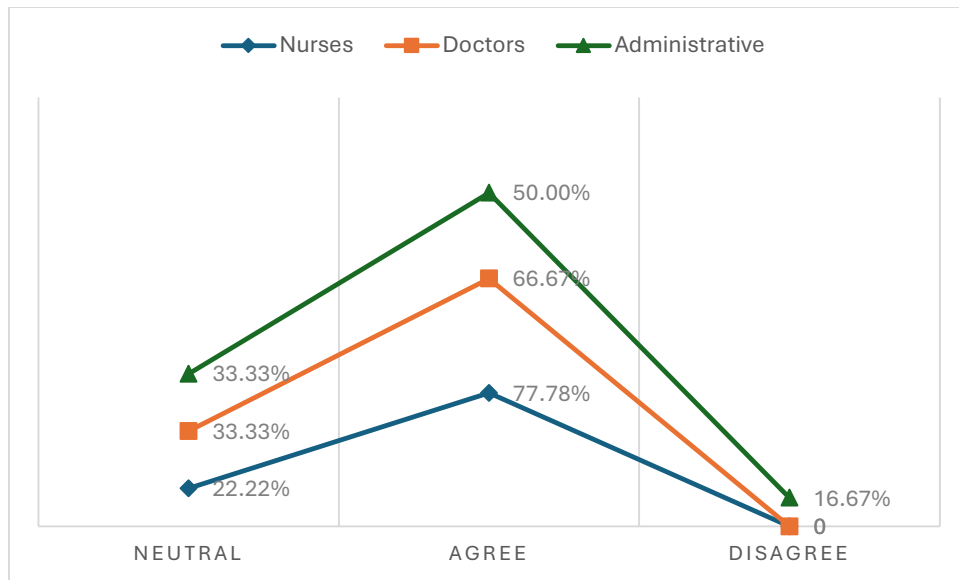


Figure 4.7: Percent distribution on whether EHR improves quality of care

Do you think the EHR system has reduced chances of medical errors by informing against potential interactions, allergies and contraindications?

Most doctors and nurses in the study disagreed that the EHR system has reduced chances of medical errors by informing against potential interactions, allergies and contraindications mainly because the EHR system currently used in the hospital did not had the feature of reporting drug interactions.

How often do you encounter issues with the EHR system that affect patient care?

Around 78% nurses, 67% doctors and administrative staff rarely encountered any major issue with the the EHR system that affect patient care.(Figure no. 4.8)

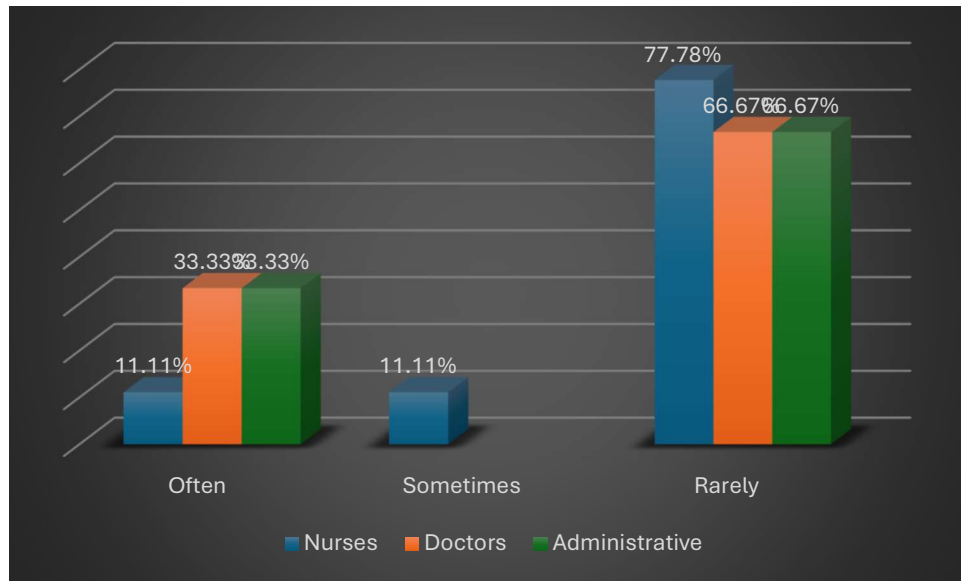


Figure 4.8: Percent distribution of you issues with the EHR system that affect patient care

Do you believe that the EHR system has made patient records more accurate and accessible?

Around 78% of doctors and 67% of nurses agree that the EHR system has made patient records more accurate and accessible while most administrative staff remains neutral. (Figure no. 4.9)

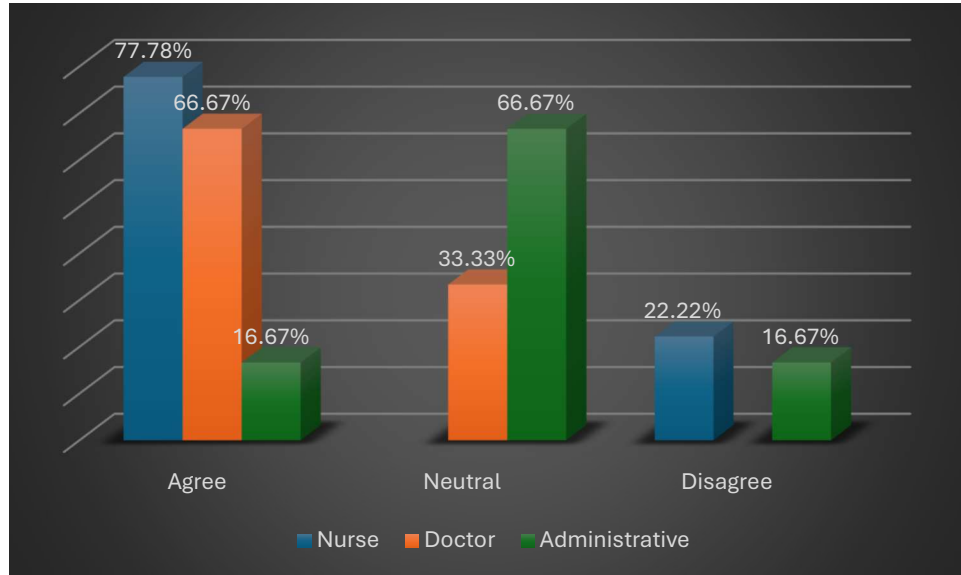


Figure 4.9: Percent distribution that EHR system has made patient records more accurate and accessible

Overall how satisfied are you with the EHR system?

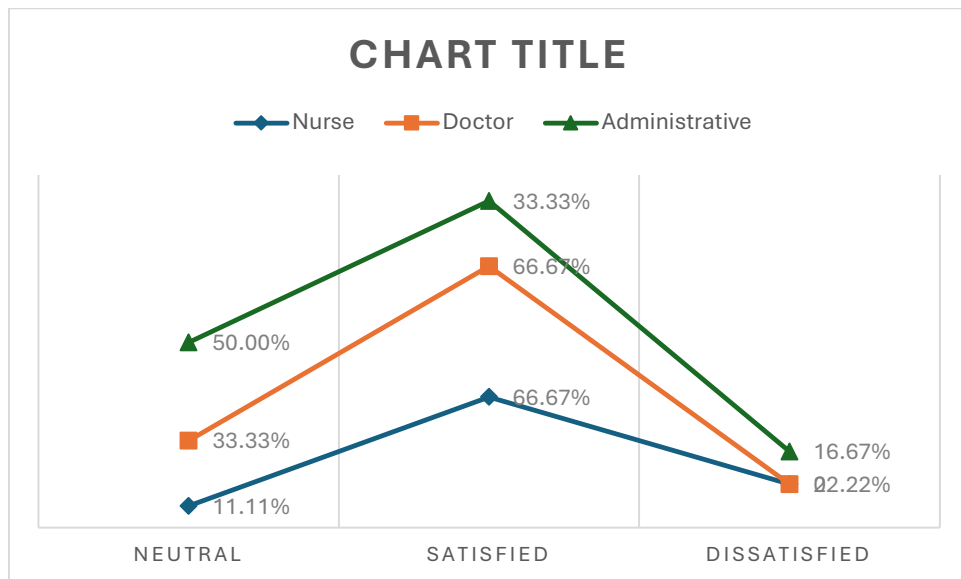


Figure 4.10: Overall satisfaction level with the EHR system

Two-thirds of doctors and nurses (66.67%) are overall satisfied with the EHR system while only 33% of administrative staff are satisfied. (Figure 4.10)

Would you recommend the current EHR system to other healthcare providers?

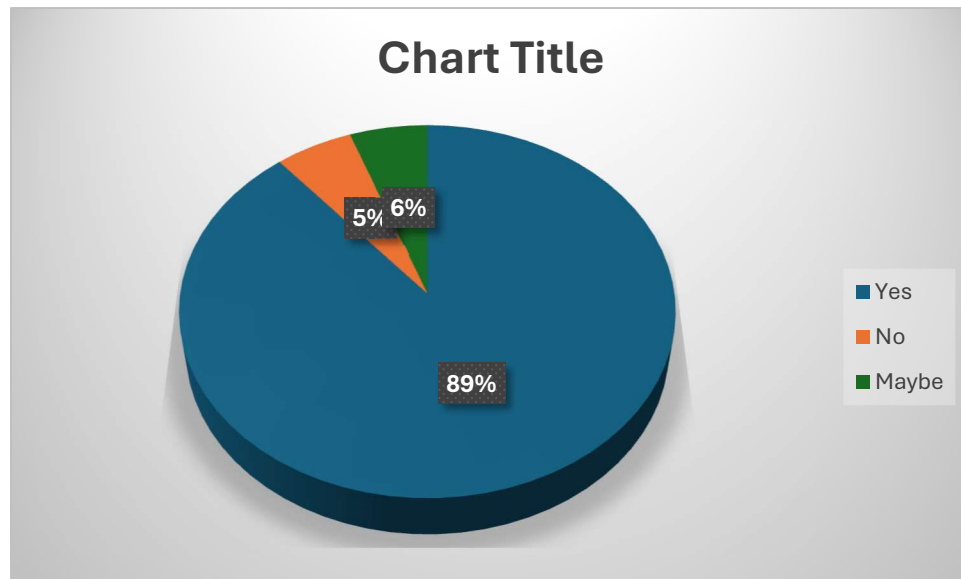


Figure 4.11: Percent distribution of recommending EHR to other healthcare providers

Most respondents (89%) agreed they would recommend EHR systems to other healthcare providers. (Figure 4.11)

Lastly, we provided an open-ended question for any additional comments or feedback regarding the EHR system or any suggestions.

The suggestions could be summed as follows: (Figure 4.12)

1. Data entry format can be improved.
2. Slow performance of the EHR systems can often delay patient care.
3. Many felt that the user interface could be improved.
4. Others

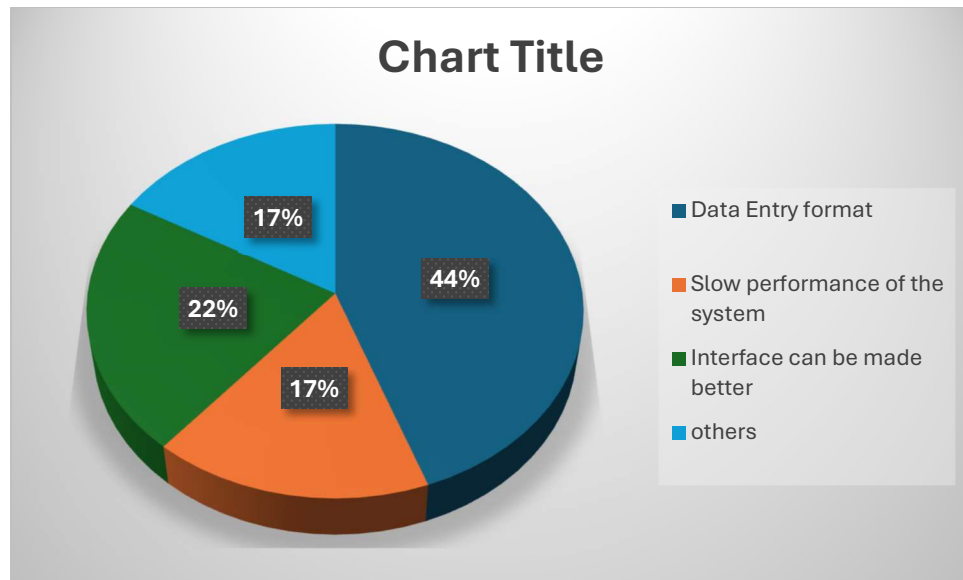


Figure 4.12: suggestions for improvements in the EHR systems

5. Discussion

Based on the feedback received from the clinicians and administrative staff of Maxwell Hospital, Jaipur following results can be inferred:

- The frequency of using EHR for documentation and data entry varies significantly among healthcare professionals as most of the documentation of a patient's medical history and data entry tasks are performed by nurses. Administrative staff is mostly responsible for patients' appointments, insurance settlements, and patient billing records. Physicians and surgeons are mostly responsible for consultation and treatment of patients.
- The majority of the respondents agreed that the time spent on documentation has decreased with the introduction of EHR due to the user-friendly interface and standard templates for filling in information. Also, digital records are easy to maintain when compared to paper records.
- Overall, the respondents found EHR is easy to use although there is an initial learning curve where they feel it is difficult as there is a lot of typing work plus they find it difficult to navigate the EHR system. Some nurses remain neutral, believing that EHR systems require more detailed information input compared to paper documentation, where they could summarize multiple observations in one entry. Administrative professionals find EHR systems easy to use over time as the structured data entry and search functionalities help in quickly locating patient documents and records.
- Doctors are of the view that with the help of EHR systems, they have immediate access to patient records and notes provided by other doctors which helps them in understanding the patient's treatment history and whether they are moving in the right direction or not. This is very important for patients where multiple doctors are working together as the EHR system helps them in better coordination and patient care.

Nurses also have similar feedback and added that EHR helps in reducing errors because of the consistency of information and avoiding the same treatment from a different doctor.

However, feedback from administrative professionals is mixed where some suggest that EHR systems have streamlined and helped in communicating with other specialities and reduced time in communicating with other departments as paperwork is reduced. But some have different views as they said they have to filter through extensive data sets to find related details. Also, some said some EHR systems are not compatible with each other causing difficulties in information sharing. Here, we can say that overall EHR system helped in improving communication among different specialities whereas administrative professionals highlight both benefits and hassle.

- Majority of doctors and nurses agree that EHR system is helpful in communication when compared to previous methods as EHR system provides real-time access to patient records their allergies and treatment history and even avoid treatment conflicts and also reduces the error due to any miscommunication whereas some of the doctors and nurses feel that it doesn't have much benefits

as it reduces the telephone or face to face interaction where some of the hidden things can be discussed for patients that are not there in EHR and believe that there time is consumed in EHR system learning and training which can be consumed in other tasks.

The administrative staff has mixed reviews where some are in favour, some neutral and some disagree. Those who disagree say that not all EHR systems are compatible, and a lot of technical glitches and downtime impact the collaboration.

- Most doctors and nurses use EHR systems to communicate with different specialities frequently where updates one by department are reviewed by doctors of other departments, especially in case of tests, X-rays, ultrasound etc.
- Doctors find that EHR systems have reduced the time spent with patients during consultations as EHR systems help them with the proper access to required information helping them with quick decision-making. However, they also believe more face-to-face interaction with patients helps to understand the patient's disease and the effect of the treatment plan.

The majority of nurses considered the time spent in consultations is reduced as they have a standard template where they can update the patient's information faster.

Administrative staff suggests that there is only a slight decrease in the time associated with patient interaction.

- Doctors do agree that with the help of the EHR system, there has been improvement in the care of patients as all the patient's history, medical records and allergies are available based on navigation that helps in reducing the errors and allowing doctors to suggest the best of treatment and all that helps in improving the patients care.

Nurses also have similar feedback as streamlined documents helps better communication with patients and as documents are updated in real-time that helps them to be aware of the latest care plans which all help them in delivering better quality care.

As EHR system helps administrative staff to organize and get proper access to patient information helping doctors and nurses improve the quality of care delivered by the healthcare providers.

Majority of the healthcare professionals agree that EHR systems improve the overall quality of care for the reasons mentioned above.

- Though one of the reasons for the implementation of EHR is to reduce medical errors, we have seen mixed feedback from nurses and administrative professionals whereas the majority of doctors remain neutral.

Most nurses and administrative staff agree that EHR systems have reduced medical errors but as most nurses enter the data in EHR systems; the technical and work-related disruptions while entering the data potentially lead to errors.

- The majority of respondents report that though, there are issues like system slowness, downtime for updates, more time taken to get the search output and technical glitches these do not affect patient care much and EHR is indeed reliable and mostly manageable.
- The majority of doctors agreed that EHR has improved the accuracy and accessibility of patients' records, histories and allergies. Standard templates and formats in which data needs to be filled help to reduce handwritten errors. Moreover, data can be accessed from anywhere and even remotely also helping doctors to study more about patients

Nurses also have similar feedback as ease of entering data and standard templates help to reduce errors that are caused mostly due to scattered information and also increase accessibility in minimal time.

On the contrary, the majority of administrative staff have neutral feedback as they tend to face continuous technical glitches, software update issues and data migration processes which make their stance neutral.

This explains majority of doctors and nurses express satisfaction with EHR systems whereas only 33% of administrative professionals are satisfied and 50% are neutral. And since the satisfaction level is good among the respondents, they highly recommend the current EHR system to other healthcare providers.

- Based on the feedback received from healthcare professionals. Below is the list of issues mostly common in the feedback provided:

Data Entry Format

The issue with the data entry is that different specialities have different requirements and preferences for the user interface. However, the EHR system uses a standard template which is not very helpful, and doctors need to spend time in navigating to access their required information. Also, several doctors have been concerned about the process through which data entry is made.

Slow performance of the system

Slow performance is another significant issue highlighted where the communication has been affected especially when happens in critical/emergencies as it diverts the focus of patient care

Interface Design

Most users find it difficult to navigate through the system and instructions are not very clear to drill down. This sometimes led to mistakes in data entry and retrieval. Therefore, most of the healthcare professionals demand clear instructions at the interface level.

Some highlighted similar problems as mentioned in the data entry format where different specialities need interface design according to their requirements. This I believe should be possible to create an interface at the user level.

Other Issues

Here healthcare professionals highlighted issues related to alert mechanisms where if any healthcare professional found any information wrong or misleading. He/she can tag or comment that this is not correct where it should be visible to others.

Some highlighted privacy concerns on patients' data as some healthcare professionals want to give limited access to other specialties and request more stringent controls

Some highlighted that regular trainings are not arranged therefore they are lacking with benefits of upgrades in the system.

Strengths of the Study

1. **Comprehensive Setting:** Conducting the study in a multispecialty hospital provides a diverse and comprehensive understanding of how EHR systems impact various specialties, making the findings more generalizable to similar hospital settings.
2. **Quantitative Data:** Self-administered questionnaires allow for the collection of quantifiable data on specific aspects of workflow changes, providing measurable insights into the impact of EHR implementation.
3. **Stratified Random Sampling:** This technique ensures representation from different clinical specialties, enhancing the results' robustness and reliability.
4. **Focused Objectives:** Clearly defined objectives and hypotheses provide a focused approach to investigating the research question, ensuring that relevant aspects of EHR impact are thoroughly examined.
5. **Operational Definitions:** Well-defined operational definitions ensure clarity and consistency in data collection and analysis.

Limitations of the Study

1. **Sample Size:** A relatively small sample size of 18 clinicians may limit the generalizability of the findings. A larger sample size would provide more robust data and potentially more significant results.
2. **Self-Reported Data:** Reliance on self-administered questionnaires can introduce bias, as participants may overestimate or underestimate their responses, affecting the accuracy of the data.
3. **Single Institution:** Conducting the study in a single hospital setting may limit the external validity of the results. The findings may not be applicable to other hospitals with different characteristics or in different geographical locations.
4. **Cross-Sectional Design:** This design captures data at a single point in time, which may not account for changes over time or the long-term impact of EHR implementation on clinical workflows.

5. **Potential for Non-Response Bias:** If certain groups of clinicians are less likely to participate, the study may suffer from non-response bias, affecting the representativeness of the sample.
6. **Limited Scope:** The study focuses on a specific set of workflow metrics and may not capture all aspects of clinical workflows affected by EHR systems.
7. **Technology Variability:** Differences in EHR systems' features and functionalities can vary significantly between different hospitals or even departments, which may affect the study's findings and their applicability to other settings.

6. Conclusion

With the help of analysis done on the feedback provided by various healthcare professionals. We can see that use of EHR is significant in the daily work of healthcare professionals whether they are doctors, nurses and administrative staff. However, we have received mixed feedback for some of the questions but the majority consensus highlighted the benefits listed below

- The time required for documentation is decreased
- Improved communication among healthcare professionals
- Helped in improving quality care
- Reduced the errors in documentation

However, also like to provide some recommendations on my end for the areas where the healthcare professionals were not very satisfied with the EHR system

Nurses and administrative staff are primarily responsible for documentation and data entry to improve the satisfaction level of EHR and concerns about errors related to data

- Regular training should be arranged
 - about processes of documentation and data entry should be captured correctly
 - How to navigate the interface to drill down and search required details
 - On template and how that is useful for healthcare professionals
 - How to use EHR system in communicating with different specialities
- Implementing the best EHR system (Speech to text capabilities) available that caters the problem highlighted by healthcare professionals Ex: typing issues highlighted by nurses, system slowness etc
- Task delegation can help as it avoids duplicate work

The above recommendations will not only help nursed and administrative staff in reducing errors in documentation and data entry but also addresses the data accuracy and system slowness concerns up to an extent highlighted by some of the doctors whereas the major concern highlighted by doctors that they need to have separate interface and data entry format as per their specialties. This can be achieved if

- Separate users' segments are created for each of the specialities and EHR systems should have different interface design for each of the user segments where some efforts can also be made to populate the data in the format requested by the specialities. However, this will be an additional cost for the organization so optimization needs to be done before execution

To address the issue related to Data privacy and security concerns highlighted by healthcare professionals

- Role-based user access can be designed to stop unauthorized access
- Sensitive information can be classified while sharing so that all should know that this is sensitive information
- Healthcare organizations should follow best-of-industry legally approved security protocols designed for data

Key Findings

Based on feedback provided by various healthcare professionals. Below are the key findings derived

- Different healthcare professionals use EHR systems for different purposes. Ex: Doctors mostly derive patients' records, and medical history whereas nurses apart from deriving patients' records do critical documentation and data entry
- EHR system has improved communication among different specialities as the patient's medical records, treatment plan and feedback from other doctors/ nurses are readily available as and when required
- With the help of the EHR system consultation time is reduced slightly some doctors appreciate this and say they can address more patients now whereas some highlighted that as face-to-face interaction with patients is reduced that may impact the treatment plan
- EHR systems have helped in improving quality care as they get the detailed knowledge of patient's medical history
- EHR systems have not influenced the majority on the reduction of medical errors as some healthcare professionals believe that the medical errors are slightly decreased whereas some highlighted that there are various errors due to typing and technical work related to documentation and data entry
- Effective use of EHR systems requires sometimes and training.

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