Factors Affecting Electronic Medication Administration Record Acceptability among Healthcare Providers

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PG/22/126
PGDM [Hospital and Health Management equivalent to MBA]

INTERNSHIP TRAINING
At
My Healthcare Technologies Pvt Ltd.

Under The Guidance Of
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International Institute of Health Management Research,
New Delhi, India
2024

Dated: 4th July 2024

TO WHOM IT MAY CONCERN

This is to certify that Soni Girsay, a student of IIHMR Delhi, is undergoing an internship as Management Trainee with MyHealthcare Technologies Private Limited since 4th March 2024 and she is continuing her internship as on date.

For and on behalf of MyHealthcare Technologies

Kuntal Sinha Roy
VP - Human Resource
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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Soni Girsay** student of **PGDM (Hospital & Health Management) from the International Institute of Health Management Research**, New Delhi has undergone internship training at **"My Healthcare Technologies Pvt Ltd."** from **March to June 2024.** The Candidate has successfully carried out the study designated to her during the internship training and her approach to the study has been sincere, scientific, and analytical. The Internship is in fulfilment of the course requirements.

I wish her all success in all his/her future endeavours.

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

Dr Mukesh Ravi Raushan
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Certificate of Approval

The following dissertation title **"Factors Affecting Electronic Medication Administration Record (eMAR) Acceptability among Healthcare provider: Secondary Desk Review"** at "**My Healthcare Technologies Pvt Ltd**" is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of PGDM (Hospital & Health Management) for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed, or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Certificate from Dissertation Advisory Committee

This is to certify that **Ms. Soni Girsay**, a graduate student of the PGDM (Hospital & Health Management) has worked under our guidance and supervision. She is submitting this dissertation titled **"Factors Affecting Electronic Medication Administration Record (eMAR) Acceptability among Healthcare provider: Secondary Desk Review"** at **"My Healthcare Technologies Pvt Ltd."** in partial fulfilment of the requirements for the award of the PGDM (Hospital & Health Management). This Dissertation has the requisite standard and to the best of our knowledge, no part of it has been reproduced from any other dissertation, monograph, report or book.

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INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH,

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CERTIFICATE BY SCHOLAR

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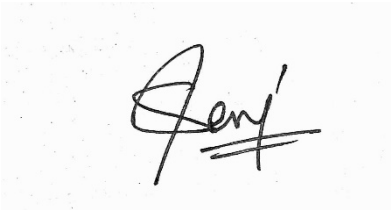

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Name of the organisation: My Healthcare Pvt. Ltd.

Area of Dissertation: Clinical Transformation / EHR

Attendance: 100 %.

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Deliverables: Monitoring EMR adoption issues and plugging in training gaps.

Strengths: Quick learner, committed, flexible & thorough, open to challenges.

Suggestions for Improvement:
Detailed requirement gathering
But overall good, good performer.

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8

Acknowledgment

Completing a dissertation is a significant opportunity for professional growth and learning. I feel fortunate to have had the opportunity to undertake my project at My Healthcare Technologies. The knowledge and experience I gained from the professionals in the organization have been invaluable.

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Table of Contents

List of Abbreviations

Symbol	Abbreviations
PCS	Patient Chart Summary
eMAR	Electronic Medication Administration record
EHR	Electronic Health Record
PHR	Personal Health Record
EMR	Electronic Medical Record
MAR	Medication Administration Error

Organization Profile

BACKGROUND

MyHealthcare Technologies is a digital health tech company that focuses on building an integrated, digital patient care ecosystem. The company collaborates with hospitals and clinics to create a comprehensive healthcare platform centered around patient-centric care delivery. The platform encompasses various aspects of healthcare, including doctor consultations (both physical and virtual), home diagnostics, pharmacy services, home healthcare, remote patient monitoring, preventive health, vaccination programs, and more.

One of the key goals of MyHealthcare is to bridge the gap in healthcare delivery using the latest advancements in digital technology. The company aims to create a data-driven care continuum process that enhances patient engagement and empowers individuals to manage their own healthcare needs and those of their families.

The MyHealthcare ecosystem revolves around the concept of a structured repository of a patient's clinical data and longitudinal history. It integrates all interventions and services offered through the platform, providing a comprehensive overview of the patient's healthcare journey. This approach allows for better coordination and continuity of care.

The digital healthcare ecosystem provided by MyHealthcare includes a 360-degree clinical management system for doctors and nurses. This system encompasses various platforms such as practice management, patient management, and electronic medical records (EMRs). EMRs are available for different specialties, including General Physician/Internal Medicine, Paediatrics, Endocrinology, and Cardiology. Additional EMRs for specialties such as Obstetrics & Gynaecology, Oncology, Dentistry, Ophthalmology, and Neurology are planned to be available soon.

MyHealthcare ecosystem includes a comprehensive library of care protocols and encompasses attributes for over 19,000 drugs. The availability of a patient's longitudinal history helps in managing emergency care needs, while the integrated care platform aims to improve patient experience and deliver better clinical outcomes.

MyHealthcare AI utilizes clinical data, treatment protocols, and big data generated from partner hospitals to develop augmented intelligence modules. These modules assist in

diagnosing conditions and offer complete cure process protocols, leveraging the power of artificial intelligence and data analytics.

The MyHealthcare platform incorporates various core platforms and features to provide a connected care ecosystem. These include:

Hospital Portal: A patient support platform for the hospital team to manage patient related activities and information.

Doctor/Nurse EMR & Practice Management: Web, mobile, and tablet platforms for doctors and nurses to manage electronic medical records (EMRs), practice management, and patient care.

Homecare nursing platform: Web and mobile platforms for managing homecare nursing services. Remote patient monitoring: Web and mobile platforms for monitoring patients remotely, including vital signs and health data.

Queue Management System (mobile): A mobile application to manage patient queues and appointments efficiently.

Fig.2:

The MyHealthcare Patient Platform allows patients from various regions to connect with doctors, seek appointments for virtual consultations or in-person visits, upload documents and notes, receive prescriptions, and manage their healthcare needs. The platform supports services such as diagnostics at home, pharmacy services at home, home care, remote patient monitoring, and home isolation monitoring.

MYHEALTHCARE PATIENT APPLICATION

The MyHealthcare Patient Application is an integrated ecosystem that allows patients and their families to manage their healthcare needs. It provides features such as patient registration, appointment booking for consultations, secure video consultations,

centralized storage of prescriptions and reports, booking diagnostic tests and health check-up packages, homecare service booking, e-pharmacy orders, profile management, family member registration, online payment options, coupon codes for promotions, tracking of bookings, document uploads, management of allergies and existing conditions, patient history management, personal health records (PHR), vitals tracking, device integrations for monitoring, viewing family prescriptions, invoice delivery, and a loyalty and rewards program.

MYHEALTHCARE DOCTOR OPD EMR

The MyHealthcare Doctor Platform helps doctors manage their virtual consultation and OPD consultations seamlessly, from a user-friendly web or mobile platform. The MyHealthcare Doctor Platform is integrated with all clinical platforms of a hospital such as the Hospital Information System (HIS), Laboratory Information System (LIS), Radiology Information System (RIS) and Picture Archiving and Communication System (PACS). The MyHealthcare Doctor ecosystem is integrated with the MyHealthcare patient platform, MyHealthcare@Home platform, the Queue Management System and Doctor Referral platform.

The MyHealthcare Doctor Platform helps providers better manage care for patients and provide better health care by:

• Providing accurate, up-to-date, and complete information about patients at the point of care

• Enabling quick access to patient records for more coordinated, efficient care

A. Functional Features MyHealthcare EMR Doctor Platform includes:

1. My Doctor Profile (view and edit details except Doctor Registration Number, Speciality, Mobile Number and Designation)

2. Calendar view of all appointments (virtual and OPD)

3. Create new appointment for registered patients (SMS will go with payment link; appointment will be held for 30 mins and get confirmed only upon successful payment)

4. Cancel appointments (as per configurable business logic)

5. Task based user journey for patient management

MYHEALTHCARE IPD EMR

EMR for In-Patient Department (IPD) manages hospital functions for admitted patients. Integrated firmly with the hospital HIS, LIS, PACS and other integral systems of the hospital. EMR IPD systematises processes related to the treatment.

Key components of IPD- EMR are mentioned below:

1. IPD- EMR for Doctors:

a) Order Management (CPOE): Doctor can order, acknowledge result, and edit or cancel any order e.g., Lab test.

b) Order sets for easy selection & placement of clinical orders

c) Medication review – hold/ resume, stop or renew medication order

2. IPD- EMR for Nurses:

a) Order Management: Nurse can view, track, amend and even cancel the orders. Access control based.

b) Supplies: Acknowledge, ward supplies, return or approve return of drugs

c) Medication Administration Record: EMR IPD allows nurse to administer medication records and perform several activities.

d) Patient Discharge: Give nursing clearance, view pending orders, view patient's discharge timeline, and send discharge cancellation intimations.

MYHEALTHCARE EMERGENCY EMR

Complete management of Ambulance starting from call receiving to dispatch, real-time tracking, and in-transit management of patients from command centre.

Triage and Vitals tracking with clinical markers, clinical alerts.

Single screen ER workbench to order and monitor service status, report tracker, capture clinical notes, medicine administration, referral tracking and length of stay.

Admission request tracker starting from the point of admission advice from the practitioner till the arrival in ward, which also helps track conversion.

Discharge Initiation, ER Visit Summary with configurable templates which can be automated, Nursing clearance and discharge.

Abstract

Factors Affecting Electronic Medication Administration Record (eMAR) Acceptability among Healthcare provider: Secondary Desk Review

Background

Technology is driving a global transformation, with healthcare being one of the sectors experiencing the most significant impact. The development of numerous technological advancements in healthcare aims to enhance patient safety and improve the quality of care. Among these innovations, the introduction of Electronic Health Records (EHRs), Electronic Medication Administration Records (eMARs) has sparked a new era in healthcare. The shift to digital technologies has led to more personalized and efficient healthcare services, primarily due to the enhanced functionality and comprehensive nature of EHRs. EMRs and medication administration records (MARs) are fundamental to modern medication management, providing a complete overview of a patient's medication history and current requirements. The workflow of the MAR is crucial for ensuring patient safety, legal compliance, informed decision-making, effective communication, and continuity of care. Proper implementation and management of MARs are essential for optimizing patient outcomes and fostering high-quality healthcare delivery.

Objective

1. To study the challenges healthcare institutions face using pen-and-paper method and eMAR as both are Medication Administration Record.
2. To study the factors (support and challenges) affecting the acceptability or adoption of eMAR in healthcare.
3. To study the proximate determinants of motivating to use electronic medication administration record (MAR) among healthcare professionals.

Method

The dissertation utilized a systematic review of literature to justify the study's objectives. The data were searched by different sites like PubMed, google scholar etc for relevant literature. Different key terms were used to identify potential sources to understand the factors supporting and barriers to adopting the electronic Medication Administration Record (eMAR).

Result

The transition from traditional pen-and-paper methods to eMAR marks a significant advancement in medication management within healthcare facilities. eMAR systems enhance patient safety by providing real-time data access, ensuring accurate and legible records, and offering automated alerts for potential drug interactions or allergies. They also contribute to workflow efficiency, freeing up valuable time for direct patient care by reducing the need for manual documentation. The success of eMAR adoption hinges on

system dependability and user-friendliness, ensuring that the technology is seen as an asset rather than a hindrance.

Conclusion

The primary objective was to thoroughly comprehend the challenges and resources that healthcare facilities encounter when implementing these systems. Additionally, the study aimed to investigate the factors that affect the acceptance and adoption of eMARs in clinical environments, as well as the motivations driving medical staff to embrace this technology. Key barriers to adoption and implementation identified include time constraints, resistance to change, and varying levels of computer literacy. Comfort with technology alongside their technical skills.

1.1 Background

Today, technology is bringing about a global revolution. Healthcare is one of the biggest sectors where these technological interventions have made a significant impact. There are numerous technologies that are being developed in health care to improve patient safety. Furthermore, technology is demonstrating its efficacy in the efficient and effective use of healthcare resources. The healthcare industry is one of the most rapidly changing, and the introduction of Electronic Health Records (EHRs), Personal Health Record (PHR), Electronic Medication Administration Record(eMAR) etc has begun a new revolution. Adoption of digital technologies has resulted in more personalized healthcare services. The acceptance of digital technology in healthcare is primarily due to improved functionality and EHRs. It is the first step to transform healthcare(1). In the modern healthcare landscape, the effective administration and recording of patient care procedures are crucial to guaranteeing the best possible treatment results and patient well-being. Electronic Medication Administration Records (eMAR) and Electronic Health Records (EHR) represent two essential elements within this framework. Despite their unique purposes, MAR and EHR systems are intrinsically linked, serving as mutually supportive components in promoting uninterrupted healthcare provision and improving the standard of patient care.

The Electronic Medication Administration Record (eMAR) functions as a crucial document within healthcare environments, offering a comprehensive account of medications dispensed to individuals during a specified timeframe. Historically reliant on paper, eMAR systems have progressed to digital forms, allowing healthcare practitioners to effectively record medication dispensation, observe patient reactions, and trace medication backgrounds. eMAR systems represent essential instruments for nurses and other healthcare professionals engaged in direct patient interaction, guaranteeing precision, promptness, and compliance with prescribed medication schedules(2).

Electronic Health Record (EHR) systems save a patient's medical history in text or photos. The patient's medical record may include demographics, medications, allergies, immunization status, laboratory test results, radiological imaging, vital signs, prescriptions, and billing information(3).

Electronic records of a patient's medical history in the form of text or pictures are called electronic medical record systems. It may include the patient's demographics, medication and allergy information, immunization history, test results from labs, radiological pictures, vital signs, prescriptions, and billing details in addition to their medical information(4).

EMR software contributes to improving both the effectiveness and calibre of care provided by the businesses. According to numerous published research, hospital settings may see a decrease in their expenses when they switch from paper records to electronic medical records (EMR). Additionally, it guarantees the security of patient care by enhancing openness and making all information readily available in one location(5).

1.2 Review of Literature

In many healthcare settings, the old paper-based drug administration method has been replaced by the electronic medication administration record, or eMAR, an eHealth system. Studies have indicated that eHealth technologies have the potential to alter professional roles and work practices in both expected and surprising ways.(6)

Why Electronic Medication Administration Record is need of current health system?

Drug administration technology is one type of information technology that has been promoted throughout the years to help reduce drug errors. It is made up of the automated medication dispensing system, the bar-code medication administration system, and the electronic medication administration record(7). According to the study, using bar codes to administer medications has a greater impact and is more effective at reducing drug errors. The acceptability of this technology by users, however, has frequently been overlooked. In the study, 676 drug administrations were recorded prior to the adoption of bar-code medication and 656 after it. On the other hand, the results indicate that with the deployment of bar-code medicine delivery, the drug administration error rate decreased to 0.76%, a relative decrease of 74.2% (8).

Addressing medication mistakes and associated harm can be greatly enhanced by promptly identifying drug administration errors (MAEs) (8). As new research is published, we learn that medication errors and health information technology usability are related. This suggests that usability can lower medical errors and increase patient safety (9). A study was conducted to examine the relationship between medication errors and usability issues related to the electronic drug administration record (eMAR) using patient safety event reports (PSEs). By analysing PSEs, the study was able to identify a

number of eMAR usability issues that lead to medication errors. Results show how important it is to enhance the eMAR user interface. Better vendor usability testing, eMAR-focused certification testing, improved interface design, taking work system factors into account, eMAR–focused usability and safety testing by health care facilities can improve eMAR technology and patient safety (9).

Medication mistakes can happen during one or more stages of the medication procedure. One major element affecting the standard of patient care is medical error. "Any preventable event that may cause or lead to inappropriate medication use or patient harm" is how the Council of Europe and the British Department of Health defined medication errors.(9).

Personal Health Records (PHRs) reveals a multifaceted landscape. While some studies highlight positive attitudes towards PHRs, citing benefits such as enhanced patient engagement and communication, others underscore challenges such as usability issues, data security concerns, and resistance to change. Key factors influencing acceptance include perceived usefulness, ease of use, interoperability with existing systems, and training and support(10).

1.2.1 Adoption of EHR

In the United States, an initiative was launched to establish EHR for most of the population by 2014, leading to the creation of the Office of the National Coordinator for Health Information Technology in 2004. Recent research conducted by the HIMSS revealed that merely 1.1% of hospitals have fully transitioned to paperless systems, while nearly 90% are in the process of shifting from PBMR to EHR. Similarly, within Canada, no hospital has achieved complete paperless status as of now; however, close to 50% of healthcare facilities have initiated partial integration of EHR systems, with ongoing governmental endeavours to further facilitate this implementation. The National Health Service in the United Kingdom established a goal in 1998 to have electronic medical records operational across all its trusts by 2005. Nevertheless, by 2002, only 3% of the trusts had managed to meet this objective, primarily due to financial limitations and a deficiency in essential IT standards. European countries like Sweden, the Netherlands, Denmark, Finland, and Austria have high percentages of GPs using electronic medical records, with initiatives for cross-border EHR implementation by the European Commission(11).

According to the Institute of Medicine and other sources, increasing patient safety and the standard of healthcare might be greatly aided by the widespread use of EHRs. The

price of ambulatory care may also be decreased with the use of EHRs. Nevertheless, there are significant obstacles to adoption even in light of growing information regarding the advantages of EHRs(12). About twenty prominent hospitals participated in the seven-month pilot program, during which the EHR system was effectively installed. China (96%), Brazil (92%), France (85%), and Russia (93%) are the top four countries in the world in terms of EHR adoption rates. According to CAGR data, the worldwide market for electronic health records is expected to reach US$25.98 billion in 2020. The main obstacles to EHR implementation in India are interoperability standards difficulties, funding shortages, and a lack of appropriate governance and health policies(13).

Despite the international pressure to improve the standard, quality, continuity, safety, and effectiveness of healthcare and the high expectations and activity surrounding, the adoption rate of Electronic Medical Records (EMRs) is extremely low. Over fifty per cent of electronic medical records (EMRs) might not work properly or at all(14).

1.2.2 Medication Error

Errors are a fundamental aspect of the human experience, often stemming from the inherent process of cognitive and behavioural adjustments that foster the acquisition of appropriate behavioural competencies. The proper implementation of medical directives plays a crucial role in the recuperative journey and overall well-being of patients, constituting a key element in the performance of nursing duties and significantly contributing to ensuring patient welfare. Adverse consequences on patient safety and treatment expenses can be markedly impacted by medication errors, posing risks to both patients and their families. Giving medication stands out as a pivotal responsibility for nurses, given that inaccuracies in this task can lead to unforeseen and severe implications for the individual receiving care(15). The occurrence of medication errors bears the potential for unfavourable results such as heightened mortality rates, prolonged hospital stays, and increased healthcare costs, with nursing-related medication errors standing out as the most prevalent among all healthcare team members(15).

Medication mistakes can happen at any point during the prescription procedure. One significant element affecting the standard of patient care is medical mistake. pharmaceutical errors are defined as "any preventable event that may cause or lead to inappropriate medication use or patient harm" by the Council of Europe and the British Department of Health(16).

Proper use of medication is crucial for effective medical treatment; however, medication errors occur frequently, especially during prescribing, administration, and recording. Medication administration is crucial since it is the last stage in the medication distribution process. Errors in early steps can be corrected by the healthcare worker in the next step (e.g. nurses can rectify dispensing errors). After the administration of medication, only responsive patients may notice an error. When a patient is not responsive, this last possibility of correction fails and therefore medication administration errors have a great likelihood to result in patient harm(17).

Reviews have suggested that up to 50% of adverse events in the medication process may be preventable. Thus, the medication administration and its documentation process are an important area for safety improvements(18).

Medication administration error (MAE): Dose or rate recorded in the eMAR does not match the medication dose or rate ordered in the medication order or medication order audit.

Medication errors cost an estimated US$42 billion in a single year. This comprises 0.7% of total global health expenditure(19).

1.2.3 Documentation

Nursing documentation is critical in assuring patient safety, care quality, and regulatory compliance in healthcare facilities. The method of medication documentation using pen and paper entails the manual recording of various details related to medication administration, including the patient's identity, prescribed medication, dosage, administration route, date and time of administration, as well as the healthcare professional's initials or signature on paper-based forms or charts. Traditional pen and paper methods have long been the foundation of nursing documentation procedures.

Pros of Traditional pen and paper methods

There are few advantages associated with utilizing Traditional pen and paper methods paper in the contemporary era. Nevertheless, conventional paper-oriented frameworks are uncomplicated to instruct and grasp by new members of staff. Possessing tangible information and documents readily available can prove advantageous when duplication and dissemination to relatives or healthcare providers are necessary. Moreover, the healthcare team is relieved of concerns regarding system failures or upkeep.

Cons of Traditional pen and paper methods

The use of pen and paper for medication recordkeeping presents numerous issues in modern healthcare settings:

Firstly, it is susceptible to errors such as handwriting mistakes, illegible entries, and errors in transcription, thereby elevating the likelihood of medication errors. Secondly, manual documentation is time-consuming, demanding healthcare practitioners to dedicate considerable time to writing and updating medication records, time that could be more effectively utilized in providing direct patient care. Moreover, paper-based medication records are typically kept in physical files or charts, posing challenges in remotely accessing patient data or promptly sharing it with other healthcare professionals. Additionally, paper-based medication documentation systems may not integrate seamlessly with electronic health record (EHR) systems, resulting in fragmented patient information and inefficiencies in healthcare provision. Lastly, analysing medication administration patterns and recognizing trends in medication usage or errors proves to be challenging with paper-based documentation systems. However, these challenges, prompting the exploration of alternative solutions such as Electronic Medication Administration Record (eMAR) systems(20).

Factors supporting usability of eMAR:

The eMAR's purpose in medicine administration is the link between medication errors and the staff. The eMAR help medical practitioners to ensure that the correct medicine is given to the right patient at the right time in the right dose via the right route. It does this by precisely documenting each medication that is provided to a patient.

The eMAR is an essential tool to identify variances between what was intended and what was provided when medication errors occur. It enables medical professionals to track down and investigate any drug regimen deviations, making it easier to analyse the mistake and put preventative measures in place to stop it from happening again.

Electronic Medication administration record (eMAR)

Electronic Medication administration records (eMAR’S) are official documents, typically presented in the format of a chart or table, utilized for documenting the dispensation and ingestion of medications by an individual, which subsequently become integrated into their enduring care/medical dossier. Some components commonly included in eMAR documents are:

- A column enumerating the names of prescribed medications.
- The specific time and date of medication administration.
- The initials denoting the employee participating in the medication process.
- A designated commencement date and conclusion date.
- if ascertainable Details facilitating the identification of an individual such as date of birth, allergies, diagnoses, among others.

eMAR serves as a vital tool in ensuring the safe and effective administration of medications within healthcare settings. It documents essential information such as medication names, dosages, administration times, routes, and patient responses, thereby facilitating accurate medication management and promoting patient safety. By providing a comprehensive record of medication administrations, eMAR enable healthcare professionals to track patient adherence, monitor for adverse reactions, and identify potential medication errors.

Pros of eMAR

It reduces errors by solving the issues that would face with pen and paper method. It will automatically record what your stock levels of each medicine are, and the stock will be reduced after administration of medicine. The eMAR is used to document medication administration and other assigned activities. It includes a worklist created by the nurse, which details the activities to be completed for each patient—for example, provide medicines to patient X at 8 PM. The eMAR is a stand-alone system that does not communicate with the EHR. More specifically, it includes a web-based administrative interface for a computer and an eMAR mobile app. The eMAR on the computer is only accessible to system administrators and authorized persons (nurses and doctors). Nurses use computers to develop worklists and handle delegations. The eMAR provides information and statistics on signed and unperformed interventions at the individual and group levels(2).

Transitioning from the traditional pen and paper approach to Electronic Medication administration records (eMAR) presents a multitude of advantages:

Enhanced Precision: The utilization of electronic documentation diminishes the likelihood of errors linked to unreadable handwriting and transcription inaccuracies, ultimately enhancing the precision of medication records.

Enhanced Efficiency: eMAR systems streamline the processes involved in medication documentation, thereby economizing time for healthcare practitioners, and enabling them to devote more attention to patient care.

Enhanced Accessibility: Electronic medication records can be securely accessed from any authorized device with an internet connection, facilitating prompt retrieval of patient data and promoting communication among healthcare providers.

Integration with Electronic Health Records (EHR): eMAR systems have the capability to seamlessly integrate with electronic health record (EHR) systems, fostering smooth information exchange and enhancing the continuity of care.

Decision Support: Electronic medication documentation systems frequently incorporate embedded decision support functionalities, such as alerts for drug interactions and calculators for dosages, aiding healthcare professionals in making well-informed decisions related to medication.

Improved Patient Safety: eMAR systems eliminate the potential of misinterpretation in medicine delivery compared to handwritten data. Furthermore, they automatically cross-reference prescriptions with patient medication histories to identify potential interactions or allergies before medication is dispensed, reducing adverse occurrences.

Promotes Quality Improvement: eMAR systems help healthcare professionals create and implement evidence-based medication regimes. Through data aggregation and analysis, clinicians may compare their prescribing behaviours to those of larger patient populations, enabling ongoing quality improvement.

Improves Practice Efficiency: By digitizing drug administration records, eMAR systems simplify workflows and minimize administrative burden. This efficiency advantage translates to faster access to patient information, less time spent on manual procedures like chart retrieval and prescription renewals, and overall increased practice productivity.

Background:

Medication Administration Record (MAR) often faces resistance from staff, leading to decreased efficiency, user dissatisfaction, and a potential return on investment (ROI) short fall. To address this challenge, healthcare institutions are increasingly implementing electronic Medication Administration Records (eMARs) alongside standardized workflows. While eMARs offer numerous advantages, such as improved accuracy and legibility, reduce medication error.

This study will provide valuable insights into factors affecting the acceptability of the eMAR workflow. By understanding staff perspectives and challenges, healthcare institutions can implement strategies to improve user adoption and optimize the benefits of the eMAR system, ultimately enhancing patient safety and medication administration efficiency.

2.1 Search Strategy

The dissertation utilizes the systematic review of literature to justify the objectives of the study. The literature was search using academic and electronic databases such as:

1. PubMed,
2. Science direct,
3. Scopus,
4. JStor,
5. Library of various universities and
6. Google Scholar.

The key terms were used to search the potential literatures to understand the factors supporting ad barriers in adopting the eMAR. The following Keywords were use to search the literatures. Sometimes the combination of these keywords was also used. Those key terms were such as:

#Barcode,

#Factors affecting,

#Attitudes affecting,

#Barrier affecting,

#Evaluating affecting,

#Experience affecting,

#Opinion affecting,

#Perception affecting,

#Medical administration Record,

#resistance,

#acceptability,

#Medication error,

#eMAR.

2.2 Inclusion Criteria

1. The inclusion criteria will be those studies published in English from 2005 to 2024 which focus on examining factors affecting healthcare staff acceptance/adoptability of eMARs (e.g., user interface design, training, individual characteristics), impact of eMAR implementation on medication errors.

2. Only full article available freely and downloadable were included in the study.

2.3 Exclusion Criteria

1. Studies not directly related to healthcare, PHR, EMR, MAR other than not matching with time frame were excluded.

2. Nonpublished research articles which are not published in blind peer reviewed journal or working papers, chapters were excluded for the study.

3. The reviewed research articles were excluded from the study.

4. Duplicate references were excluded, as were references without abstracts and full text.

5. Those did not specifically either relate to health or focus on electronic medication administration record, both were excluded.

6. Commentary, editorial or news/presses, documentation, summary executive and report of conferences or any national/international policy and announcement and books, as well as papers described intentions to implementation, but not implementation experiences were not included.

7. The studies were accepted regardless of qualitative or quantitative research and health care setting. 8. I studies which are published in non-English language, or unpublished were also excluded.

Data Source of the Literatures:

The data sources included PubMed, National Library of Medicine (NLM), Google scholar. In each database, the search terms were searched.

2.4 Process Method

Study techniques throughout the selection process, inclusion and exclusion criteria were established to make sure the papers that were chosen could address the research topic. A four-step screening procedure checklist was created to weed out irrelevant studies.

Step 1: Based on the results of each database's search criteria, the study titles were skimmed. When a study was identified in the database, it was indicated by the terms "barrier affecting," "electronic medication administration records," "eMAR," "computerized," "factors affecting," or any other associated vocabulary. **Step 2**: Studies that weren't eligible were filtered with the aid of inclusion and exclusion criteria. For instance, research without an abstract that was published before to 2005. **Step 3**: These eligible studies' abstracts were evaluated based on the following criteria: they had to provide detailed information about the study's design, results, and whether or not the eMAR function was mentioned in the study links. The studies in the database were removed if they did not meet the requirements. These studies' worth of data was combined and organized into a database with the most and least important information at the top. **Step 4**: The data collected in Step 3 was methodically combined and expanded upon by grouping all of the results into two main categories: positive and negative variables.

2.5 Data Extraction

Relevant information, including the source of resistance, factors affecting acceptability, theoretical frameworks, and strategies, will be extracted from selected studies.

2.6 Data Analysis

Compare the findings from different studies to highlight similarities and differences for creating improvements and future research. Also ensure that data analysis is clear, concise, and logically structured.

2.7 Research Question

Q1. What challenges healthcare institutions, face in transitioning from pen-and-paper method to eMAR?

Q2. What is the impact of MARs on healthcare staff workflows, including efficiency and time management? Is it supportive or more challenging?

Q3. What is the various logistic cost including on training required to implement the eMAR by health care staff?

Q4. How do training and support affects the hospitals in adoption of MAR?

2.8 Objectives

1. To study the challenges and support healthcare institutions, face using pen-and-paper method and eMAR as both are Medication Administration Record MAR.

2. To study the factors (support and challenges) affecting the acceptability or adoption of eMAR in healthcare.

3. To study the proximate determinants of motivating to use electronic medication administration record (MAR) among healthcare professionals.

Chapter 3: Challenges for the healthcare institutions in accepting the eMAR and pen and paper method in healthcare

Background

Medication administration and management in healthcare facilities have historically been documented via pen-and-paper techniques. But as technology has developed, electronic Medication Administration Records(eMAR), have proliferated. While recording medicine delivery is the goal of both systems, their usefulness and dependability in healthcare settings are impacted by different forms of assistance and barriers.

Challenges faced by institutions using pen-and-paper methods

The conventional pen-and-paper approach to nursing documentation, as examined in the study "Usability Testing of Digital Pen and Paper System in Nursing Documentation," presents numerous challenges that can impede the efficiency and effectiveness of healthcare delivery. One of the primary issues is the significant amount of time required for manual documentation. Nurses and other medical personnel often spend extensive periods recording patient information, prescription details, and other vital data on paper. This meticulous and time-consuming process detracts from the time available for direct patient care, especially during hectic shifts or emergencies, where the demand for accuracy and thoroughness in documentation is paramount. Human error is another inherent risk associated with manual documentation systems. Illegible handwriting can lead to the misinterpretation of critical information such as prescription dosages or patient allergies, potentially resulting in severe consequences for patient safety, including medication errors and inappropriate treatments. Additionally, pen-and-paper systems are notoriously inefficient when it comes to information exchange and retrieval. Physical records stored in folders can be challenging to locate quickly, causing delays in treatment, particularly in urgent care scenarios where timely access to patient records is crucial. The manual transfer or copying of these documents not only prolongs the process but also increases the risk of loss or damage.(1)(10)

Moreover, traditional documentation methods hinder data integration and analysis. Paper records, being discrete data sets, are difficult to compile and systematically examine, limiting healthcare facilities' ability to conduct comprehensive audits, identify patterns, and implement evidence-based practices. This challenge hampers efforts to improve

healthcare quality and efficiency through data-driven decision-making. The logistical burden of space and storage further exacerbates the situation. Maintaining vast quantities of paper records requires substantial physical space, a growing concern for large hospitals with high patient volumes. Over time, these records can become cumbersome, necessitating additional resources for storage and management, compounded by the legal requirement to retain documents for extended periods.

Privacy and security concerns are also prominent with manual record-keeping. Paper records are vulnerable to theft, unauthorized access, and environmental damage such as fire or water, making it difficult to maintain patient confidentiality. The ease with which physical documents can be misplaced or accessed by unauthorized personnel heightens the risk of privacy breaches. Updating records manually adds another layer of complexity and potential error. Each modification must be entered by hand and ensuring that all copies of the record reflect the latest information can be challenging in fast-paced healthcare environments where patient conditions can change rapidly. Incomplete or outdated records can lead to inappropriate care decisions, emphasizing the need for timely and accurate updates.(20)

These challenges underscore the critical need for more integrated, accurate, and efficient documentation systems. Solutions like electronic Medication Administration Records (eMAR) offer significant improvements by addressing many of these issues, ultimately enhancing the overall quality of healthcare delivery. (21)

Supports hospital get by using pen-and-paper method

Despite the myriad challenges associated with pen-and-paper methods in nursing documentation, there are notable advantages that support its continued use in some hospital settings. As a traditional approach that has been employed for hundreds of years worldwide, pen-and-paper documentation offers significant benefits, particularly in terms of accessibility, ease of use, and versatility. One of the primary advantages of this method is its simplicity and user-friendliness. Unlike electronic systems, the paper-based approach requires minimal training, making it especially beneficial in environments with high staff turnover or where temporary personnel are frequently employed. With basic instruction, nurses and other healthcare workers can quickly understand and implement the medication administration process without the need for extensive training sessions on new technologies. This simplicity ensures that all staff members can promptly and efficiently participate in patient care documentation.

Flexibility is another significant benefit of the pen-and-paper method. Paper records can be easily adjusted to meet specific needs without requiring software updates or programming changes. Nurses can make quick annotations, edits, and personalized notes directly on paper, which is particularly useful for documenting unique patient orders or issues that may not be adequately addressed by standardized computerized forms. This adaptability allows for a more personalized approach to documentation and can be crucial when rapid changes are necessary.

Moreover, the comfort and familiarity associated with traditional pen-and-paper methods can be advantageous in workplaces resistant to change or where the workforce has limited computer literacy. For healthcare providers with many years of experience, adopting new electronic technologies can be daunting. Familiarity with pen and paper can reduce resistance to documentation, ensuring accurate and comprehensive record-keeping. Additionally, the visibility and transparency provided by physical records can be beneficial. Multiple team members can easily access and review paper records simultaneously without the need to log into a system or navigate through digital interfaces. This ease of access can simplify supervision and collaborative efforts in patient care. In sum, while the pen-and-paper method has its drawbacks, it remains a valuable approach in certain hospital settings due to its simplicity, flexibility, familiarity, and transparency. These attributes ensure that it continues to be a practical solution for many healthcare professionals, facilitating effective and efficient documentation in diverse clinical environments.(21)(18)

Challenges faced in using/accepting eMAR

Transitioning from traditional pen-and-paper methods to electronic Medication Administration Records (eMAR) in hospitals presents several challenges that need careful consideration and management. One of the primary issues is usability. If staff members are not adequately trained, eMAR systems can be difficult to navigate, leading to errors. Complex interfaces and excessive notifications can overwhelm users, potentially causing them to become desensitized to critical alerts, thereby increasing the risk of mistakes. Technical issues also pose a significant challenge. The reliance on technology means that medicine administration can be disrupted by software glitches, system outages, and network failures. These technical problems, if not managed effectively, can compromise patient care and create significant disruptions in the medication administration process.(22)

Moreover, staff resistance and the need for extensive training can hinder the adoption of eMAR systems. Employees accustomed to traditional methods often resist the shift to electronic systems. Ensuring that all users are proficient with the new technology requires substantial training efforts, which can be resource-intensive and time-consuming. This resistance and the demand for comprehensive training can slow down the transition process and impact overall efficiency. Integrating eMAR into existing workflows is another significant challenge. Healthcare practitioners must adapt their daily routines to incorporate electronic documentation, which can initially slow down processes and lead to frustration among staff. The adjustment period can be disruptive, as practitioners modify their established practices to accommodate the new system, potentially leading to temporary declines in productivity and morale.

By understanding and addressing these challenges, healthcare institutions can improve the efficiency and safety of medication administration. Careful planning, adequate training, and robust support systems are essential to overcoming these obstacles, ultimately enhancing patient care and ensuring a smooth transition to eMAR systems..(21)(2)

Supports hospital get by using eMAR

The adoption of electronic Medication Administration Records (eMAR) has led to significant improvements in medication management across various hospital settings, enhancing accuracy, efficiency, communication, compliance, and nurse satisfaction. One of the most notable advantages of eMAR systems is the substantial reduction in medication errors. Studies have demonstrated that eMAR systems dramatically decrease the rate of medication errors by providing real-time updates and inspections, ensuring accurate administration and documentation. Unlike traditional paper-based systems, eMAR minimizes errors related to illegible handwriting and manual transcription, both of which are common issues in conventional methods. Another critical benefit of eMAR is the provision of real-time checks and alerts. These systems notify nurses immediately of potential issues such as drug interactions, allergies, or incorrect dosages, enhancing patient safety by ensuring that contraindications are addressed before medication administration. These integrated safety features significantly improve medication administration practices, thereby reducing the likelihood of adverse drug events.

The integration of eMAR also streamlines workflows for healthcare personnel. Automated processes reduce the time required for manual recording, allowing nurses to

focus more on patient care. This efficiency is supported by reports from long-term care facilities, where nurses have experienced significant time savings with eMAR. Features such as simplified documentation procedures, quick access to patient records, and automated medication scheduling contribute to this streamlined workflow, making daily tasks more manageable and efficient. eMAR systems also alleviate the administrative burden associated with traditional paper-based records. By automating the documentation process, eMAR eliminates the need for labour-intensive manual entry and subsequent verification processes. This not only saves time but also reduces the mental strain on nurses, allowing them to devote more attention to clinical tasks and patient care (18).

Moreover, eMAR enhances patient information sharing, facilitating seamless communication of accurate medication records among healthcare professionals. This is particularly beneficial during patient transitions between different care settings, reducing the risk of medication errors and ensuring continuity of care. The ease of information exchange provided by eMAR systems is crucial for maintaining comprehensive and accurate patient records.

Additionally, the reduction in medication errors and administrative burdens contributes to lower stress levels and workload for nurses. eMAR systems help alleviate the cognitive load associated with medication administration, improving the overall well-being and job satisfaction of the nursing staff. A stable and motivated workforce is essential for delivering high-quality patient care, and the implementation of eMAR systems supports this by reducing stress and enhancing job satisfaction (21)(9).

In summary, the implementation of eMAR systems offers numerous benefits that significantly enhance medication management in healthcare settings. By minimizing medication errors, providing real-time alerts, streamlining workflows, reducing administrative burdens, facilitating patient information sharing, and reducing stress and workload for nurses, eMAR systems contribute to improved patient care and a more efficient healthcare environment (18)(21)(9).

Chapter 4: Factors (support and challenges) affecting the acceptability or adoption of eMAR in healthcare

4.1 Background

One of the major obstacles is resistance from medical personnel, especially nurses. When switching from conventional paper-based systems to electronic ones, routines must change, and distrust may arise. Healthcare staff perceived system complexity and level of comfort with technology have an impact on their acceptance of eMAR systems. Employee adoption of the system is unlikely if they feel it is laborious or time-consuming(23). In the hectic world of healthcare, especially in hospitals, nurses and physicians frequently have too much on their shoulders, leaving little time for laborious paperwork duties. eMAR deployment make time management problems worse. Physicians and nurses are already under a lot of pressure to do their work on schedule. They view switching to an eMAR system as an extra responsibility since they will need to fit correct and timely electronic record updates into their already busy schedules. The acceptance and uptake of eMAR systems generally hampered by this perception of an increased workload.(15)(24)

Other barriers include the high costs of infrastructure, the need for extensive staff training, and resistance from top management and medical professionals. The study concludes that while hospitals that have adopted HIS report satisfaction with its performance, addressing the identified barriers is crucial to increasing adoption rates.(25)

Also, adoption of eMAR systems hampered by technical and usability issues, despite the possible advantages. Technical problems like software bugs, system outages, downtime and trouble integrating eMAR with other medical information systems are major obstacles. These problems may interfere with the delivery of medications and diminish the system's dependability, which may cause medical professionals to become resistant. Maintaining staff confidence in the system and immediately addressing any faults also depend on ongoing technical support. Insufficient training and assistance may impede the full realization of eMAR potential benefits. (16)(23)

Supporting factors for adoption of eMAR in healthcare

The ability to drastically lower medication errors is one of the strongest reasons in favor of eMAR system adoption. It is being observed that eMAR and other electronic prescribing systems lower the number of adverse drug events (ADEs) and medication errors by providing accurate, real-time data and ensuring adherence to prescribed

protocols. simultaneously, computerized methods guarantee pharmaceutical orders that are more precise and comprehensive, leading to safer outcomes for patients. One of the main factors driving eMAR's adoption is the clear link between using it and reducing errors. MARs have shown to be quite helpful in enhancing the accuracy of medicine delivery. By using integrated safety features like dose alerts and barcode scanning, nurses can confidentially ensure that the correct medication is given to the correct patient at the right time, reducing mistakes and enhancing patient care.(23)(9)

It is possible and works better than the existing incident reporting systems to automatically detect medication administration error through the eMAR. Real-time error identification and mitigation may benefit from automated techniques. Also nursing and the patients they care for have benefited directly from the efficiency achieved by digital MARs. Patient waiting time are shortened and drug administration procedures run more smoothly, and nurses report feeling more empowered and competent in their work.

In healthcare settings, documentation completeness and accuracy are crucial. eMAR systems offer an efficient and secure way to document the administration of medications, ensuring compliance to internal and external regulations. With a clear and unchangeable record of medicine administration, this improved documentation might be extremely important during audits and legal inquiries.

Also, Real-time notifications from eMAR systems inform nurses of possible problems such drug interactions, allergies, or miscalculated dosages. By ensuring that nurses are promptly informed of any contraindications prior to providing medicine, these integrated safety elements improve patient safety. These two studies highlight the ways in which these warnings help to improve medication administration habits and, in turn, lower the likelihood of adverse drug events (26).

4.2 The proximate determinants of motivating to use electronic medication administration record (eMAR) among healthcare professionals.

The perceived increase in patient safety is a crucial factor to consider. eMAR systems can help reduce medication errors by providing real-time patient data access, accurate and readable electronic records, and automated notifications for potential drug interactions or allergies. These features are what drive healthcare professionals. The improvement in workflow efficiency is a significant contributing aspect. Automating medication administration procedures with eMAR systems frees up time for direct patient care by decreasing manual paperwork time. Moreover, encouraging professionals to use this

technology is the way in which eMAR integrates with other electronic health record (EHR) systems to facilitate coordinated and all-encompassing patient care.

Another important factor in encouraging the usage of eMAR systems is training and simplicity of use. Sufficient educational initiatives that give medical staff members the know-how to operate eMAR systems efficiently can reduce resistance and boost self-assurance. Moreover, system dependability and user-friendliness are critical components in making sure that technology is perceived as a benefit rather than a barrier.(16)

Positive perceptions of the eMAR are also influenced by the availability of user-friendly interfaces and intuitive design elements, which lessen the cognitive load and learning curve involved in its use. The perceived influence on workflow is another factor. eMAR is more likely to be used by nurses and other healthcare professionals if it fits in easily with their daily schedules and doesn't significantly interfere. A compelling incentive is the possibility of lowering administrative costs and streamlining the documentation procedure. The advantages of eMAR in terms of documentation, e-prescribing, and monitoring were well-received by stakeholders. Enhanced resident condition monitoring, fewer prescription errors, streamlined workflows, and better staff-to-staff communication were among the immediate benefits. Long-term benefits of these advancements included less task redundancy, improved data unification, and higher efficiency, safety, and quality of care (27).

Organizational culture and influences from peers are significant factors. Coworker recommendations and experiences that are positive can boost motivation, as can an encouraging work culture that values creativity and supplies the tools needed to put it into practice (21)(9)(20).

4.3 Conclusion

The proximate determinants motivating healthcare professionals to use electronic medication administration records (eMAR) primarily include perceived ease of use, perceived usefulness, and the overall impact on patient safety and workflow efficiency. Ease of use refers to how intuitively the system can be operated, while usefulness is tied to the tangible benefits it brings, such as reducing medication errors and streamlining administrative tasks. These factors are bolstered by proper training and continuous support, ensuring that healthcare professionals are confident and proficient in using eMAR. Moreover, positive attitudes towards technology and a culture that embraces

innovation within the healthcare environment also play significant roles in fostering motivation.

When examining the factors affecting the acceptability or adoption of eMAR, both support and challenges emerge as critical elements. On the supportive side, robust training programs, technical assistance, and a clear demonstration of the eMAR system's benefits contribute significantly to its adoption. Leadership endorsement and the presence of a technologically conducive infrastructure further facilitate acceptance. Conversely, challenges such as resistance to change, initial costs, and potential disruptions during the transition phase can hinder adoption. Additionally, concerns regarding data security and the learning curve associated with new technology also pose significant obstacles. Addressing these challenges through strategic planning, ongoing support, and addressing user concerns comprehensively can enhance the acceptability and widespread adoption of eMAR in healthcare settings.

In conclusion, motivating healthcare professionals to use eMAR hinges on demonstrating its usability and tangible benefits, supported by effective training and a culture of technological acceptance. The acceptability and adoption of eMAR are influenced by a balance of supportive factors such as training and infrastructure, and challenges like resistance to change and security concerns, all of which must be strategically managed to ensure successful implementation.

4.4 Discussion

The result of current study shows that there are different reasons for adoption and barriers to adopt Electronic Medication Record.

A systematic review of six electronic databases was carried out by Stolic, Snezana, Ng, Linda, Sheridan, and Georgina in order to determine the cause between 2007 and 2020. Research indicates that during nursing administration, pharmaceutical errors occur in 2.8% to 16% of cases. Conversation Results vary; some research found positive trends and a decrease in medication errors, while other studies found neither a decrease in medication errors nor the emergence of new forms of errors. They found out that One of the major obstacles is resistance from medical personnel, especially nurses. When switching from conventional paper-based systems to electronic ones, routines change, and distrust arise. Healthcare staff perceived system complexity and level of comfort with technology have an impact on their acceptance of eMAR systems. Employee adoption of the system is unlikely because they feel it is laborious or time-consuming.

Similar to this, a study carried out in 2008 by Ni, Yizhao, Lingren, Todd, Hall, and this team aimed to determine the prompt identification of medication administration mistakes (MAEs), which can be very beneficial for reducing medication errors and the harm they cause. They discovered that the sensitivity with automated MAE detection was greatly enhanced from 4.3% to 85.3%, with a positive predictive value of 78.0%, in comparison to present practice. Additionally, the system demonstrated the ability to cut down on patient exposure to risk from 256 minutes to 35 minutes. Additionally, it demonstrated promise in lowering patient exposure to possible injury after MAE incidents. Whereas Cheragi, Mohammad Ali, Mohammadnejad conducted a study in Iran in 2018 where they found the reason of not adopting eMAR. In the hectic world of healthcare, especially in hospitals, nurses and physicians frequently have too much on their shoulders, leaving little time for laborious paperwork duties. eMAR deployment make time management problems worse. Physicians and nurses are already under a lot of pressure to do their work on schedule. They view switching to an eMAR system as an extra responsibility since they will need to fit correct and timely electronic record updates into their already busy schedules. The acceptance and uptake of eMAR systems generally hampered by this perception of an increased workload.

Ammenwerth carried out subgroup analyses for categorical factors, including the level of care, patient group, drug type, system type, system functionality, comparison group type, study design, and error detection method, in an Austrian study he conducted in 2008 to determine the benefits of using eMAR. Of the 25 papers that examined the impact on the rate of medication errors, 23 demonstrated a statistically significant relative risk decrease ranging from 13% to 99%. Six out of nine studies that examined the impact on possible adverse drug events (ADEs) revealed a noteworthy 35% to 98% relative risk reduction. The impact on ADEs was analysed in seven trials, and four of them revealed a significant relative risk decrease of 30% to 84%.

This study highlights the importance of being both aware of and responsive to factors that can influence. The goal of the study was to fully understand the difficulties and resources that healthcare facilities have when utilizing both electronic Medication Administration Records (eMAR) and traditional pen-and-paper approaches. In addition, the study aimed to examine the variables affecting eMARs acceptance or adoption in healthcare environments and the incentives pushing medical staff to use it.

The results of this study shed light on several aspects of the complexity related to medicine administration in hospital settings. First and foremost, problems with legible handwriting, the possibility of transcribing errors, and limitations with tracking drug administration in real-time are expected to be the main drawbacks of traditional pen-and-paper approaches. On the other hand, by offering a digital platform for precise recording, automated alarms for any errors, and simplified communication among healthcare teams, eMAR systems provide answers to many of these problems.

However, the study also identifies the immediate factors that encourage medical staff to use electronic medication administration records. These factors could be perceived benefits in accuracy and efficiency, improved teamwork and communication within the healthcare system, and the possibility of improved patient outcomes from fewer drug errors.

The main challenges to adoption and implementation were time, change-aversion, and computer literacy. In evaluating the adoption of EMR and eMAR, it may be helpful to evaluate a person's comfort level with computers in addition to their skill level. The computer proficiency of all healthcare workers who have been exposed to utilizing it is essential for successful acceptance and use in the healthcare industry. For every employee, there are still challenges to be overcome in the areas of training, retraining, infrastructure requirements, and attitude adjustments. The unique method of patient care that has been created over years by doctors and nurses is altered by the implementation of EMR, which is in and of itself a serious concern. Since the transition from paper records to electronic systems is accompanied by changes in patient care, organizational factors also undergo change. As a result, an EMR-friendly culture may encourage eMAR use throughout the entire company and raise the likelihood that MAR will be implemented successfully.

Lack of time, knowledge, and experience to oversee the process, according to studies, is another obstacle to adoption. Reforming workflows and creating rules to facilitate the adoption of EMRs were undertaken by practices that underwent less complicated transitions. And finally, better EMR might be made possible by designating an individual.

Furthermore, during the project's early phases and throughout the tool's lifetime, physician participation and representation are crucial. It is consistent with the research paper's findings, as adoption issues with eMAR are a big worry in any healthcare setting. They both exhibit opposition to the adoption of eMAR as well as a favourable outlook on EMR implementation. Even while they think EMR is incredibly helpful, they are just not prepared for change management. Physicians often use electronic medical records (EMR) because they recognize its value and concur that it facilitates secure recordkeeping and convenient access to patient details.

5.2 Recommendations

The initial recommendations would be to Develop and implement comprehensive training programs to ensure that healthcare staff are proficient in using the electronic MAR system. Work closely with healthcare staff to integrate the MAR system seamlessly into existing workflows. Establish channels for ongoing support and feedback to address staff concerns and optimize the functionality of the MAR system. Encourage open communication between IT personnel, management, and frontline staff.

- **Invest in Education and Training:** To familiarize medical staff with eMAR systems, healthcare facilities must make significant investments in extensive educational initiatives. This can enhance user acceptability and overcome resistance to change.
- **Address Usability Issues:** In order to improve usability and resolve issues with navigation and operation, eMAR system developers should give priority to user-centered design. Early detection and resolution of usability problems can be achieved by involving end users in the design and testing stages.
- **Ensure Data Security and** Privacy: To protect patient data kept in eMAR systems, healthcare organizations should have strong data security mechanisms in place. To reduce the chance of data breaches, this entails encryption mechanisms, access limits, and routine security assessments.

References

1. Janssen A, Donnelly C, Elder E, Pathmanathan N, Shaw T. Electronic medical record implementation in tertiary care: factors influencing adoption of an electronic medical record in a cancer centre. BMC Health Serv Res. 2021 Jan;21(1):23.
2. Karnehed S, Erlandsson LK, Norell Pejner M. Nurses' Perspectives on an Electronic Medication Administration Record in Home Health Care: Qualitative Interview Study. JMIR Nurs. 2022 Apr;5(1):e35363.
3. Hatton JD, Schmidt TM, Jelen J. Adoption of Electronic Health Care Records: Physician Heuristics and Hesitancy. Procedia Technol [Internet]. 2012;5:706–15. Available from: https://www.sciencedirect.com/science/article/pii/S2212017312005099
4. Goetz Goldberg D, Kuzel AJ, Feng LB, DeShazo JP, Love LE. EHRs in primary care practices: benefits, challenges, and successful strategies. Am J Manag Care. 2012 Feb;18(2):e48-54.
5. Zaheer S, Sayed SA. Evaluation of EMR implementation in a private hospital from user's perspective. GSTF J Nurs Heal Care. 2014;1(1).
6. Karnehed S, Pejner MN, Erlandsson LK, Petersson L. Electronic medication administration record (eMAR) in Swedish home healthcare—Implications for Nurses' and nurse Assistants' Work environment: A qualitative study. Scand J Caring Sci. 2024;(January):1–11.
7. Owens K, Palmore M, Penoyer D, Viers P. The Effect of Implementing Bar-Code Medication Administration in an Emergency Department on Medication Administration Errors and Nursing Satisfaction. J Emerg Nurs [Internet]. 2020;46(6):884–91. Available from: https://www.sciencedirect.com/science/article/pii/S009917672030235X
8. Ni Y, Lingren T, Hall ES, Leonard M, Melton K, Kirkendall ES. Designing and evaluating an automated system for real-time medication administration error detection in a neonatal intensive care unit. J Am Med Informatics Assoc. 2018 May 1;25(5):555–63.
9. Ammenwerth E, Schnell-Inderst P, Machan C, Siebert U. The Effect of Electronic Prescribing on Medication Errors and Adverse Drug Events: A Systematic Review. J Am Med Informatics Assoc [Internet]. 2008;15(5):585–600. Available from: https://www.sciencedirect.com/science/article/pii/S106750270800100X

10. Yousef CC, Salgado TM, Farooq A, Burnett K, McClelland LE, Esba LCA, et al. Health care providers' acceptance of a personal health record: Cross-sectional study. J Med Internet Res. 2021 Oct 1;23(10).
11. Al-Aswad A, Brownsell S. A Review Paper of the Current Status of Electronic Health Records Adoption Worldwide: The Gap between Developed and Developing Countries. … Dev Ctries [Internet]. 2013;7(2):153–64. Available from: http://www.jhidc.org/index.php/jhidc/article/view/106
12. Simon SR, Kaushal R, Cleary PD, Jenter CA, Volk LA, Poon EG, et al. Correlates of Electronic Health Record Adoption in Office Practices: A Statewide Survey. J Am Med Informatics Assoc [Internet]. 2007 Jan 1;14(1):110–7. Available from: https://doi.org/10.1197/jamia.M2187
13. Sharma M, Aggarwal H. EHR Adoption in India: Potential and the Challenges. Indian J Sci Technol. 2016;9(34).
14. Yehualashet DE, Seboka BT, Tesfa GA, Demeke AD, Amede ES. Barriers to the Adoption of Electronic Medical Record System in Ethiopia: A Systematic Review. J Multidiscip Healthc. 2021;14:2597–603.
15. Cheragi MA, Manoocheri H, Mohammadnejad E, Ehsani SR. Types and causes of medication errors from nurse's viewpoint. Iran J Nurs Midwifery Res [Internet]. 2013;18(3). Available from: https://journals.lww.com/jnmr/fulltext/2013/18030/types_and_causes_of_medication_errors_from_nurse_s.11.aspx
16. Ammenwerth E, Schnell-Inderst P, Machan C, Siebert U. The Effect of Electronic Prescribing on Medication Errors and Adverse Drug Events: A Systematic Review. J Am Med Informatics Assoc. 2008 Sep;15(5):585–600.
17. Schimmel AM, Becker ML, van den Bout T, Taxis K, van den Bemt PMLA. The impact of type of manual medication cart filling method on the frequency of medication administration errors: A prospective before and after study. Int J Nurs Stud [Internet]. 2011;48(7):791–7. Available from: https://www.sciencedirect.com/science/article/pii/S0020748910004062
18. Risør BW, Lisby M, Sørensen J. Complex automated medication systems reduce medication administration errors in a Danish acute medical unit. Int J Qual Heal Care [Internet]. 2018 Jul 1;30(6):457–65. Available from: https://doi.org/10.1093/intqhc/mzy042
19. Donaldson LJ, Kelley ET, Dhingra-Kumar N, Kieny MP, Sheikh A. Medication Without Harm: WHO's Third Global Patient Safety Challenge. Lancet [Internet].

2017 Apr 29;389(10080):1680–1. Available from: https://doi.org/10.1016/S0140-6736(17)31047-4

20. Yen PY, Gorman P. Usability testing of digital pen and paper system in nursing documentation. AMIA . Annu Symp proceedings AMIA Symp. 2005;2005:844–8.
21. Kaasalainen S, Agarwal G, Dolovich L, Papaioannou A, Brazil K, Akhtar-Danesh N. Nurses' perceptions of and satisfaction with the medication administration system in long-term-care homes. Can J Nurs Res = Rev Can Rech en Sci Infirm. 2010 Dec;42(4):58–79.
22. Pera N, Kaur A, Rao R. Perception of electronic medical records (EMRs) by nursing staff in a teaching hospital in India. Int J Adv Med Heal Res. 2014;1(2):75.
23. Stolic S, Ng L, Sheridan G. Electronic medication administration records and nursing administration of medications: An integrative review. Collegian [Internet]. 2023;30(1):163–89. Available from: https://www.sciencedirect.com/science/article/pii/S1322769622000993
24. FitzHenry F, Peterson JF, Arrieta M, Waitman LR, Schildcrout JS, Miller RA. Medication Administration Discrepancies Persist Despite Electronic Ordering. J Am Med Informatics Assoc [Internet]. 2007;14(6):756–64. Available from: https://www.sciencedirect.com/science/article/pii/S1067502707002149
25. Batra R, Pall AS. Adoption and Assessment of Hospital Information Systems: A Study of Hospitals in Jalandhar. Asia-Pacific J Manag Res Innov [Internet]. 2015 Sep 1;11(3):205–18. Available from: https://doi.org/10.1177/2319510X15588383
26. Li Q, Kirkendall ES, Hall ES, Ni Y, Lingren T, Kaiser M, et al. Automated detection of medication administration errors in neonatal intensive care. J Biomed Inform [Internet]. 2015;57:124–33. Available from: https://www.sciencedirect.com/science/article/pii/S1532046415001525
27. Jedwab RM, Chalmers C, Dobroff N, Redley B. Measuring nursing benefits of an electronic medical record system: A scoping review. Collegian [Internet]. 2019;26(5):562–82. Available from: https://www.sciencedirect.com/science/article/pii/S1322769618303068

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