International Institute of Health Management Research New Delhi

Dissertation Training

At

IIHMR Delhi

E-Prescription Systems – Reducing Medication Errors in Hospitals

By

Dhruv Bhatt
Enrollment No. -PG/23/030

Under the guidance of

Dr. Nishikant Bele

PGDM (Hospital and Health Management)
2023-25

(Completion of Dissertation from respective organization)

The certificate is awarded

To

Name - Dhruv Bhatt

In Recognition of having successfully completed his Internship in the department of

IIHMR Delhi

And has successfully completed his/her Project
On

E-Prescription Systems – Reducing Medication Errors in Hospitals

Organization - IIHMR Delhi

He comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning

We wish him all the best for future endeavors.

Training & Development **Zonal Head-Human Resources**

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dhruv Bhatt** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **z2o Creative** from 24/03/2025 to 31/05/2025.

The Candidate has successfully carried out the study designated to him during internship training and his/her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course

requirements.

I wish him all success in all his/her future endeavors.

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

Mentor- Dr.Nishikant Bele

IIHMR, New Delhi

Certificate from Dissertation Advisory Committee

This is to certify that **Dhruv Bhatt,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He is submitting this dissertation titled **"*E-Prescription Systems – Reducing Medication Errors in Hospitals*"** in partial fulfillment 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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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "***E-Prescription Systems – Reducing Medication Errors in Hospitals"*** and submitted by **Dhruv Bhatt.** Enrollment No. PG/23/030 under the supervision of **Dr.Nishikant Bele** for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from 24//02/2025 to 30/06/2025.

Embodies my original work and has not formed the basis for the award of any degree, diploma associate ship,

Fellowship, titles in this or any other Institute or other similar institution of higher learning.

Dhruv Bhatt

FEEDBACK FORM

Name of the Student: Dhruv Bhatt

Name of the organization in Which Dissertation Has Been Completed: IIHMR Delhi

Attendance:

Objectives achieved: Assessed the effectiveness of e-prescription (eRx) systems in reducing medication errors through a comprehensive secondary research approach.

Compared error rates before and after eRx implementation across various clinical settings including ICUs, emergency departments, and outpatient clinics.

Identified key improvements such as enhanced dosage accuracy, better interdepartmental communication, and increased patient adherence.

Highlighted the role of decision-support tools (e.g., DERS, allergy/interaction alerts) in improving prescription safety.

Provided research-backed insights for healthcare administrators and policymakers regarding the integration and optimization of eRx systems.

Deliverables:

Strengths:

Suggestions for Improvement:

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):

Signature of the Officer-in-Charge/organization Mentor (Dissertation)

Date:

Place:

Certificate of Approval

Certificate of Approval

The following dissertation titled **E-Prescription Systems – Reducing Medication Errors in Hospitals** at **IIHMR Delhi** 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.

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CERTIFICATE ON PLAGIARISM CHECK

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Course Specialization (Choose one)	Hospital Management	Health Management	Healthcare IT ✓
Name of Guide/Supervisor	Dr./~~Prof.~~: NISHIKANT BELE		
Title of the Dissertation/Summer Assignment	E- Prescription Systems - Reducing Medication Errors in Hospitals		
Plagiarism detect software used	"TURNITIN"		
Similar contents acceptable (%)	Up to **15** Percent as per policy		
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Acknowledgement:

This dissertation has been a profoundly rewarding journey for me both intellectually and personally. I sincerely appreciate the opportunity to undertake this research in an environment that values mentorship, innovation, and offers thoughtful guidance.

My deepest appreciation goes out to the rest of the faculty and staff of IIHMR Delhi for their unwavering support, rigorous feedback, valuable materials, and extensive academic resources that facilitated the completion of this study. Their encouragement and dedication to excellence was inspiring and constructive throughout the many phases of this research.

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I want to thank my peers and colleagues as well, whose thoughts and conversations shaped the contours of my work and enriched the depth of my analysis. I also thank everyone who participated in the learning process, directly or indirectly, in this academic undertaking.

Thank you so much to everyone who offered my support and guidance during this journey. Whether you provided mentorship, discussions, or encouragement, know that your support helped me complete this journey.

Table of Contents:

List of Figures:

List of Tables:

LIST OF ABBREVIATIONS

ERx- electronic Prescription

ADE- Adverse Drug Event

HER- Electronic Health Record

HIS- Hospital Information System

HMIS- Hospital Management Information System

CPOE- Computerized Physician Order Entry

DERS- Drug Error Reduction Software

ICU- Intensive Care Unit

PICU- Pediatric Intensive Care Unit

NICU- Neonatal Intensive Care Unit

CICU- Cardiac Intensive Care Unit

AICU- Adult Intensive Care Unit

OPD- Outpatient Department

CDS- Clinical Decision Support

ABHA- Ayushman Bharat Health Account

NHM- National Health Mission

ABDM- Ayushman Bharat Digital Mission

QI- Quality Improvement

HMX- High-risk Medication Event

CCU- Coronary Care Unit

IV- Intravenous

WHO- World Health Organization

IT- Information Technology

Rx- Prescription

Scope of the Project:

- This study looks at how electronic prescription (eRx) systems help reduce mistakes with medications in hospitals. To understand how eRx improves patient safety, lowers the chance of errors related to drugs, and makes prescriptions more accurate, the research uses data and published studies from 2018 to 2024.

The project covers these important topics:

- Comparing handwritten prescriptions with electronic prescribing systems.
- Looking at how eRx affects different kinds of medication errors in areas like paediatrics, intensive care units, and emergency departments.
- Checking the features of eRx systems, such as tools that help make decisions, alerts about drug interactions, and systems that prevent mistakes.
- Finding out the challenges in using eRx systems, like problems with keeping the drug information up to date and making sure users follow the system properly. And workflow integration.
- Recommendations for improving the performance and use of eRx systems in hospitals, whether they have lots of resources or not.

The project doesn't collect new data; it uses existing information through secondary research. The goal is to give clear, research-backed advice to help lawmakers, doctors,

and hospital leaders make smart choices about setting up and improving e-prescription systems.

ABOUT THE INDUSTRY:

In today's fast-changing healthcare world, digital changes are very important for making treatments better and keeping patients safer. One big development is the use of Hospital Management Information Systems (HMIS), and electronic prescription (eRx) systems are a key part of these.

As concerns about mistakes in medicine like messy handwriting or wrong drug amounts have grown, e-prescription systems have become a dependable way to improve how doctors work, write prescriptions more exactly, and help patients get better results.

These systems are a vital part of HMIS because they turn the process of getting medicine into a digital, faster way.

The Impact of e-Prescription Systems on the Healthcare Industry:

Reduction in Medication Errors: To cut down on the risks from handwritten prescriptions, eRx systems use clear, organized, and easy-to-read formats. This reduces adverse drug events (ADEs) and enhances patient safety.

Clinical Decision Support: Many eRx systems give warnings about drug interactions, allergies, and proper dosages. This helps doctors avoid mistakes that might happen when they write prescriptions.

Workflow Optimization: eRx replaces old, manual tasks with digital tools, making it easier for different departments like pharmacy, nursing, and medical records to work together. This reduces delays and speeds up the overall process.

Data-Driven Improvement: With digital tools, healthcare workers can track patient safety, prescription patterns, and how medicines are used.
This lets them make better decisions based on real data and evidence.

The Indian Context

India is quickly adopting digital health technologies, especially because of national efforts to improve healthcare. Through programs like the **Ayushman Bharat Digital Mission (ABDM)**, the government is pushing hard to include e-prescription systems in both public and private healthcare settings.

In the public sector, hospitals are working to make their systems digital by using eRx and HMIS.

This helps fix problems in the system and makes healthcare services more consistent.

In the private sector, hospitals with many specialty areas and diagnostic centers are setting up eprescription systems.

They do this to make patients happier and to run their operations more smoothly. Now, more and more people see these changes as important and necessary, not just nice to have.

Conclusion

The e-prescription system is a mix of a new technology and a smart plan to improve healthcare, as part of using Health Management Information Systems more widely. It helps meet the country's goals for digital health and tackles a big, long-existing issue in medical care, which is making sure medicines are safe. As India moves forward with its digital health plans, eRx systems will continue to be important in making healthcare safer, more efficient, and better at responding to patients' needs.

TITLE

E-Prescription Systems – Reducing Medication Errors in Hospitals

Abstract:

To make sure patients are safer and reduce mistakes with medicine in hospitals, this dissertation looks at how electronic prescription (eRx) systems work. Paper prescriptions can lead to errors because of hard-to-read handwriting, wrong dosages, and not noticing when drugs don't go together. ERx systems help by using digital tools that make prescriptions clearer and include features that support better decision-making for doctors.

This study looked at research published from 2018 to 2024 using a careful and detailed review of existing studies.

It used information from trusted sources like PubMed, Scopus, Google Scholar, and HIMSS. The findings show that after eRx systems were used, there was a big decrease in medication mistakes. One key improvement was making sure the right dosages were given more often.

However, the literature also points out some issues like not having a balanced collection of drugs, patients not following their prescriptions, and people finding ways around the system.

This study shows how important e-prescription systems are as a key part of moving toward digital health.

By looking at both the good and bad sides, it gives useful advice that can help in making, using, and training eRx systems to make medicine safer and make clinical work faster.

INTRODUCTION:

Keeping medicines safe is a big challenge in today's healthcare. Mistakes happen when doctors write prescriptions, when nurses write down the instructions, when the medicine is given out, or when it's actually given to the patient. These errors can affect how well patients get better and put a lot of pressure on the healthcare system. Many of these mistakes could be avoided, but they still cause longer hospital stays, bad reactions to medicine, and in some cases, serious injury or even death. Some of the main reasons for these errors are wrong calculations of medicine amounts, hard-to-read handwriting, and poor communication between healthcare workers.

Hospitals are using more digital tools to make things run smoother and cut down on risks.

One of these is electronic prescriptions, or eRx. These systems take the place of handwritten notes by using standard digital forms. This helps make sure that the medicine details are clear, easier to understand, and less likely to be misunderstood.

Modern eRx systems often include tools that help doctors make better decisions, besides fixing problems with handwriting. These tools give warnings about possible drug interactions, allergies, and wrong dosages, based on a patient's medical history. These features help doctors make safer and more reliable choices when prescribing medicine.

E-prescription systems also help different hospital teams, like pharmacists, nurses, and medical staff, work together better.

This makes it easier and faster to fill prescriptions, which helps avoid delays in treatment. These improvements are especially important in fast-paced areas like emergency rooms and intensive care units, where patient safety and care quality are very important.

Many hospitals have managed to use eRx systems, but how well they work depends on things like the hospital's setup, how well staff are trained, how the system is designed, and how it fits with current hospital processes. Even though there's a lot of evidence showing eRx can be helpful, we still don't fully understand how effective these systems are in different kinds of medical settings.

This study tries to fill that gap by looking closely at how e-prescription systems affect drug safety and how well treatments work in hospitals.

It brings together findings from various global studies and real-world examples to show what works best, what problems commonly happen, and what steps hospitals can take to get the most out of digital prescription tools.

Objectives:

The main goal of this study is to check how well electronic prescription systems work in preventing mistakes when giving medicine, compared to old-fashioned handwritten prescriptions. The study also wants to find out how much eRx technology helps keep patients safe, reduces problems with giving the right drugs, and makes sure prescriptions are correct in hospitals.

Research Questions:

1. How much do hospitals use electronic prescription systems to prevent mistakes with medications?
2. How do electronic prescription systems work compared to old handwritten ones in terms of how well they work for patients and how safe they are?

Review of Literature:

To gain insight into the impact of electronic prescription systems on medication safety, several peer-reviewed studies were examined. These studies span a variety of clinical settings and highlight the measurable reduction in prescription-related errors following the implementation of eRx systems. The research covers diverse hospital departments, including emergency rooms, intensive care units, outpatient clinics, and specialty wards.

Common themes across the literature include improved prescribing accuracy, enhanced medication adherence, and reduced rates of adverse drug events. The studies also emphasize the importance of pharmacist interventions, clinical decision support tools, and system integration in achieving these outcomes.

Below is a summary of key studies reviewed-

Article	Authors	Departments Included in the Study	Top Drug Classes Involved	Error rate Before ePrescription System	Error rate after e-Prescription System	Source
1. Effect of electronic prescription system modifications on reducing prescribing errors in a military hospital (2024)	Wafa K. Alanazi, Saleh H. Almutairi, Abdullah A. Alamri, Muneerah F. Alsubaie, Yosef A. Alamari	AICU, Cardiac Ward CCU, CICU, Female Medical & Female Surgical Male Medical, Male Surgical & Male Specialty OB/GYN, Paediatrics, PICU NICU, SCBU, Surgical ICU Accident & Emergency Day Case Endoscopy Unit	Antibiotics, Proton Pump, Inhibitors, Antiemetic, Analgesic/Antipyretic	Total Admissions- **(15,201)** Total Prescribing Errors- **(218)** Error rate- **1.43%**	Total Admissions- **(14,353)** Total Prescribing Errors- **(73)** Error rate- **0.51%**	**Google Scholar**
2. Effect of Electronic Prescribing Strategies on Medication Error and Harm in Hospital: a Systematic Review and Meta-analysis (2019)	Nadia Roumeliotis, Jonathan Sniderman, Thomasin Adams, Newton Addo, Vijay Anand, Paula Rochon, MPH Anna Taddio, Christopher Parshuram	ICUs Hospital Wards Emergency Departments Operating Rooms NICUs	Insulin, Mycophenolate mofetil, Antibiotics, Drugs for post-operative nausea and vomiting, Pain control medications, Rehydration therapies (especially for paediatric cases), Drugs involved in medication reconciliation efforts	Prescribing errors per admission- Hospital A: (**6.25** /adm) Hospital B: (**3.62** /adm) Potentially serious MAEs- (**3.3%** of administrations)	Prescribing errors per admission- Hospital A: (**2.12** /adm) Hospital B: (**1.46** /adm) Potentially serious MAEs- (**0.9%** of administrations) Error rate- **2.4% absolute (approx. 56% reduction)**	**PubMed**

3. E-Prescription Implementation: An Analytical Study On The Transformation Of Medical Records From Physical To Electronic (2024)	Rolly Catur Widyantoro Puput Oktamianti	Outpatient Clinics Inpatient Wards Emergency Departments Maternal and Child Health Independent Practitioner Clinics	Opioids, Antibiotics, Paediatric Drugs, Polypharmacy Combinations	Prescribing error rate – (6.94%)	Prescribing error rate- (1.96%) Reduction in error rate- (Approx. 5%)	Google Scholar
4. Pharmacists' Interventions on Electronic Prescriptions from Various Specialty Wards in a Malaysian Public Hospital: A Cross-Sectional Study (2021)	Poh Ling Ooi, Hadzliana Zainal, Qi Ying Lean, Long Chiau Ming, Baharudin Ibrahim	Medical, Surgical Intensive Care Pediatrics Orthopedics OB-GYN Psychiatric Others	Anti-infective agents- (33.84% of all pharmacist interventions)	Referenced manual prescribing error rate- **7.1% – 10.1%** (from cited studies) **3.3%** (11,922 interventions out of 357,760 eprescriptions)	Approximate reduction- **(7.1% to 3.3%)** Reduction in error rate- **(53.5%)**	**PubMed, *Pharmacy (MDPI), 2021***

5. Effect of Electronic Prescribing Compared to Paper-Based Prescribing on Primary Medication Adherence in an Outpatient Setting: A Systematic Review (2021)	David Aluga, Lawrence A. Nnyanzi, Nicola King, Elvis A. Okolie, Peter Raby	Outpatient dermatology clinic (143 patients) Dermatology clinic, Parkland Hospital (2,496 patients) Emergency department, California (224 patients) Retail pharmacy data (multistate)	Not drug-specific, this study focused on adherence, not specific medication error types.	Some referenced studies show (3.4% to 7.1%) abandonment rate with paper scripts	Ranged from (0.1% to 3.6%) based on individual studies, eRx improved adherence in 4/10 studies	Google Scholar, Applied Clinical Informatics, 2021
6. The impact of drug error reduction software on preventing harmful adverse drug events in England: a retrospective database study (2022)	Adam Sutherland, William S. Gerrard, Arif Patel, Michelle Randall, Emma Weston	Paediatrics Medical Surgical Critical Care Women's Care	Parenteral anticoagulants, Antiarrhythmic, Antiepileptic, Potassium chloride, Insulin, Antiviral drugs	Potentially harmful errors- **(100–130 / 1000)** DERS was bypassed in **(42.4%**)of 1,493,035 total infusions Without DERS, historical UK studies showed up to **(12–13%)** error rate in IV medication administration	Potentially harmful errors- **(0.9 / 1000)** DERSenabled infusions: **338,263** out of **745,170 (45.4%).** Error Reduction rate is (Approx. **99.2%)**	**Google Scholar, *BMJ Open Quality, 2022***

Research Methodology:

This research adopts a retrospective, descriptive, and analytical approach grounded in secondary data analysis. Instead of collecting primary data through interviews, surveys, or observational studies, the investigation relies on a comprehensive review of existing academic literature. The aim is to assess the effectiveness of electronic prescription (eRx) systems in reducing medication-related errors within hospital environments.

Study Design

The study follows a non-experimental research design that synthesizes outcomes from previously published sources. This design is particularly well-suited for evaluating technological interventions in healthcare, where robust datasets from earlier implementations can offer valuable insights without the need for real-time experimentation.

Research Approach

- **Type**: Literature-based secondary research
- **Nature**: Descriptive and analytical
- **Strategy**: Systematic review with thematic comparison

This method helps keep things fair and based on real facts, showing how e-prescription systems affect patient safety and how things work in different healthcare settings.

Data Collection Process the following significant databases were used in a systematic literature search:

- **PubMed**
- **Google Scholar**
- **Scopus**
- **Health Information and Management Systems Society (HIMSS)**

Search terms are combines of the following:

- "electronic prescribing"
- "eRx systems"
- "medication errors in hospitals"
- "digital prescribing accuracy"
- "CPOE" (Computerized Physician Order Entry)

The search method was created to make sure all global experiences with e-prescription systems are covered, including those in different parts of hospitals like emergency rooms, intensive care units, and outpatient services.

Inclusion Criteria to maintain relevance and emphasis, only research that met the following criteria were included:

- Published between 2018 and 2024
- Conducted in hospital-based settings
- Focused on medication safety, prescribing accuracy, or error reduction
- Peer-reviewed articles, systematic reviews, or observational studies
- Published in the English language

Exclusion Criteria
Studies that looked at places outside hospitals, like pharmacies or home care, were left out because they used old systems or tech, or they weren't in English, or there wasn't enough information about how well the systems worked or how many mistakes happened.

Data Analysis Method

Important details about how well the eRx system is working were taken from the information and then analyzed to find main themes. Looking at the studies that were relevant, there were patterns seen in how medication errors are reduced, how effective the system is, and the difficulties faced during its implementation. Comparing the different studies showed that results can vary depending on the type of clinical setting, how the system is designed, and the healthcare system in the region.

Rationale for Methodology

This secondary research approach gives a clear picture of how effective e-prescriptions are by using data that's already been collected. It avoids the real-world and ethical issues that come with gathering new data from people. This makes it a helpful resource for healthcare leaders, government officials, and doctors who want to improve patient safety and support the move toward digital healthcare systems.

Results:

This research draws upon evidence from multiple peer-reviewed studies to evaluate the practical impact of electronic prescription (eRx) systems within hospital settings. The collective findings underscore a significant improvement in prescribing safety and clinical workflow following the implementation of these systems.

Key outcomes from selected studies include:

- **Alanazi et al. (2024)** observed a **64.3% reduction in prescription errors** after eRx systems were introduced across several departments including ICU and OB/GYN demonstrating a drop in error rate from **1.43% to 0.51%**.

- **Roumeliotis et al. (2019)**, through a systematic meta-analysis, identified a **56% decrease** in prescribing errors, particularly in the administration of high-risk medications such as **antibiotics and insulin**.

- **Ooi et al. (2021)** reported a significant drop in error rates from **10.1% to 3.3%** in a Malaysian public hospital when pharmacists actively engaged with e-prescription systems.

- **Sutherland et al. (2022)** highlighted a **99.2% reduction in harmful IV medication errors** when Drug Error Reduction Software (DERS) was integrated with eRx systems, although they noted that **42% of infusions bypassed the system**, revealing a compliance gap.

- **Widyantoro & Oktamianti (2024)** emphasized improvements in operational efficiency and safety following the transition from paper-based to digital prescriptions, particularly in tracking and medication reconciliation processes.

- **Aluga et al. (2021)** found that electronic prescribing **improved primary medication adherence** compared to handwritten prescriptions in outpatient settings.

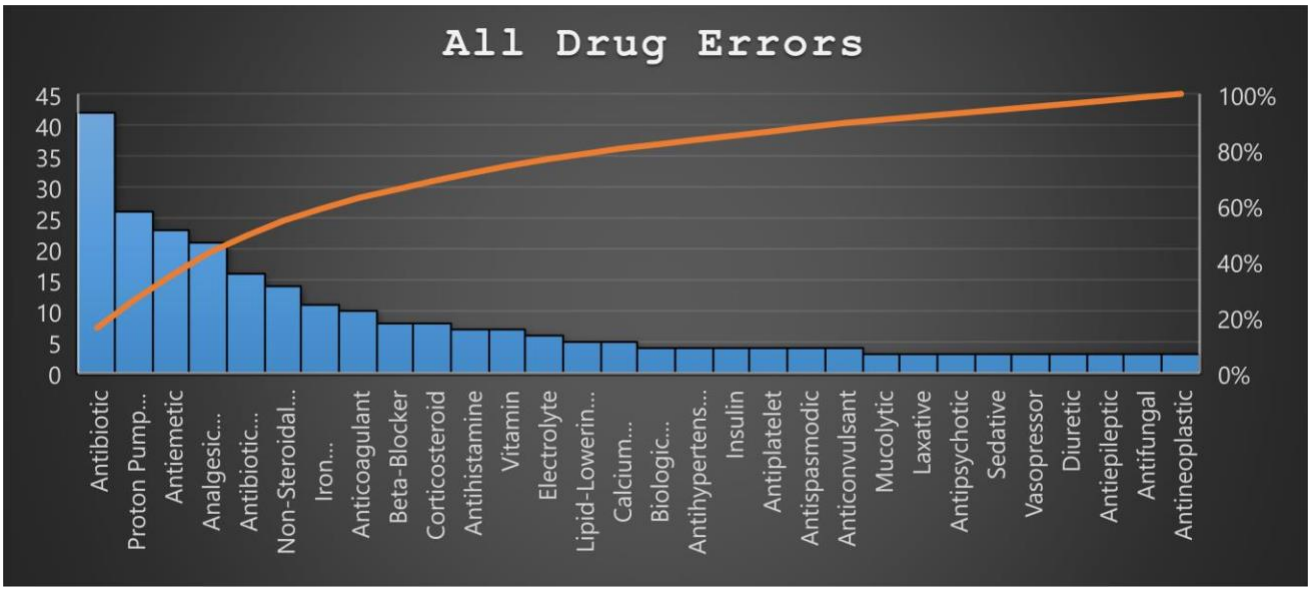
Overall, the reviewed literature demonstrates that eRx systems lead to significant improvements in:

- Improved accuracy in dosage and drug selection
- Enhanced interdepartmental communication
- Fewer delays in medication administration
- Stronger pharmacist involvement and oversight
- Higher patient compliance and reduced prescription abandonment

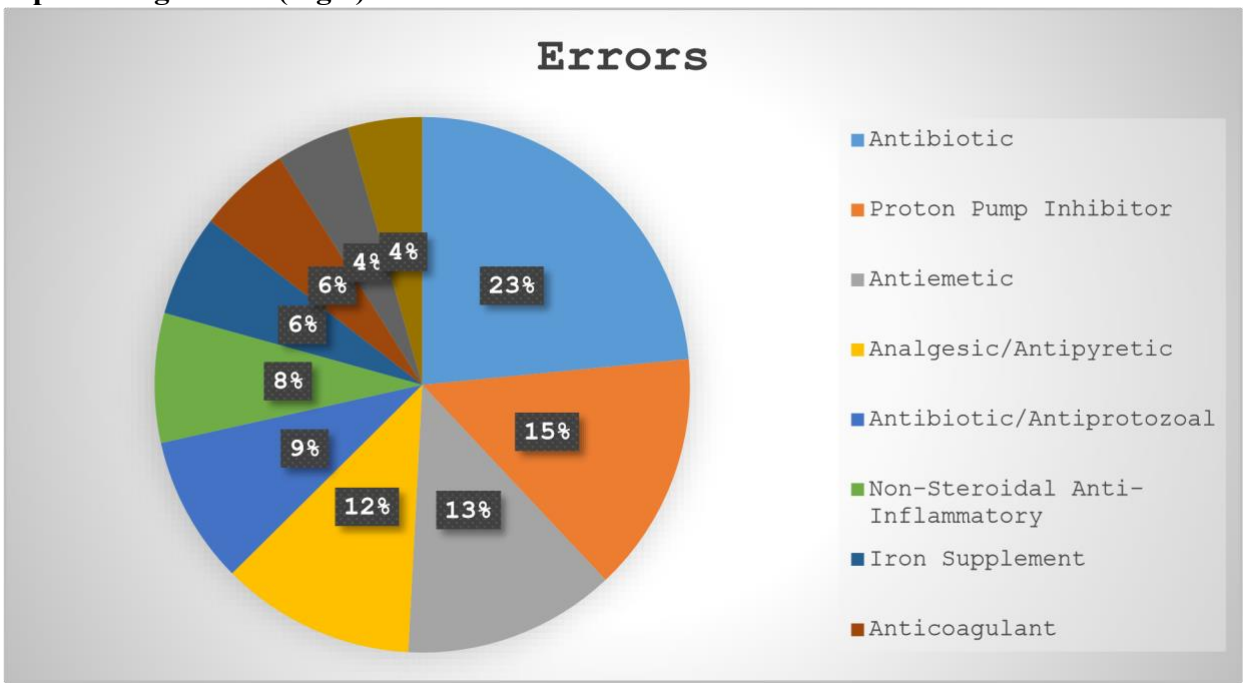
Despite these positive outcomes, recurring challenges included incomplete drug databases, insufficient user training, and instances of system bypassing—all of which can diminish the potential impact of eRx systems if not addressed.

Figures:

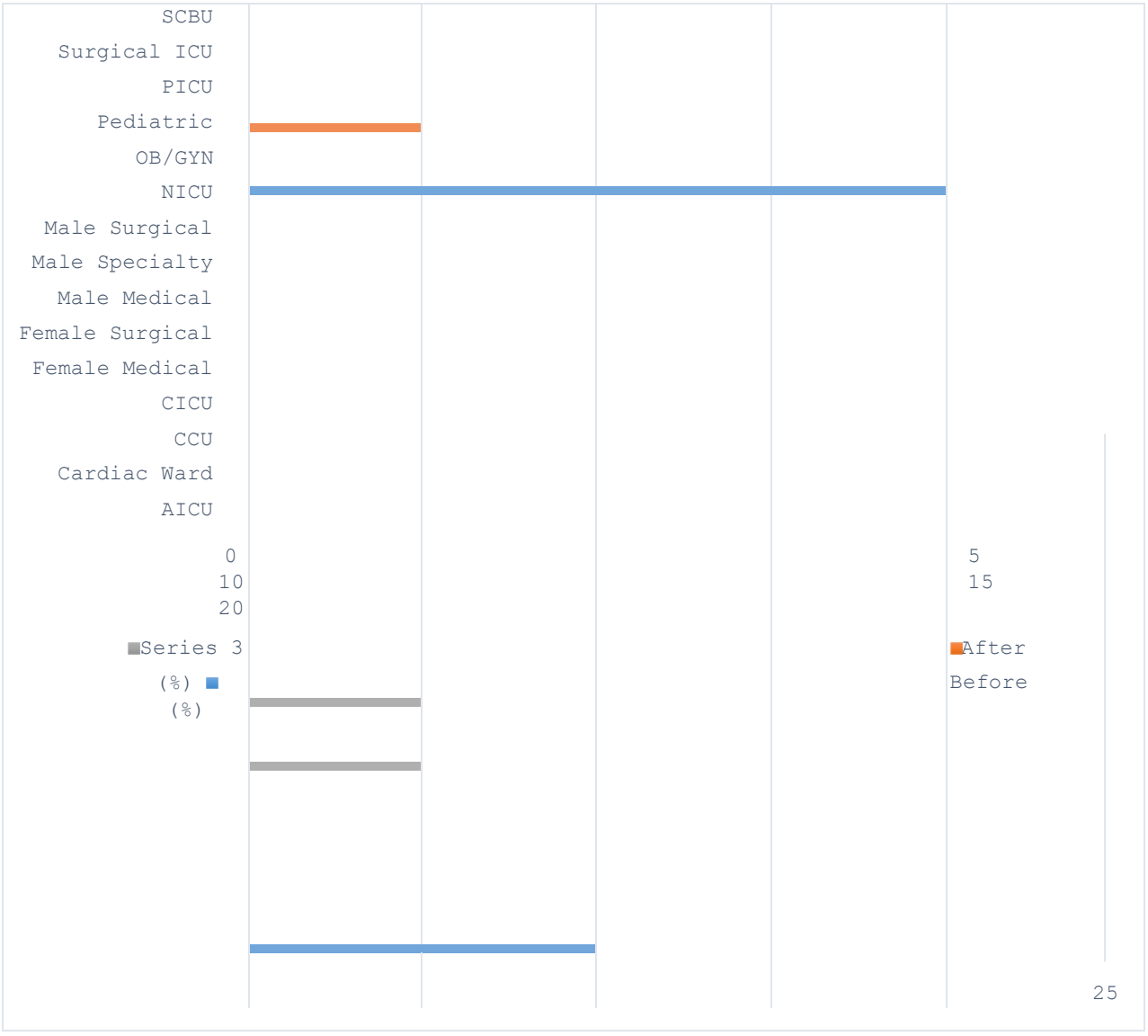
All Drug Errors (Fig1)



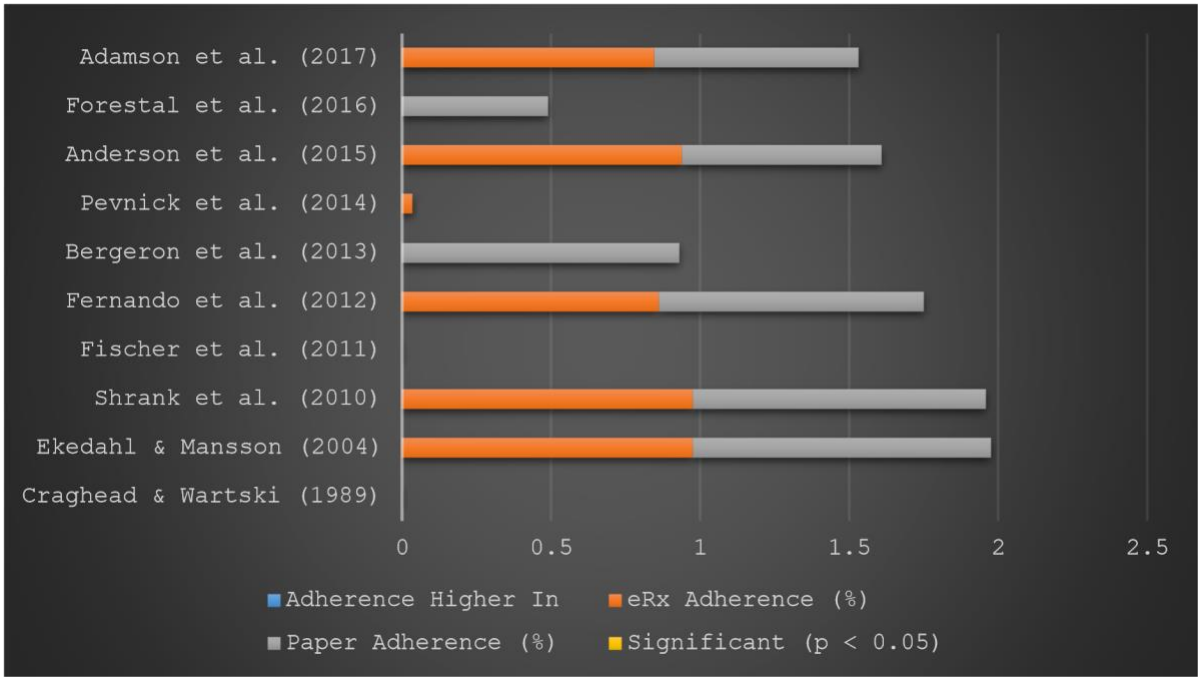
Top 10 Drug Errors (Fig 2)



Error Reduction by Department (Fig 3)



Adherence Outcomes from Included Studies (Fig 4)



Results

The results from the literature review and the data visuals clearly show how electronic prescription systems help reduce medication errors and make it easier for patients to follow their treatment plans.

- **Figure 1 (All Drug Errors)** as you can see in this figure, antibiotics had the highest rate of medication errors, then came proton pump inhibitors, antiemetic drugs, and pain relievers. A big part of the preventable prescription problems came from these drug groups, which means there's a need for stricter rules on the most commonly used medicines.

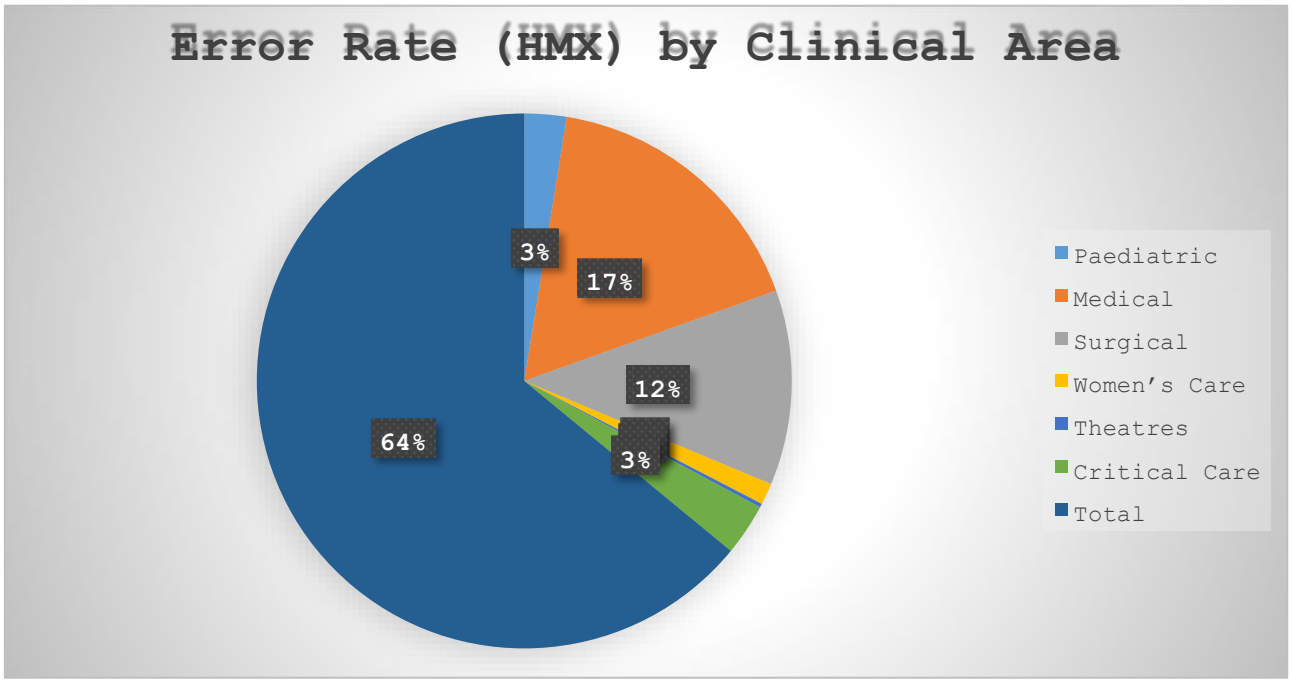
- **Figure 2 (Top 10 Drug Errors - Pie Chart)**
  The top three reasons for medication mistakes antibiotics (23%), proton pump inhibitors (15%), and antiemetic drugs (13%) together make up more than half of all recorded prescription problems. This shows how important it is to take extra care when handling these groups of medications.

- **Figure 3 (Error Reduction by Department):**
  The PICU, Cardiac ICU, and Surgical ICU were some of the departments where mistake rates dropped significantly after eRx was introduced. Especially in the paediatric intensive care unit, there were clear improvements, showing that the technology works well even in high-risk settings.

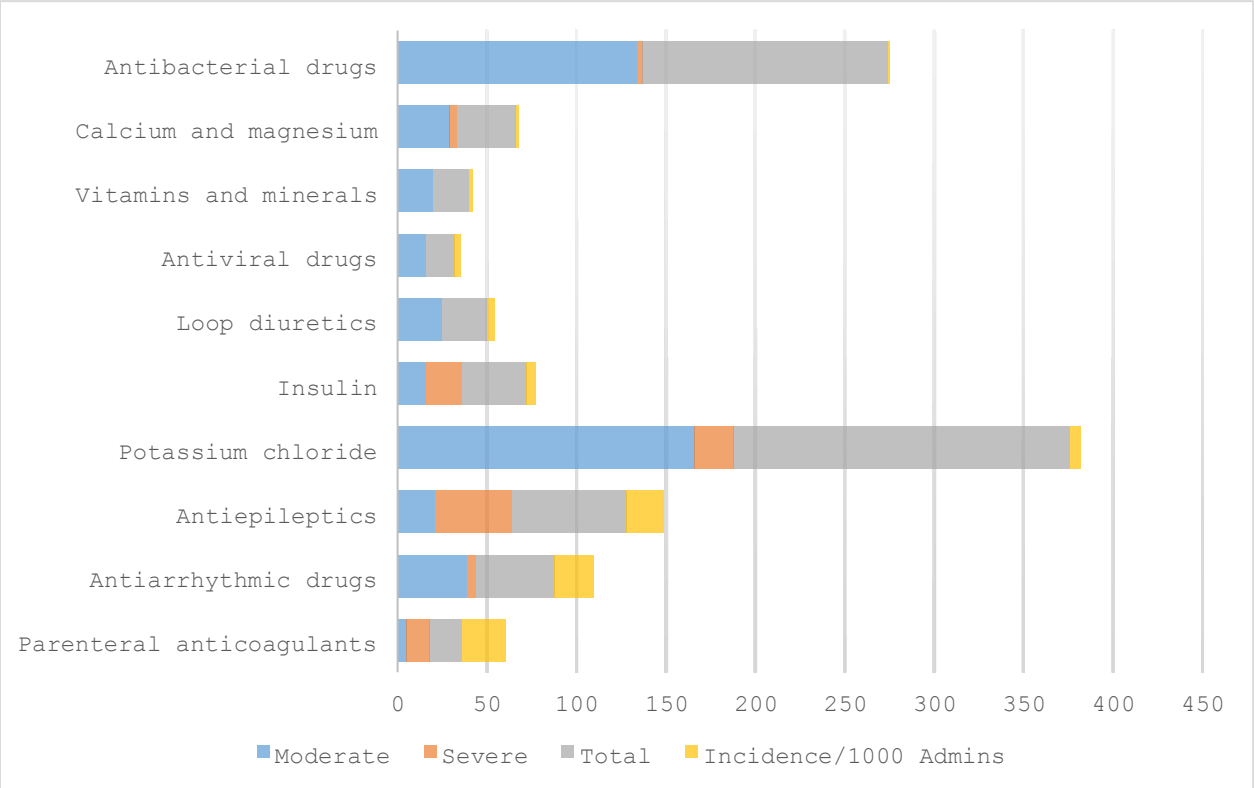
- **Figure 4 (Adherence Outcomes):**
  Several studies reviewed found that using eRx led to significant improvements in how well patients followed their medication plans, with results showing a strong statistical difference ($p < 0.05$). Patients who got their prescriptions electronically were more likely to pick them up and take them as directed compared to those who got paper prescriptions.

Together, these findings validate the effectiveness of electronic prescription systems in reducing medication-related errors, improving prescriber accuracy, and enhancing patient safety particularly in high-risk drug categories and critical care departments.

Error Rate (HMX) by Clinical Area (Fig 5)



Severe Harm Events by Drug Type (Top 10) (Fig 6)



Result

The evaluation of infusion data and medication error rates across different clinical departments and drug classes offers critical insight into the prevalence and severity of high-risk medication events, as well as the effectiveness of integrating electronic prescription (eRx) systems and Drug Error Reduction Software (DERS) in mitigating such risks.

Clinical Area Analysis:

From a total of **745,170 infusion instances**, approximately **338,263** were processed through DERS. Across these, a total of **6,067 high-risk medication (HMX) events** were identified. Key trends observed include:

- The **Paediatric department** exhibited the **highest rate** of HMX incidents, recording **56.1 events per 1,000 DERS-managed infusions**, nearly **three times the overall hospital average** of 17.9 per 1,000.
- **Medical units** accounted for the **largest number of absolute HMX events (2,423)**, although **Critical Care**, despite handling a high infusion volume, maintained a comparatively low event rate of **9.3 per 1,000**.
- Departments such as **Women's Care** and **Theatres** reported **the lowest HMX frequencies**, possibly due to reduced exposure to high-alert medications or more controlled prescribing environments.

These findings highlight the critical need for accurate dosing tools and decision-support integration in complex clinical areas, particularly in **paediatrics** and **internal medicine**, where patient-specific variations make precision even more vital.

Drug Category Analysis:

When categorized by drug type, the distribution of medication incidents revealed the following insights:

- **Parenteral anticoagulants** were linked to the **highest error incidence**, with **24.16 events per 1,000 administrations**, including a **notable share of severe cases** (13 of 18).

- **Antiarrhythmic medications (21.8 per 1,000)** and **antiepileptic drugs (20.86 per 1,000)** also demonstrated **elevated error rates**, underscoring the importance of heightened monitoring protocols and safety checks for these drug groups.

- Despite having the most errors overall **(188 events)**, **potassium chloride** had a moderate error incidence rate **(5.78 per 1,000)**, most likely as a result of its frequent use.

- **Antibacterial medicines** had a lower chance of mistakes, only **1.01** mistakes per **1,000** prescriptions, when used regularly. This shows that the current safety steps and advice for these drugs might be more reliable.

All the data shows that e-prescription systems are important in preventing avoidable harm, especially when used with clinical alerts and **DERS.**

This is even more important for high-risk medicine groups like insulin, blood thinners, and heart medications.

Conclusion

This research shows again how important electronic prescription systems are for making medicine safer and improving how hospitals run their operations. Through a comprehensive review of global literature, the research confirms that eRx platforms significantly reduce prescribing errors, improve clinical workflows, and contribute to better patient outcomes.

The most substantial benefits were observed in departments that handle high-risk medications, such as pediatrics, intensive care units, and emergency departments. Key advantages include improved legibility, automated dosage validation, real-time allergy and interaction alerts, and faster communication between prescribers and pharmacies. These features not only reduce adverse drug events but also foster a culture of safety and accountability within clinical teams.

However, the study also highlights persisting challenges. Inconsistencies in drug databases, limited user training, and the ability to bypass safety features were identified as common barriers to the full utilization of eRx systems. Addressing these gaps is essential to realize the full potential of digital prescribing technologies.

Overall, the findings support the continued investment in and refinement of e-prescription systems as a strategic component of hospital digitalization, particularly in healthcare settings aiming to align with national digital health initiatives and patient safety mandates.

Study Limitations

As a secondary research-based study, the findings are inherently dependent on the quality and scope of existing literature. No primary data were collected, which limits the ability to capture real-time perspectives from clinicians, pharmacists, or patients involved in using eRx systems.

Additionally, variations in healthcare infrastructure, policy environments, and reporting practices across different countries and hospitals may influence the generalizability of the results. The methodologies used in the reviewed studies also differed, which could affect consistency in reported outcomes. Future research could benefit from incorporating mixed methods or direct field studies to address these gaps.

Recommendations for Improvement

Based on the insights drawn from the literature, the following steps are recommended to enhance the adoption and effectiveness of electronic prescription systems in hospitals:

1. **Expand Structured Training Programs**
   Institutions should implement comprehensive training sessions for all users, including initial on boarding and periodic refreshers, to improve familiarity and reduce system bypassing.
2. **Develop Quick-Reference Aids**
   Tools such as flowcharts, checklists, FAQs, and short tutorial videos can help clinicians navigate complex prescribing tasks and reduce dependency on manual overrides.
3. **Customize Decision Support Features**
   Alert fatigue can be minimized by refining clinical decision support systems to prioritize critical warnings and ensure drug libraries are regularly updated and standardized.
4. **Encourage Continuous Feedback**
   setting up internal feedback loops between IT teams and clinical users can help identify workflow bottlenecks or technical shortcomings and lead to meaningful improvements.
5. **Pilot High-Risk Areas First**
   Rollouts should initially target departments with historically high medication error rates such as ICUs, paediatric wards, and oncology to build confidence and demonstrate early success.

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