ASSESSMENT OF IMPACT OF DIGITAL REVOLUTION ON PRESCRIPTION LEGIBILITY AND DISPENSING EFFICIENCY IN COMMUNITY PHARMACIES IN INDIA

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR MSC IN DIGITAL TRANSFORMATION (LIFE SCIENCE)

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Degree: MSc. Digital transformation (life science)

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DECLARATION

The information in application form is accurate to the best of my knowledge. I undertake to abide by the ethical principles outlined by Innopharma/ Griffith college ethics policy in my research project. I conformed that I have completed a full ethics assessment for my research project as per the college guidelines. I confirm that the research contained within my research project does not enquire ethical review and/or subsequent approval by the GEC/Innopharma ethics committee

Student Signature
Govind Vinodkumaar

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Govind Vinod Kumar

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LIST OF ABBREVIATIONS

IOM	Institute of medicine
WHO	World health organisation
EP	Electronic prescription
CPOE	Computerised physician order entry
ADE	Adverse drug events
CDSS	Clinical decision support solutions
EMAR	Electronic medication administration records

ABSTRACT

The research analyses pharmacists' opinions about the implementation of electronic prescribing systems and investigates at the frequency and effects of illegible prescriptions in community pharmacies in Kerala, India. A survey comprising both closed-ended and open-ended questions was administered to 105 registered pharmacists in order to collect data. For the quantitative and qualitative data, respectively, descriptive statistics and thematic analysis were used. The survey shows that prescriptions that are difficult to read is a common problem; 80.8% of pharmacists identify things like poor handwriting, unclear symbols, and missing information. Of the respondents, over half (48.1%) received illegible prescriptions once in a while, and 25% received them frequently. Readability issues with these prescriptions were identified by the vast majority (97.1%), which resulted in processing errors (67.3%), possible patient damage (56.7%), and decreased workflow efficiency (48.1%). When presented with illegible prescriptions, pharmacists frequently consulted colleagues (33.7%) or contacted prescribers (63.5%) for clarification. The most common outcome of illegible prescriptions was found to be dispensing errors (64.4%). Improved understanding (38.5%), reduced mistake rates (33.7%), and increased workflow efficiency (23.1%) are only some of the benefits of electronic prescription systems that the report reveals.

The majority of pharmacists supported the switch to electronic prescription, even though they mentioned possible difficulties such technological issues (73.1%) and problems during system failures (13.5%). Benefits including improved patient safety, more efficient workflow, and reduced administrative load were highlighted. The study's findings emphasize how critical it is to address prescription legibility in order to enhance patient safety and pharmacy efficiency. It is suggested that electronic prescription systems be implemented as a realistic approach, given that sufficient technical assistance and training are provided.

CHAPTER 1

1. INTRODUCTION

1.1 BACKGROUND

0Illegible prescriptions play a major role in adverse drug events, which can cause injury to patients and, in extreme situations, even result in death. Prescription illegibility has a significant effect; according to a 2006 Institute of Medicine (IOM) assessment from the National Academies of Science, it is responsible for at least 7,000 deaths a year. (Singh *et al.*, 2020) In 1988, the British court decision awarded penalty for a patient who received an oral hypoglycaemic agent instead of antibiotic which resulted in irreversible brain injury. the physician was partially responsible for the incident due to illegible prescribing. (Gupta *et al.*, 2003) Almost sixteen percent of doctors have illegible handwriting, which can cause misunderstanding and medicine delivery problems Fig.1. One of the most common reasons for prescribing errors is illegible handwriting on pharmaceutical orders, which can have serious consequences for patient safety. Misinterpretations resulting from illegible prescriptions have been associated with incidents of patient injury and even death. In a 1997 American Medical Association survey, it was reported that medication errors resulting from illegible prescriptions were the second most common and expensive claimed malpractice during a seven-year period. (Ashish Nair and Mona Srivastava, 2013)

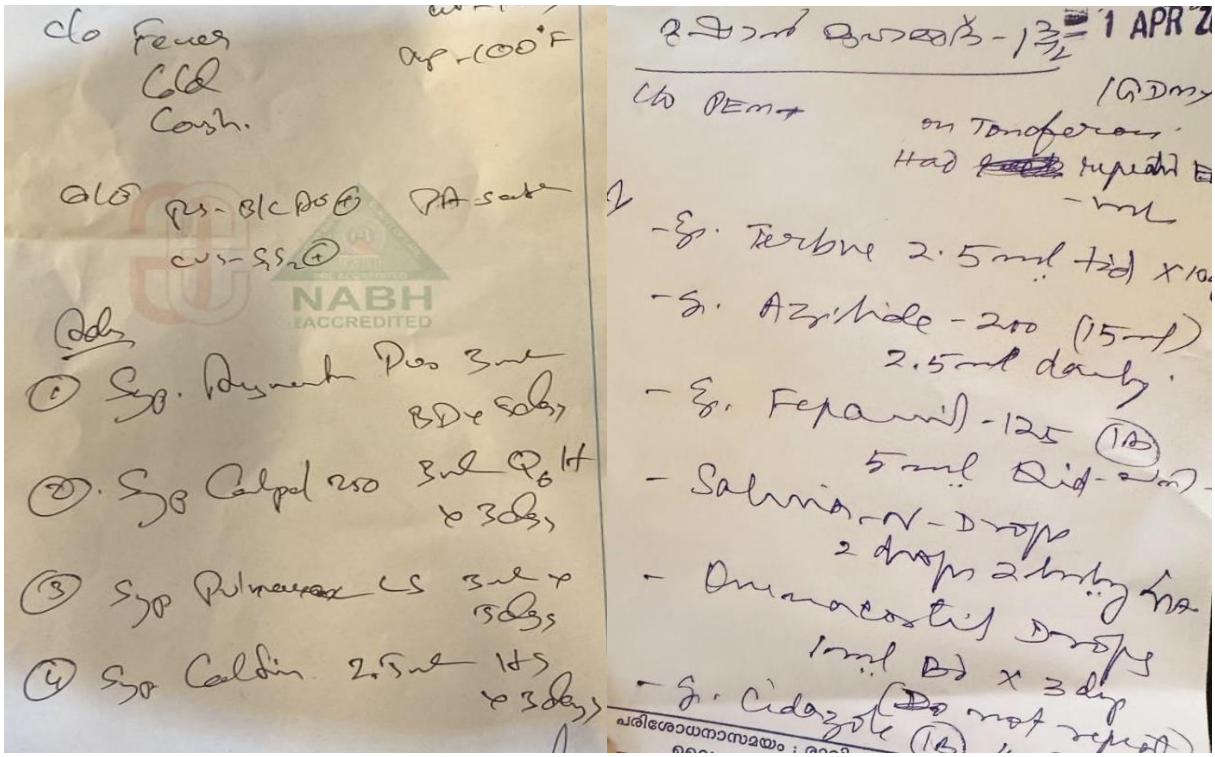


Figure 1 Illegible prescription model

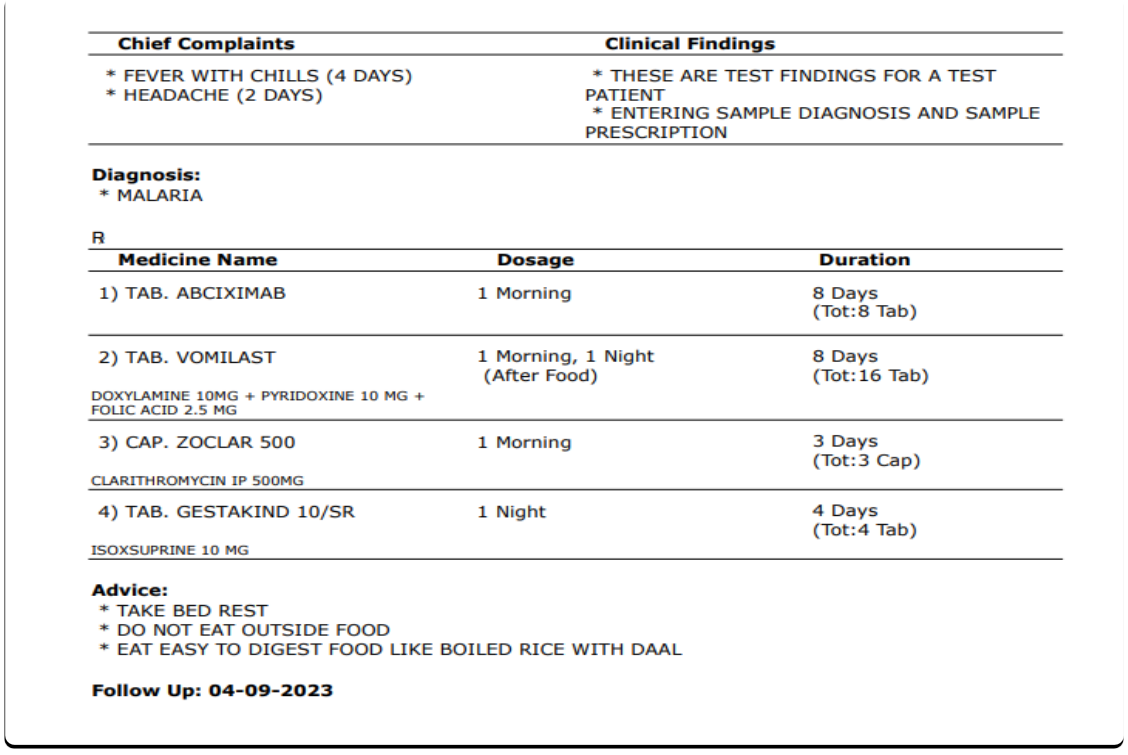
In India, doctors frequently write prescriptions in a difficult to read manner which poses challenges for pharmacists. The challenging healthcare landscape in India, which is characterized by a high patient-to-doctor ratio and limited communication time, makes it difficult for healthcare providers to contact prescribers to clarify misleading prescriptions. As such, individuals might have to make educated assumptions about the prescribed drugs, which increases the risk of errors. (Dhayalan *et al.*, 2021)

Digitalization is the process of incorporating digital technologies into various activities to improve the efficiency and quality across various sectors. (Zamanan *et al.*, 2022) India's healthcare system experienced significant modifications since the beginning of the digital revolution. Major transformations are being brought about by the integration of digital technology, particularly in community pharmacies, which serve as primary centre for patient and healthcare service interactions. India's healthcare industry has seen a significant increase in the use of digital technologies in recent years. These developments, which include telemedicine, electronic health records, and electronic prescriptions, have the potential to significantly improve the general effectiveness and efficiency of healthcare services provided to the country. (Deetjen, n.d.) In order to improve patient care efficiency and efficacy, the main goal of digitalization in healthcare is to optimize and simplify operations. Using technology to digitize medical data, automate processes, and promote collaboration and communication among healthcare providers are all part of this. Healthcare organizations may increase patient outcomes, decrease errors, and function more efficiently by utilizing digital tools.(Fabio Liebenspacher 1 *et al.*, 2022)

Community pharmacies play an important part in the distribution of pharmaceuticals and the supply of essential healthcare information, acting as the primary points of contact between patients and healthcare providers. Pharmacists will play an essential part in healthcare management in the emerging field of pharmacy, which will be defined by a combination of traditional and digital technologies. Pharmacists can continue to fulfil the changing requirements of patients and communities by adopting technology and maintaining ethical standards and human values. (Silva *et al.*, 2022) Community pharmacies are undergoing a digital transformation, as evidenced by the transition from traditional paper prescriptions to electronic formats. The goal of this change is to improve understanding, decrease errors, and accelerate prescription management—all of which will contribute to a more convenient and accessible procedure.

With several benefits for patients, healthcare professionals, and the healthcare system as a whole, the digital transformation of community pharmacies from traditional paper prescriptions to electronic formats constitutes an important advancement in pharmacy practice. Pharmacists can provide more accessible and convenient healthcare services, increase patient safety, and optimize prescription administration procedures by utilizing digital technologies. Conventional handwritten prescriptions are naturally prone to misunderstanding in a number of ways, such as poor handwriting, incorrect dose instructions, and misinterpretation of medical terms or abbreviations. These elements greatly increase the likelihood of medication errors, dangerous drug reactions, and even fatalities at every stage of the medication use process, from filling the prescription to administering it. The model of a legible electronic prescription is shown in Fig.2

This research topic complies with modules of Business strategy and change management and this module help me to know more about the digital transformation. It analyses the possible advantages and difficulties in the Kerala the state of Indian environment as it relates to the intersection between technology and pharmaceutical practices.



Chief Complaints	Clinical Findings
* FEVER WITH CHILLS (4 DAYS) * HEADACHE (2 DAYS)	* THESE ARE TEST FINDINGS FOR A TEST PATIENT * ENTERING SAMPLE DIAGNOSIS AND SAMPLE PRESCRIPTION

Diagnosis:
* MALARIA

R

Medicine Name	Dosage	Duration
1) TAB. ABCIXIMAB	1 Morning	8 Days (Tot:8 Tab)
2) TAB. VOMILAST DOXYLAMINE 10MG + PYRIDOXINE 10 MG + FOLIC ACID 2.5 MG	1 Morning, 1 Night (After Food)	8 Days (Tot:16 Tab)
3) CAP. ZOCLAR 500 CLARITHROMYCIN IP 500MG	1 Morning	3 Days (Tot:3 Cap)
4) TAB. GESTAKIND 10/SR ISOXSUPRINE 10 MG	1 Night	4 Days (Tot:4 Tab)

Advice:
* TAKE BED REST
* DO NOT EAT OUTSIDE FOOD
* EAT EASY TO DIGEST FOOD LIKE BOILED RICE WITH DAAL

Follow Up: 04-09-2023

Figure 2 Electronic prescription model

1.2 HYPOTHESIS

The use of digital technology, such as electronic prescriptions (e-prescriptions), in community pharmacies would improve patient safety, enhance dispensing efficiency, and improve prescription legibility compared to handwritten prescriptions.

1.3 PURPOSE

This study aims to investigate the impact of digitalization on prescription legibility and dispensing efficiency within community pharmacies. Illegible prescriptions are the common concern in healthcare settings due to their potential to increase the risk of medication errors and adverse drug reactions, ultimately compromising patient safety. The primary objective of this research is to identify strategies that promote patient safety and optimize the drug distribution process by assessing the efficacy of digital technology.

By examining the adoption of digital solutions in community pharmacies, this study aims to evaluate how these technologies influence prescription legibility and dispensing efficiency. Digitalization methods, such as electronic prescribing systems and digital prescription management platforms, have the potential to enhance the accuracy and legibility of prescriptions by replacing handwritten orders with electronically generated ones. Additionally, digital tools can streamline the dispensing process by providing pharmacists with easy access to understand patient information, medication histories, and drug interactions.

It also aims to identify best practices and implementation strategies that contribute to improved prescription legibility and dispensing efficiency. By understanding the impact of digital technology on pharmacy operations, healthcare providers can identify opportunities for initiatives for quality improvement, distribution of resources, and process improvement.

1.4 SIGNIFICANCE OF THE STUDY

By integrating digital technology into community pharmacies, less patient injury from illegible prescriptions, adverse drug events, and medication errors may occur. Digitization can help enhance patient safety outcomes by improving the readability and accuracy of prescriptions. Pharmacy procedures are streamlined by digital technologies that give pharmacists quick access to patient data, medication histories, and drug interactions. Examples of these tools are electronic prescribing systems and digital prescription management platforms. Pharmacists and patients may eventually profit from this since it may result in more efficient prescription

processing and dispensing. The study intends to provide useful insights for pharmacy consumers, policymakers, and healthcare providers by identifying the most effective procedures and implementation methods that support improved prescription readability and dispensing efficiency.

1.5 RESEARCH QUESTION

The major research questions that need to be addressed are:

1. What method can be used to assess the legibility score of prescription in community pharmacy?
2. What are the common errors associated with illegible prescriptions and dispensing practices and its impact in patients?
3. What are the digital technologies used in medication dispensing?
4. What are the impacts of implementing digital technologies in dispensing efficiency and prescription legibility in community pharmacy?

1.6 AIM AND OBJECTIVES

The research aims to assess the impact of digitalization on dispensing practices and prescription legibility in community pharmacy in Kerala state of India. It emphasises on the use of digital technologies for dispensing practices and prescription process and it also focus on the benefits and challenges associated with these digital revolutions.

The main research objectives are:

- To assess the legibility of prescriptions in community pharmacies using a standardized scoring system
- To identify the digital technologies used in the medication dispensing
- To evaluate the impact of digital technologies in prescription illegibility and dispensing practices.
- To identify the types of errors associated with illegible prescriptions and dispensing process and its impact in patients.

CHAPTER 2

2. LITERATURE REVIEW

2.1 DIGITAL REVOLUTION IN PHARMACIES

A study was conducted to investigate how pharmacies and digitalization interact within the framework of changing healthcare dynamics. It emphasizes how important it is for pharmacies to use digital technology in order to remain competitive in a market that is evolving. The need for digital adoption is highlighted by the declining pharmacy sector in the context of an expanding healthcare industry. Important discoveries show that incorporating digital solutions can improve patient safety overall, prescription clarity, and dispensing efficiency. The study finds that in order for pharmacies to succeed in the digital age, they must use methods including electronic prescribing systems, online sales channels, and mobile health applications. The review also stresses the value of relationships between pharmacists and patients as well as the strong confidence that the public has in community pharmacists when seeking advice on medications to improve customer experiences and optimize pharmacy operations, it is advised to automate warehouse systems, apply Big Data analytics, and establish up 24/7 sales counters. Overall, the research emphasizes how digitalization has the ability to completely change pharmacies and emphasizes the necessity of early adaptation in order to take advantage of new potential customers in the healthcare sector. (L. Fabio Liebenspacher.*et al.*, 2022)

The implementation of digital technologies has significantly transformed pharmacy practice, including patient care, efficiency, and the professional development of pharmacists. The study evaluates the different effects of digitalization on pharmacies, with a focus on innovations that have increased patient access and accuracy, like electronic records, tele-pharmacy, and digital prescriptions. But there are further difficulties, such as data security and the need for continuing education. The study highlights the advantages of digitalization in improving patient outcomes and workflow efficiency while dealing with ethical and regulatory concerns. In the context of technological advancements, it promotes an integrated approach to digital innovation that sets patient safety and privacy first. In addition, the study highlights the importance of partnership in navigating the changing digital landscape in healthcare and points out areas for further research. It also illustrates the ability of digital technologies to completely transform the world of pharmacy, but also emphasizes the need of careful adoption and modification to ensure the best possible outcomes. (Zamanan *et al.*, 2022)

The revolutionary potential of digital technology in the pharmacy industry is emphasized by the literature on digital pharmacists and their incorporation into pharmacy practice and education. Worldwide, there has been a notable increase in the use of digital technologies for pharmaceutical therapy and teaching during the COVID-19 epidemic. Numerous uses of digital technology in pharmacy practice, such as tele pharmacy, medication management programs, electronic health platforms, and monitoring patients from a distance, have been demonstrated by study. These tools have demonstrated effectiveness in improving medication adherence, optimizing patient outcomes, and increasing access to pharmacy services. (Silva *et al.*, 2022)

Community Pharmacies (CP) and the healthcare industry as a whole are experiencing a substantial digital transition that comes together with opportunities and challenges. This study divides CP into adoption clusters using Rogers' Diffusion of Innovation Model and the answers provided by Technical Directors to an online survey. The findings show that pharmacy associations are frequently a source of CP with lower adoption percentages. It's interesting to see that although respondents think CP in Portugal is creative, innovators are less like to agree. The need for integrated networks amongst healthcare stakeholders to improve communication and data exchange, as well as the incorporation of digital technologies into pharmacy management procedures, have been cited as major concerns. The conversation explores these issues, CP's innovative thinking, preferred modes of communication, the importance of regulatory rules, and possible digital remedies. The gaps in the literature that have been identified draw attention to the need for more research on the influence of regulatory policies on industry innovation and the work satisfaction of pharmacists. In order to support this transformation, the thesis highlights prospects for ongoing digital innovation within CP and recommends in favor of pharmacy associations, pharmacists, and a range of governmental strategies. All things considered, the study provides insight into the state of CP digitization nowadays and lays out directions for further research and cooperation. (Monteiro, 2023)

2.2 PRESCRIPTION LEGIBILITY AND PATIENT SAFETY

Improving prescription procedures is essential to improving patient safety and elevating the general standard of healthcare delivery systems. Prescribers should continue to get ongoing training in order to minimize cases of illegible, incomplete, and incorrect prescriptions. These issues are widespread and can lead to medication errors and poor patient outcomes. An overall

readability percentage of 69.27% was found in research led by Kamal et al. in Sudan, which evaluated 395 prescriptions randomly. Important patient data and prescriber information was clearly missing, highlighting a structural flaw in documentation standards. Additionally, the research uncovered concerning patterns of illogical antibiotic prescriptions, beyond suggested limits in 55.8% of cases, underscoring the urgent requirement for measures to prevent unnecessary antibiotic use. To address these deficiencies, coordinated efforts are needed to improve prescribing practices through more focused education, improved documentation guidelines, and strict supervision procedures. The only way the healthcare system is able to maintain patient welfare and maximize treatment outcomes is by implementing such extensive procedures. (Idris and Al-Talib, 2017).

Cross-sectional research evaluated the correctness and readability of more than 2000 prescriptions obtained from 23 establishments at community pharmacies in Sana'a, Yemen. The results showed that 99.12% of prescriptions were of low quality, mostly because of inaccurate information. This is concerning. This drawback highlights how urgently an effective professional development program is needed. By addressing the flaws in prescription processes, such a program would be crucial in improving patient safety and the general quality of healthcare. By providing pharmacists with up-to-date information and abilities, it seeks to reduce mistakes and ensure accuracy in prescription paperwork. Moreover, this initiative can encourage adherence to established procedures and regulations by developing an environment of continuous improvement within the pharmacy profession. The adoption of a successful professional development program ultimately has the potential to greatly improve patient outcomes and pharmaceutical care standards in the community. (Mohammed Al-Worafi *et al.*, 2018)

Prescription procedures require ongoing review and improvement since they are essential to protecting patient health and improving healthcare delivery. Research conducted in rural Anantapuri, India by Vigneshwaran et al. highlights how important it is for prescriptions to be clear and comprehensive. Of the 285 prescriptions analysed, half were missing patient information and essential medicine. Prescriptions that are this illegible or incomplete greatly increase the chances of drug mistakes and compromise patient safety. It becomes essential to follow World Health Organization (WHO) criteria in order to improve the quality of prescriptions. Accurate diagnosis and treatment depend heavily on readable prescriptions that include complete patient and drug information, especially in resource-constrained settings like rural

areas. Prescription procedures need to be continuously monitored and improved upon in order to maximize healthcare results and reduce drug delivery mistakes. (Jaffar, 2016)

Prescriptions for medical care must be clear and accurate, according to an examination of prescription questionnaires. Remarkably, an important advancement in mistake prevention was seen, since 94% of prescriptions had readable handwriting. But the investigation revealed alarming defects in the coverage of the data, widespread use of abbreviations, and continued use of outdated terms. A practical answer to the common problems, the shift to printed prescriptions appears to be a good way to reduce pharmaceutical mistakes. In the medical field, readability, correct medication information, and patient safety are closely related. This study emphasizes how critical it is to make sure prescriptions are not only legible but also professional. (Mandal, 2013)

According to a survey done at community pharmacies in Asmara, Eritrea, 78.63% of prescriptions had detailed patient and medication information, which is a good level of completeness. Furthermore, 54.3% of these prescriptions were readable, highlighting how crucial clear handwriting is to reducing the possibility of pharmaceutical mistakes. This research indicates a relationship between completeness and legibility since complete prescriptions were more likely to be readable, which lowers the possibility of medicine distribution mistakes. These results highlight the vital role that accurate and accurate documentation plays in improving patient safety and maximizing healthcare results in pharmacy practice. Enhancing the readability and completeness of prescriptions might help reduce the number of drug mistakes that occur, which would be advantageous for patients as well as healthcare professionals. (Weldemariam *et al.*, 2020)

Rodríguez-Vera et al. (2002) evaluated the legibility of handwritten clinical records in a general hospital located in Spain. 15% of the case files they examined were so unreadable that it was difficult to understand what they meant. Compared to medical departments, records from surgical departments had a higher frequency of this problem. For auditors, researchers, and physicians involved in patient care, illegible handwriting presents serious difficulties and may result in errors in clinical interaction, research, and auditing. The authors propose that switching to computer-based medical documentation methods or carefully maintaining medical records could help address this issue by enhancing clinicians' handwriting. This study emphasizes how crucial it is to deal with unreadable handwriting in medical records in order to improve patient care and the effectiveness of the healthcare system. (Rodríguez-Vera *et al.*, 2002)

The impact of illegible prescriptions on dispensing practices among South African pharmacy personnel was investigated in pilot research conducted by Modi et al. Regardless of expertise level, they discovered that poorly legible prescriptions present serious challenges to pharmacy staff, resulting in errors and difficulties in interpretation. Medication names and dosages were accurately identified by just 20% and 18% of participants, respectively. Seventy percent of participants supported the implementation of digital prescriptions, highlighting its potential as a solution in the study. To address illegible prescription-related patient safety issues and dispensing errors, improving the quality of written prescriptions and instructions has been recognized as an important method. This emphasizes the importance of improving prescription legibility and encourage safer drug administration procedures in healthcare settings are needed. (Modi *et al.*, 2022)

2.3 IMPACT OF ELECTRONIC PRESCRIPTION

Many advantages for patients and healthcare professionals were found in an extensive assessment of the literature about the effects of e-prescriptions in the Middle East. Based on secondary sources including PubMed, Google Scholar, and Medline, the research emphasized how important e-prescriptions are to improving patient outcomes and healthcare productivity. Notably, it has been discovered that e-prescriptions may increase drug compliance, which might benefit patients' health results. Improvements in record-keeping procedures made possible by the use of electronic systems also decreased prescription errors and drug mistakes. However, a number of issues were found, mostly impacting healthcare professionals, in spite of the evident benefits. The smooth integration of e-prescription systems into healthcare practices was delayed by problems like inadequate training, system malfunctions, and poor internet access. These difficulties brought to light how crucial it is to resolve challenges with infrastructure and give healthcare personnel thorough training programs in order to guarantee the effective adoption and use of e-prescription technology. In summary, electronic prescriptions have significant advantages; yet, in order to fully realize their potential to enhance healthcare delivery in the Middle East, it is imperative to tackle the associated obstacles. (Alanazi and Alzahrani, 2024)

Electronic prescriptions, or e-prescriptions, represent a major breakthrough in health information technology that will benefit both patients and pharmacists. By improving prescription

procedures, increasing patient safety precautions, and optimizing workflow efficiency, e-prescribing provides pharmacists and patients with vital support. Still, there are advantages and disadvantages to this change. The study by Lanham et al. emphasizes how important it is for technology providers to work together in order to maximize the benefits of e-prescribing. Moreover, ongoing efforts are required to fully realize its effect and potential inside the healthcare system. Collaboration among the appropriate groups and continuous efforts to optimize adoption are critical to guaranteeing that e-prescribing acts as an impulse for change, improving patient care and operational efficiency throughout the healthcare system. (Klepser *et al.*, 2016)

Electronic prescription has many benefits for healthcare systems, but community pharmacies face certain challenges when using it. The difficulties faced by pharmacist and the workflow complexities are explained be a qualitative study conducted by o Dulcoya and Chui. Problems with software and internal problems in pharmacies are the major factors affecting the workflow. The workflow interruption caused by error may result in longer processing and waiting time for patients. These are made worse by lack of training of pharmacists. The improved accuracy and efficiency of E- Prescriptions can be achieved by a greater collaboration and will improve the patient outcomes. (Odukoya and Chui, 2012)

Community pharmacies in Finland have undergone a revolution with the integration of computerized prescriptions and direct dispensing, resulting in increased dependability and a noticeable 13% decrease in delivery times. A new era of efficiency has been brought about by this digital transition, which has simplified processes and encouraged a more systematic, technologically advanced approach to medicine delivery. Time savings and improved operational effectiveness have been greatly helped by the introduction of e-prescriptions. Pharmacies are taking use of these modern technologies by skilfully adjusting to them. The pharmaceutical industry has significantly improved as a result of embracing digitalization, assuring more efficient operations and increasing client happiness. Pharmacies are technologically evolving, yet the need for efficiency and dependability never goes away, which motivates ongoing process and service improvement. All things considered, the move to digital solutions is a step in the right direction for the pharmacy industry, offering more efficiency and convenience for patients and pharmacists alike. (Porterfield *et al.*, 2014a)

A troubling pattern emerged from research that observed at 400 prescriptions from a tertiary care hospital: many of them were incomplete or illegible. This noticeable problem emphasizes how important it is to have improved prescribing practices in order to reduce mistakes. Errors

are made more likely by incomplete pharmacological data and insufficient information on patient and prescriber specifics. Errors of this nature affect patient safety while also impeding efficient healthcare delivery. Redesigned procedures are therefore urgently required in order to reduce mistakes and improve patient care in healthcare settings. Healthcare institutions may reduce risks, guarantee correct drug dispensing, and ultimately improve the quality of care given to patients by putting strong prescription policies into place. (Bhosale *et al.*, 2013)

In order to increase the effectiveness and accuracy of prescribing in ambulatory care settings, Porterfield.et.al, undertook a study on the topic of e-prescribing. By using an approach based on systematic reviews with 47 sources, the study highlights how e-prescribing may decrease medication errors, increase productivity, and result in significant cost savings for the healthcare industry. The results show that prescribing errors have significantly decreased, sometimes to as low as a seventh of their earlier frequency. Furthermore, e-prescribing is linked to significant cost savings; the expected savings for practices who use this technology over a ten-year period range from $140 billion to $240 billion. The report highlights a number of adoption challenges despite these benefits, such as financial issues, a lack of physician support, concerns about patient privacy. (Porterfield *et al.*, 2014b)

The effect of electronic prescribing (EP) on the quality of prescriptions at a UK hospital was examined in a study by Parastou Donyai et al. Prescription errors and pharmacist interventions decreased when EP was implemented, according to the research, which also showed a substantial improvement in the quality of prescriptions. However, also highlight the emergence of new forms of errors connected specifically to EP systems. Interestingly, there was not much correlation between pharmacist interventions and prescribing errors, suggesting that pharmacists contribute differently to the quality of prescribing. The study comes to the conclusion that pharmacist interventions and EP should be seen as a part of an integrated system. (Donyai *et al.*, 2008)

2.4 MEDICATION ERROR AND ROLE OF TECHNOLOGY

In the book 'Medication errors: causes, prevention and risk management', Cohen focuses on identifying the main reasons for pharmaceutical errors and providing practical solutions to avoid them. By including a variety of sources, including real-life instances and research data, the book aims to improve patient safety and reduce the frequency of drug errors. It carefully breaks down the underlying causes of medication errors, emphasizing the roles played by problems with communication, human factors, and systemic failures. The book also

emphasizes how important technology is to preventing errors, especially when it comes to issues like misprinted prescriptions and incorrect dosages. Cohen highlights the revolutionary potential of technology in preventing prescription errors by promoting the use of barcode drug administration and computerized prescribing systems. (Cohen, 2000)

In a systematic analysis, Ammenwerth et al. evaluated how computerized physician order entry (CPOE) affected prescription errors and adverse drug events (ADEs) in 25 different trials. They found that rates of medication errors (from 13% to 99%) and potential adverse drug events (ADEs) (from 35% to 98%), as well as actual ADEs (with reductions between 30% and 84%), were all significantly lower. These results highlight how electronic prescription systems can help reduce medication errors and adverse drug events. But the evaluation also pointed up flaws in the research design and reporting quality throughout the reviewed literature, which might have influenced the findings. Future research should use more stringent procedures and standardized reporting techniques in light of the poor reporting and low study quality. Despite these drawbacks, the pattern of risk reduction that is constant across several research attests to the general effectiveness of CPOE systems in raising the standard of pharmaceutical safety. This highlights how crucial it is to keep working to improve electronic prescription systems in order to improve patient outcomes and reduce the likelihood of unfavourable occurrences. (Ammenwerth *et al.*, 2008)

Medication errors are defined as avoidable occurrences associated with medicinal products consumption. In healthcare, addressing pharmaceutical safety is critical, and professionals are essential in reducing errors. Errors are predictable and typically result from dose-related factors. Common causes of errors include ignorance, poor communication, and illegible handwriting. Prescription, dispensing, administration, and follow-up errors are just some of the many categories in which these mistakes occur. Surveys, criteria-based audits, and voluntary reporting are examples of detection strategies. Error avoidance is made easier by technological solutions like as Clinical Decision Support solutions (CDSS) and Computerized Physician Order Entry (CPOE). The assessments often use the five rights technique, which guarantee the correct patient, medication, dose, time, and route. (Shrivastav and Sachdeva, 2018) Medication errors are a major source of morbidity and mortality and provide serious hazards to patients. They cover a variety of avoidable errors that can occur during the prescription, dispensing, administering, and monitoring phases of the pharmaceutical use process. Medication mistakes can have a variety of causes, such as healthcare workers' weariness, poor communication, ignorance,

and illegible handwriting. A variety of characteristics, including the type of error and the underlying cognitive processes involved, can be used to classify errors.

Prescription mistakes, dispense errors, administration errors, and compliance problems are a few of the often-occurring pharmaceutical error kinds. These mistakes may result from mistakes, memory lapses, rule-based errors, or knowledge-based errors. Medication errors must be identified and prevented using a multimodal strategy that includes Clinical Decision Support Systems (CDSS), Electronic Medication Administration Records (eMAR), and Computerized Physician Order Entry (CPOE). The "five rights" approach is a commonly used technique for assessing medication mistakes, which makes sure that every dosage given corresponds with the appropriate patient, drug, dose, time, and route. Reducing medication mistakes and improving patient safety may be accomplished by putting in place strong control mechanisms, encouraging improved communication, and making use of technology. Addressing these mistakes is essential to maintaining the "Do no harm" philosophy and enhancing general drug control procedures. (Shrivastav and Sachdeva, 2018)

In healthcare settings, especially in Indian hospitals, the switch from handwritten prescriptions to electronic prescriptions, or E-prescriptions, represents a significant achievement. Illegible handwritten prescriptions might pose a danger to patient safety and drug delivery accuracy. The usage of Latin terminology and symbols, which can be difficult for medical staff to correctly understand, increases this long-standing issue.

Healthcare systems have been using Computerized Physician Order Entry (CPOE) systems more frequently in an effort to reduce prescription mistakes as a result of realizing how serious the problem is. E-prescriptions produced by CPOE systems provide a number of benefits, such as accuracy, reduced mistake rates, and readable text. Prescribers process these prescriptions electronically, sending the information to pharmacies to expedite the process of dispensing medicine. Globally, the use of CPOE systems has increased dramatically; in the US, the percentage increased from 2.7% in 2003 to 65.2% in 2017, according to data from the American Society of Health-System Pharmacists (ASHP).

However, to prevent the formation of new mistake types, such incorrect input errors, the deployment of CPOE systems requires close attention to detail and sufficient training. Hospitals have to integrate their CPOE databases going ahead in order to guarantee smooth interoperability and optimize the advantages of electronic prescription. Government laws in India are expected to outline user regulations and responsibilities related to CPOE systems,

which highlights the increasing awareness of these systems' significance in reducing medication mistakes and improving patient safety. Healthcare systems may utilize E-prescriptions to enhance patient outcomes and increase healthcare delivery through detailed literature studies and ongoing improvement initiatives. (Singh *et al.*, 2020)

2.5 HANDWRITTEN VS ELECTRONIC/ LEGIBILITY AND COMPLETENESS

The prospective study by Albarrak et al. evaluates medication errors and compares the completeness and legibility of handwritten versus electronic prescriptions. The study was carried out at King Khalid University Hospital in Riyadh, Saudi Arabia, and gathered computerized prescriptions from the paediatric ward and handwritten prescriptions from other clinical units. The readability of the handwritten prescriptions was evaluated and used a checklist that matched hospital criteria to determine completeness. The findings showed that handwritten and computerized prescriptions differed significantly from one another, with errors found in 35.7% of handwritten prescriptions and only 2.5% of electronic prescriptions. Interestingly, handwritten prescriptions had a higher rate of errors associated with missing doses and incorrect administration routes. This study highlights the potential advantages of using electronic systems in healthcare settings by showing the benefits of electronic prescribing over handwritten prescriptions in terms of lowering medication errors and enhancing prescription completeness. (Albarrak *et al.*, 2014)

The shift from handwritten prescriptions to electronic prescriptions, or e-prescriptions, has been recognized as a significant development in healthcare since it resolves the continued issue of prescriptions that are difficult to read and minimizes the possibility of medication errors. Studies have shown that illegible prescriptions have a major influence on patient safety and death rates, and have been generally recognized as a major contributing factor to patient harm. There has been a notable increase in the adoption rates of Computerized Prescription Order Entry (CPOE) systems in hospitals throughout the United States, especially those that are associated with clinical decision support. E-prescriptions improve patient safety and accelerate the pharmaceutical administration process by providing precision, error-free distribution, and clarity. On the other hand, because CPOE systems increase the possibility of new forms of errors, such as inaccurate input errors, so they must be implemented carefully and with sufficient training. The research compares the effects of handwritten or paper-based prescriptions against electronic prescribing (e-prescriptions) on outpatients' essential drug adherence. Upon

doing a thorough literature search and reviewing ten important papers, it was discovered that there is conflicting data about the effectiveness of electronic prescribing. A comparable number of research imply that e-prescriptions worsen early drug adherence, whereas two studies reveal no statistically significant difference between the two approaches. In order to make comparisons across prescribing practices more transparent, the study emphasizes the necessity of developing a uniform medication adherence metric system. It also emphasizes the significance of carrying out more study in various geographic contexts in order to have a more thorough grasp of drug adherence trends. The intricacy of primary drug adherence in outpatient settings is generally highlighted by this study. (Aluga *et al.*, 2021)

2.6 MEDICATION ERRORS

Prescription errors pose a serious risk to patient safety and treatment efficacy, making them a crucial concern in the healthcare industry. Studies highlight how prescription information deficiencies—either via omissions or misinformation—often cause these mistakes, which can have detrimental effects for patients. For instance, a thorough four-month investigation that examined 680 prescriptions found an unbelievable 846 mistakes overall, highlighting the severity of the problem. These mistakes, which fall into one of two categories—omissions or commissions—highlight the necessity of close inspection during the prescription process. Addressing these issues requires effective collaboration between physicians and pharmacists. Healthcare providers may ensure that prescriptions are accurate and comprehensive by collaborating to detect and correct problems. Furthermore, extant research highlights the significance of putting in place strong monitoring systems and preventative measures to reduce the underlying causes of prescription mistakes. Healthcare practitioners may maintain the highest standards of care and patient safety in clinical practice by minimizing risks and optimizing patient outcomes through proactive measures and constant attention. (Gul, 2014)

Medication errors in an intensive care unit (ICU) environment were evaluated in prospective research by Moudgil et al. with an emphasis on the kinds, causes, and frequency of errors. ICU patients' medical records, aged 14 and older, were examined for six months at the Government Head Quarters Hospital in Udhagamandalam. In all, 116 medication mistakes were found in 103 patients by the research; male patients had a greater incidence of medication errors. The most common sort of mistakes found was prescription errors, which were linked to

things like missing dosage instructions, using medications that looked similar, and handwriting that was difficult to read. The study presents the need for medication mistakes to be more widely recognized among healthcare practitioners at all levels and promotes changes to prescription procedures. Moreover, it emphasizes the necessity of approaches that successfully differentiate similar medications in order to reduce the possibility of mistakes. The study concludes that healthcare systems may improve patient safety and the standard of care in the intensive care unit by addressing these problems. (Moudgil *et al.*, 2021)

2.7 RESEARCH GAP

There remain certain gaps in the literatures of research about the digital revolution in pharmacies, medication errors, the influence of electronic prescriptions, prescription legibility and patient safety, and the comparison of handwritten and electronic prescriptions. Despite the well-established advantages of digital technology adoption in pharmacies, there is not much study on practical approaches and best practices for effortlessly integrating digital technology into current operations. The impact on the relationship between the pharmacist and the patient, which is essential for efficient healthcare delivery, hasn't received enough attention. Although data security and privacy are recognized in the literature as major challenges associated with digitalization, particular strategies to reduce these risks are not fully investigated.

2.8 SUMMARY

The extensive analysis of the literature highlights how digital technologies and electronic prescriptions have the potential to revolutionize pharmacy processes, improve patient safety, and reduce medication errors. In a healthcare environment that is evolving quickly, pharmacies need to adopt digital tools like electronic prescription systems, CPOE, to stay efficient and competitive. These technologies improve patient safety and satisfaction overall in addition to improving prescription legibility and dispensing efficiency. One of the most important factors in patient safety is prescription legibility, as incomplete or poorly written prescriptions are common causes of medication errors. Making the switch to electronic prescriptions takes care of these problems by guaranteeing more thorough and accurate documentation. Research continuously demonstrates that e-prescriptions have much fewer errors as compared to handwritten ones, emphasizing the significance of digital systems.

2.9 CONCEPTUAL FRAMEWORK

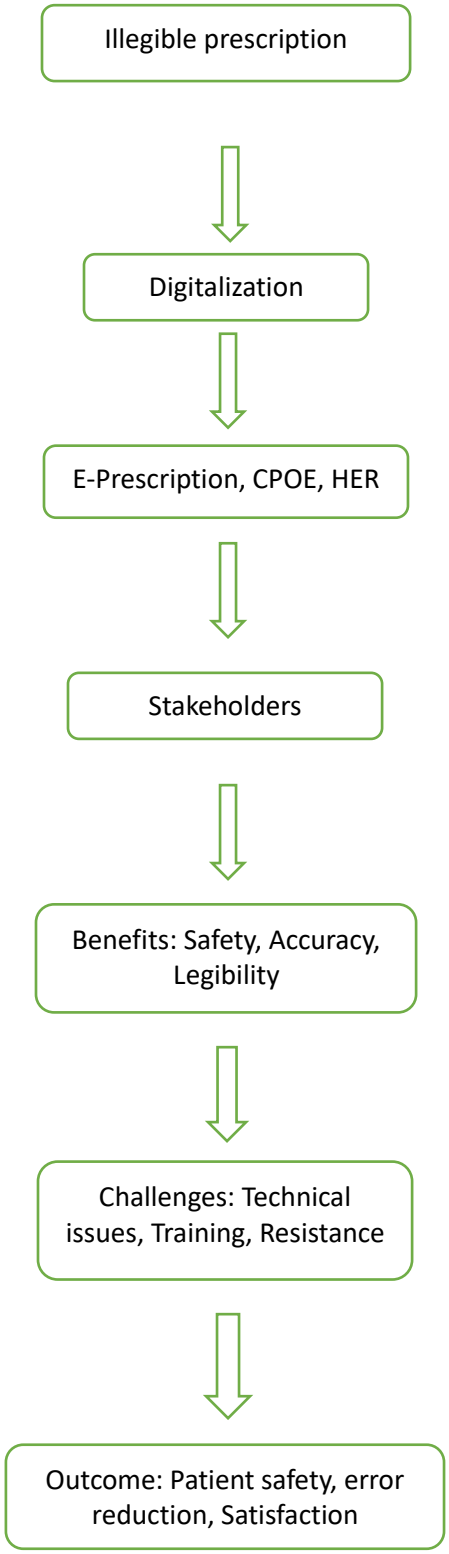


Figure 3 Conceptual framework

CHAPTER 3

3. METHODOLOGY

The systematic approach that researchers use to organize, conduct, and evaluate a study is referred to as research methodology. In order to guarantee that the study is accurate, reliable, and credible it offers a framework for collecting, assessing, and presenting data. It offers an organized framework to ensure that the study is carried out systematically, precisely, and efficiently. It includes both methods for collecting data and the theoretical foundations which govern the research process.

The research topics and the selection of research methodologies are determined by a set of principles, theoretical assumptions, and approaches that are included in the methodology. The study design, which contains the primary steps and techniques for data collecting and analysis, follows the first stages of establishing time horizons, defining methodologies, methods, and strategies, and describing the basic philosophy. Saunders, Thornhill, and Lewis (2007) proposed a Research Onion Model, a complete framework for developing a research methodology. According to this approach, the several layers of the research process are described as an onion, each of which represents a step or part of the study design. Fig.4.

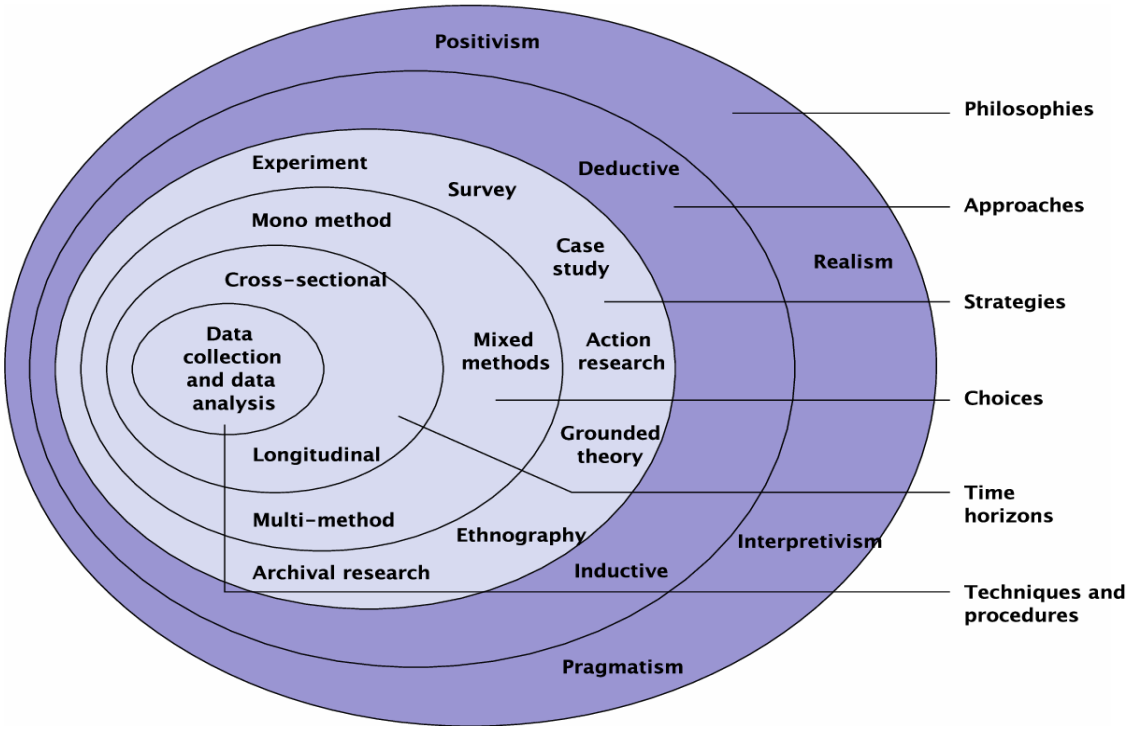


Figure 4 Research onion model

3.1 OVERVIEW

Section	Data	Methods
3.2	Research philosophy	Pragmatism
3.3	Research approach	Inductive
3.4	Research design	Mixed-method approach
3.5	Research strategy	Surveys, questionnaires
3.6	Time-horizon	Cross-sectional
3.7	Participants	Registered community pharmacists in Kerala

Table 1 Research overview

3.2 RESEARCH PHILOSOPHY

Research philosophy is an essential component of any research project, serving as the guiding principle that governs the research process. It is defined by a set of opinions, assumptions, and principles that affects the researcher's approach to the study.

Positivism: The research paradigm positivism is based on objective observation, empirical observation, and a belief that information can be acquired through quantitative evidence. It places a strong emphasis on quantitative techniques, causal relationships, and the generalizability and consistency of results.

Interpretivism: Interpretivism claims that reality is subjective and socially developed. It places a strong emphasis on using qualitative techniques, such as observations and interviews, for understanding specific meanings and interpretations. This method explores complex issues in society and provides deep understandings, but as it is subjective, it might not be easily generalized.

Pragmatism: Integrating the principles of positivism and interpretivism, pragmatic research methodology offers a flexible and useful approach. It focuses significant emphasis on adaptability and usefulness, providing researchers to utilize a variety of approaches and combined methodologies to successfully address research topics and provide important results.

Pragmatism is the chosen philosophical approach for conducting the primary research. The pragmatic approach places a strong emphasis on problem-solving and practical results, which makes it a perfect fit for research that aims to assess improve patient safety and dispensing

efficiency in community pharmacy settings. The research uses a pragmatic approach in an effort to generate practical insights and suggestions that will improve patient care and pharmacy practice. Because of pragmatism's flexibility, mixed-methods research may collect quantitative data on prescription legibility and dispensing efficiency as well as qualitative data from patients and pharmacy staff. The entire approach guarantees an extensive understanding of the influence of the digital revolution on prescription processes.

3.3 RESEARCH APPROACH

Research approaches are the basic frameworks that researchers use for organizing their investigations, defining the procedures for collecting and analysing data and methodology. Identifying, analysing, and communicating facts and phenomena are the goals of systematic research. Data is gathering, examination, and understanding in research is greatly influenced by the methodology used. In order to meet the needs of various research settings and purposes, the three main research approaches are used, each provides special perspective and methods.

Deductive approach: The deductive method is based on the idea that a researcher should begin with a general idea or hypothesis and work gradually down into more detailed observations or predictions. This strategy mostly uses quantitative, organized approaches to examine ideas or hypotheses that already exist. The main objective is to use actual data to support or challenge the original idea.

Inductive Approach: The inductive method begins with particular facts or observations and aims to reach deeper conclusions about patterns, assumptions, or generalizations. Qualitative approaches, such observations, case studies, and interviews, are frequently used for investigating and understanding unknown occurrences.

Abductive Approach: The abductive approach provides an ongoing or continuous research process by combining aspects of the deductive and inductive techniques. It starts with an issue or phenomena that is not fully understood. After developing a hypothesis or interpretation to explain the facts, the researcher gathers and analyses data to develop the theory being investigated.

For evaluating how digitization affects community pharmacy dispensing procedures and prescription legibility, the inductive method works effectively. It allows the investigation of unknown events, provides a conceptual understanding, promotes the collection of extensive and

complete information, allows adaptability for modifying and improving hypotheses, and stimulates critical thinking and observation

3.4 RESEARCH DESIGN

An entire strategy or approach for carrying out a research study is referred to as research design. In describes the aims and objectives, procedures and methods that will be utilized to gather and evaluate data. In order to guarantee that the study is carried out systematically and carefully research design is crucial since it coordinates the whole research process.

Qualitative Research: Qualitative research investigates the depths of human perspectives, objectives, and behaviours. Qualitative research provides deep and complex understandings of complex phenomena by collecting non-numerical data through methods including discussions, interviews and observation.

Quantitative Research: Quantitative research aims to measure observations and generalize findings to larger groups of participants. Quantitative research generates numerical data that may be objectively studied by using systematic techniques such as experiments, surveys, and statistical analysis.

Mixed-method Research: Qualitative and quantitative approaches are combined in mixed methods research. Through the integration of qualitative research methodologies with quantitative research techniques, mixed methods research provides a thorough comprehension of the research topic. This methodology enables researchers to verify results, investigate several viewpoints, and address study inquiries that may beyond the limitations of a single technique. The influence of digitalization on prescription and dispensing behaviours in community pharmacies is investigated in this study using a mixed methods research approach. This strategy integrates qualitative and quantitative approaches to enable a complete understanding of the study topic. The goal of this study's qualitative component is to document community pharmacists' viewpoints and experiences with relation to how digitization has affected the community pharmacy. Exploring human experiences, feelings, and perceptions is a specialty of qualitative research, that provides deep, meaningful information that can provide insight into complex phenomena.

Data for qualitative component is collected through questionnaires distributed to community pharmacists. These surveys aim to gather in-depth information on pharmacists' experiences

with digitalization, the way they see it affecting prescription and dispensing procedures, and any difficulties or advantages they may have had. This qualitative method allows pharmacists to openly share their opinions while gathering data through open conversation, providing insightful information about the human aspects of the digital revolution of pharmacy operations.

3.5 RESEARCH STRATEGY

The timeline of dissertation works was developed using the Gantt Chart Fig.4.

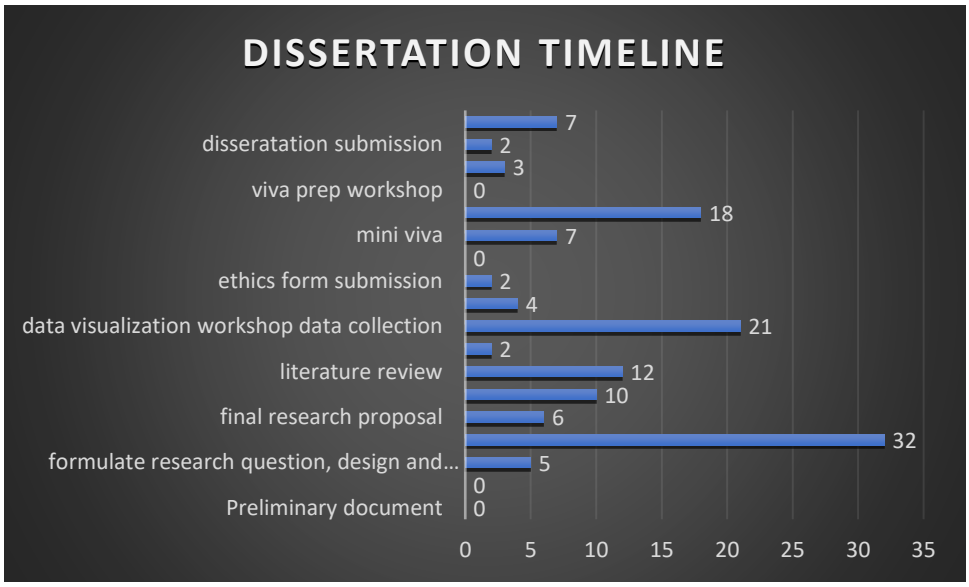


Figure 5 Dissertation timeline

The effects of digitalization on community pharmacies' prescription and dispensing procedures, a mixed methods study approach involves questionnaires and surveys. This approach focuses on gathering quantitative information on prescription legibility as well as qualitative insights into the experiences and perspectives of pharmacists**.** The research's survey component aims to document the qualitative aspects of pharmacists' perspectives and experiences with digitalization in pharmacy practices. Questions on pharmacists' experiences with digital prescription and dispensing systems will be included in the surveys like perspectives on the advantages and difficulties of digitization, effects of digitalization on patient care, efficiency, and prescription accuracy. There will be a mix of closed-ended and open-ended survey questions. Pharmacists can freely share their opinions in response to open-ended questions, which yield rich, in-depth information. Structured response possibilities provided by closed-ended questions make it easier to compare and analyse data.

The questionnaires were divided into two sections, close ended consisting of 10 questions and 5 open ended questions. The participant was informed about the purpose of the study and their consent is obtained in the beginning of the survey. It is assured that the privacy and confidentiality of the data was handled by general data protection regulation (GDPR)

3.6 TIME-HORIZON

The research design, data gathering techniques, and analysis are significantly influenced by the study's time horizon. The length of the study must be in line with the goals of the investigation and the extent of the research topic, regardless of whether a short- or long-term time horizon is chosen. Through careful consideration of the time horizon, researchers can guarantee that the study yields significant insights that are important, timely, and in line with the objectives of investigating the influence of digitalization on pharmacy practices. The time horizon is mainly divided into two types:

Cross-Sectional: Cross-sectional research collects data at one specific time or over a short period of time, giving an overview of the characteristics, customs, and mindset of the community.

Longitudinal: A longitudinal study is a type of research design in which the same variables or groups of people are observed and measured over a prolonged period of time.

In this study a cross-sectional time horizon is used due to a limited time frame for the research so the data collection and analysis will be done in a short period of time. A cross-sectional study can provide important insights into existing behaviours, perspectives, and potential areas for additional research when examining the effects of digitalization on pharmacy practices.

3.7 PARTICIPANTS

3.7.1Selection of participants

The study was conducted among community pharmacists in Kerala, India, with the aim of gathering insights into their practices and perspectives. Utilizing a mixed-methods approach, the research involves 104 participants recruited through personal networks like friends and colleagues and social media platforms like WhatsApp, Facebook and LinkedIn. Prior to participation, pharmacists were informed about the study's objectives, methodologies, and potential risks and benefits, ensuring their informed consent. Data was collected using questionnaires

featuring both open-ended and closed-ended questions, distributed online to facilitate easy access and participation. This approach enabled the collection of both qualitative and quantitative data, offering a comprehensive understanding of the pharmacists' experiences and opinions.

3.7.2 Inclusion Criteria

Licenced community pharmacists actively participating in dispensing practice in a community setting in Kerala state of India, who are willing to provide informed consent to participate in the study.

3.7.3 Exclusion Criteria

Individuals who are not licenced pharmacist actively practising in community setting would be excluded in the study and also people who are not willing to participate in the survey were not included in the study.

3.7.4 Sample Size

According to the registered pharmacists list of Kerala state of pharmacy council, there are 62302 actively registered pharmacist in the list of 2024. The sample size was calculated by using 90% of confidence interval and 8% of margin of error in the survey monkey website and got 104 participants.

3.7.5 Ethical issues

Prior to taking part, participants will be made aware of the study's objectives and their consent will need to be obtained. In India, the patient owns the prescription only after it has been filled. Therefore, prior to collecting the prescription, each patient's consent is obtained. They will be made aware of the voluntary nature of participation and their right to withdraw at any moment. Strict procedures will be followed to maintain participant confidentiality and privacy. Each element of data will be encrypted and stored securely.

3.7.6 Data analysis

In order to extract significant patterns and insights from the qualitative data collected from observations and surveys, this study will employ thematic analysis. Meanwhile, quantitative data analysis will be utilized to score prescriptions for illegibility and identify trends. Integrat-

ing these strategies will yield an in-depth understanding of how digital technologies affect prescription legibility and dispensing procedures. This integrated technique provides an efficient framework for the in-depth analysis of environmental factors as well as numerical trends, with the goal of resolving problems and optimizing the integration of digital technology in pharmacy practice.

CHAPTER 4

4. FINDING AND ANALYSIS

A questionnaire survey was conducted among registered pharmacists actively working in community pharmacies in Kerala state of India with the help of 15 close ended and 5 open ended questions. A total of 104 responses were obtained from the survey. The quantitative data were analysed with the help of descriptive statistics were using Microsoft excel. The qualitative data was analysed through the thematic analysis by analysing common pattern of responses obtained from the open-ended questions .

4.1 QUANTITATIVE AND QUALITATIVE ANALYSIS

In the initial part of survey to introductory questions were included to ensure the consent of participation in the survey. Participants were informed of the purpose of the study and their voluntary consent to participate in the survey were obtained. The total number of responses obtained from the survey is from 104 pharmacists from India from the sample size of 104.

1. what is meant by illegible prescription?

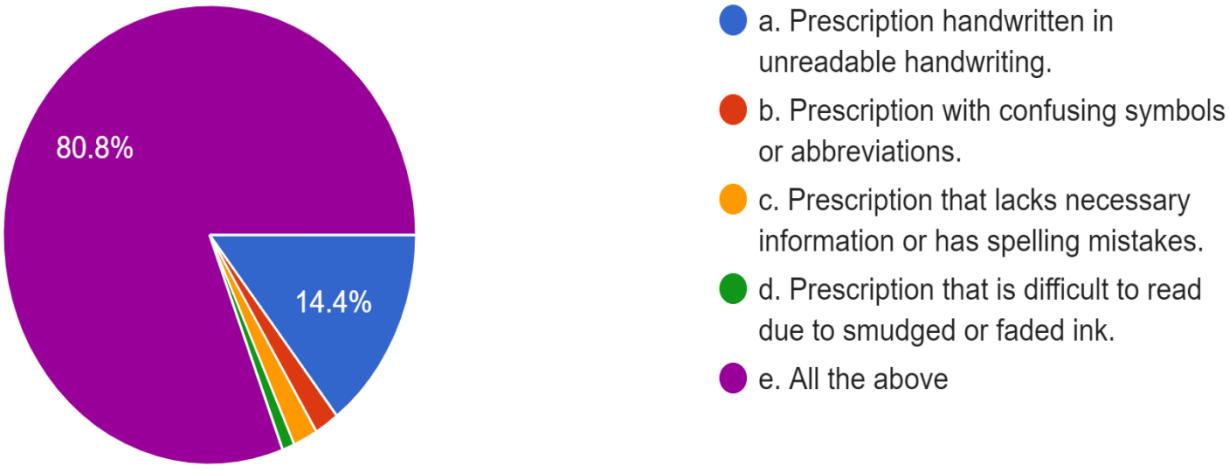


Figure 6 Perspective of respondents about meaning of illegible prescription

In this research the participants knowledge about the illegible prescriptions was evaluated out of 104 participants, 80.8% responded that the combination of unreadable handwriting, confusing symbols or abbreviations, lack necessary information and spelling mistakes, and ink smudges accounts for the illegibility of prescriptions. Individually, illegible handwriting is the most frequent issue, occurring 14.4% of the time, followed by confusing symbols or

abbreviations and missing information or spelling mistakes, each at 1.9%. Difficulties due to smudged or faded ink are the least common, accounting for 1% of cases.

Overall, the responses show that a number of issues, such as poor handwriting, unknown symbols or abbreviations, missing of information or mistakes and poor ink quality, can lead to prescriptions that are difficult to read.

In order to protect patient safety and improve prescription legibility in healthcare settings, these challenges must be addressed. Reducing the hazards associated with unreadable prescriptions can be accomplished partially by using high-quality ink, standardized symbols and abbreviations, guaranteeing completeness and correctness of information, and adopting improved handwriting readability into practice. Prescription accuracy and clarity can also be increased by encouraging collaboration among various disciplines and open means of communication between pharmacists and healthcare professionals.

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Prescription handwritten in unreadable handwriting	15	14.4%
Prescription with confusing symbols or abbreviations	2	1.9%
Prescriptions that lack necessary information or has spelling mistakes	2	1.9%
Prescription that is difficult to read due to smudged or faded ink	1	1%
All the above	84	80.8%

Table 2 Perspective of respondents about meaning of illegible prescription

2. How often do you come across prescriptions that are illegible in your practice?

Using descriptive statistics, the frequency of occurrence of illegible prescriptions in pharmacies were evaluated. Majority of respondents 48.1% indicated that the event occurs occasionally, while smaller portion reported that they come across illegible prescriptions often, rarely, always or never. 26 responders, or 25%, said they regularly came across medications that were not legible. Illegible prescriptions were found to be rare, according to 20 respondents (19.2%). 6

responders, or 5.8%, said they always come across medications that are not legible. Just 2 respondents (1.9%) said they had never come across medicines that were not readable.

As assessed by the respondents, this distribution gives insight into the event frequency and occurrence.

Overall, the data indicates that illegible prescriptions are a major issue, because as many respondents stated that they encountered them frequently or often. This emphasizes the importance it is for making prescriptions easier to read in order to enhance patient safety and ensure the effectiveness of medical treatment.

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Often	26	25%
Occasionally	50	48.1%
Rarely	20	19.2%
Always	6	5.8%
Never	2	1.9%

Table 3 Response regarding frequency of illegible prescriptions

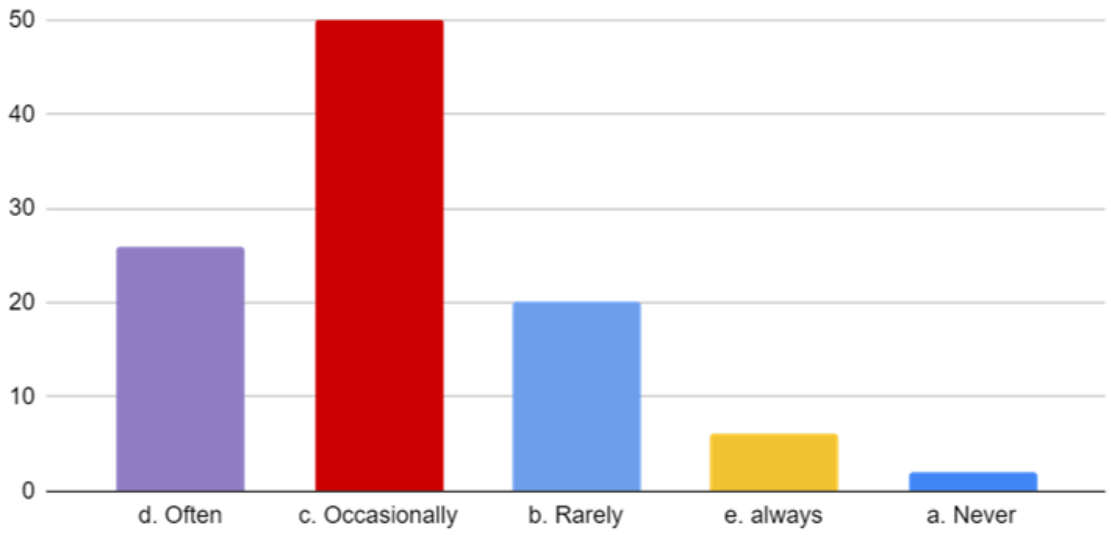


Figure 7 Response regarding frequency of illegible prescription

3. Have you ever had difficulty in reading or understanding a prescription?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Yes	101	97.1%
No	3	2.9%

Table 4 Response regarding difficulty in reading or understanding prescription

97.1% of respondents, a significant proportion, reported to have occasionally had trouble reading or comprehending a prescription. This suggests that understanding or readability problems are not uncommon when it comes to prescriptions. Merely 2.9% of the participants said that they had never encountered such challenges. This highlights the importance of clear and legible prescriptions in healthcare settings to ensure patient safety and proper medication adherence.

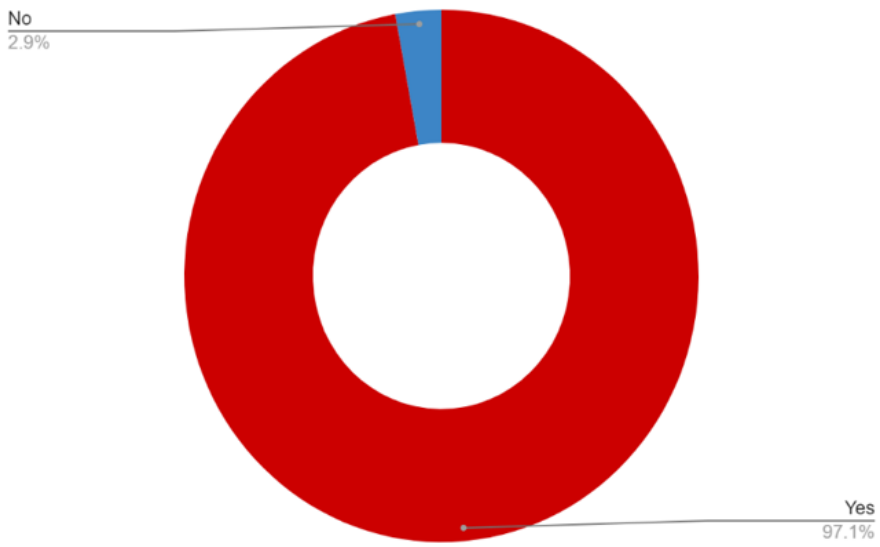


Figure 8 Response regarding difficulty in reading or understanding prescription

4. Have you ever made an error in processing a prescription due to poor handwriting?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Yes	70	67.3%
No	34	32.7%

Table 5 Response regarding errors made in processing a prescription due to poor handwriting

According to the statistics presented, it seems that 70 respondents, or 67.3% of the total, reported that they had processed prescriptions incorrectly because of their poor handwriting. At the same time, 34 respondents—or 32.7% of the sample—said they did not make these mistakes. As a result, the majority of respondents (67.3%) said that their poor handwriting had caused errors when filling prescriptions.

So, in this data shows that errors in processing prescriptions due to poor handwriting are relatively common, with the majority of respondents (67.3%) reporting such incidents. This result shows the importance of improving prescription legibility in medical field to improve patient safety and prevent medication errors. Clear communication through legible prescription is crucial in ensuring accurate prescription processing and minimizing the risk of adverse outcomes in patients.

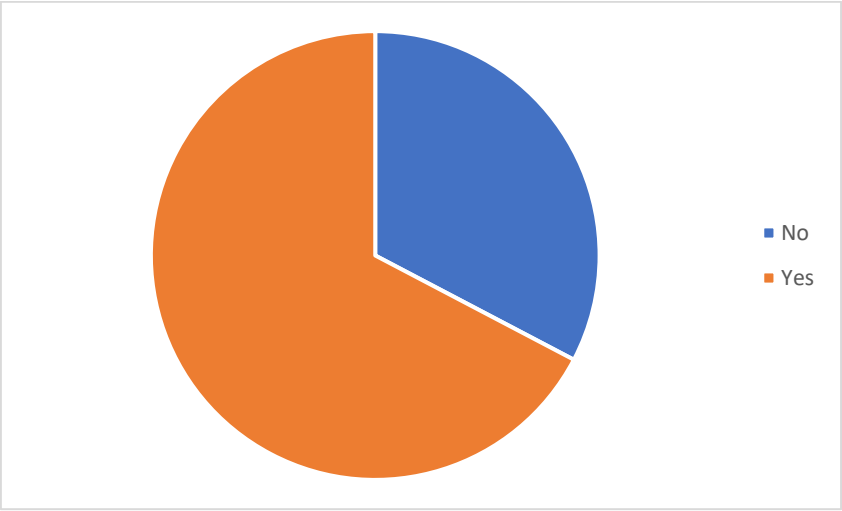


Figure 9 Response regarding errors made in processing a prescription due to poor handwriting

5. What do you think is the major risk associated with such prescriptions?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Delayed processing	14	13.5%
Dispensing error	26	25%
Reduced work efficiency	5	4.8%
Patient harm	59	56.7%

Table 6 Perspective of respondents about major risk associated with illegible prescriptions

Patient harm appears to be the main risk associated with such prescriptions, based on the data supplied (56.7% of respondents). This shows that the possibility of patient harm as a result of these prescriptions is the respondents' main concern. Additional risks that were identified are reduced work efficiency (4.8%), delayed processing (13.5%), and dispensing errors (25%), but they don't seem to be as serious as patient harm.

The results clearly show that the possibility of patient harm is the main issue with these prescriptions. This highlights how crucial it is to guarantee prescription practices' efficacy, safety, and accuracy in order to reduce risks to patients' health and wellbeing. To maximize patient safety and healthcare delivery, it's also important to address dispensing errors and boost processing efficiency.

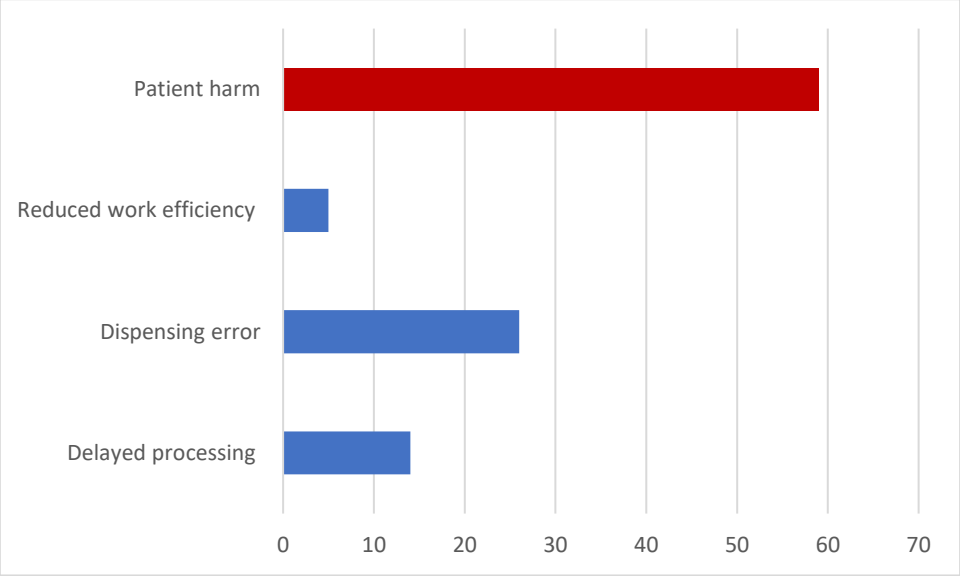


Figure 10 Perspective of respondents about major risk associated with illegible prescriptions

6. How does illegible prescriptions reflect on the workflow?

The majority of respondents (48.1%) emphasized that illegible prescriptions make it difficult to deliver medication to patients in a timely manner. A significant amount 20.2% of pharmacists report that processing prescriptions takes longer than expected because of illegibility, which could affect the efficiency with which the pharmacy performs. 15.4% of respondents replied that illegible prescriptions make it difficult to make decisions, and 16.3% said that unclear prescriptions need the respondent to get in contact with the prescriber for clarification. This data clearly shows how illegible prescriptions negatively affect community pharmacy workflow efficiency.

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Difficulty in decision-making	16	15.4%
Need to enquiring with the prescriber	17	16.3%
Getting caught up on the prescription for longer period	21	20.2%
Not able to dispense the medication to the patient in a timely manner	50	48.1%

Table 7 Perspective of respondents regarding impact of illegible prescription on workflow

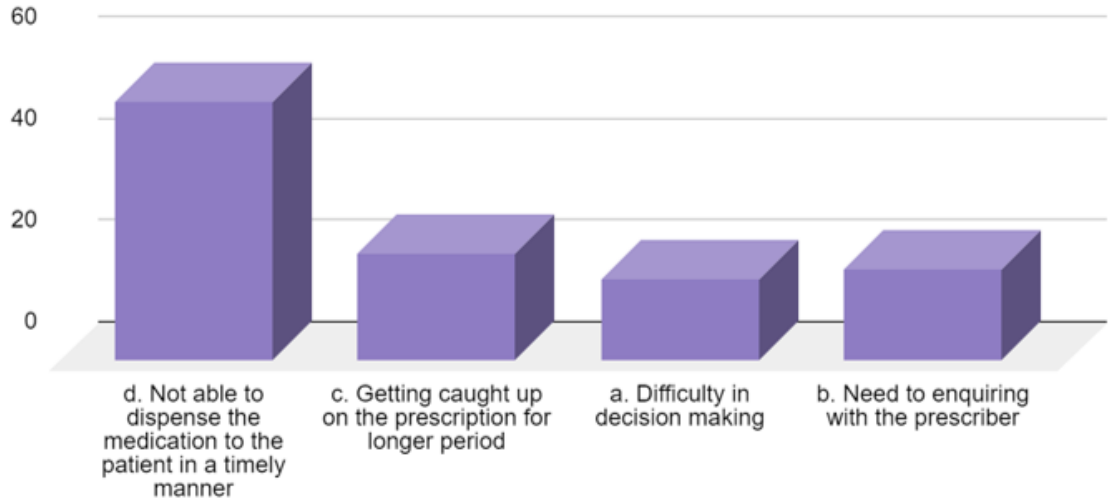


Figure 11 Perspective of respondents regarding impact of illegible prescription on workflow

7. What is the major process affected by prescription illegibility on regular activities and drug dispensing efficiency?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Patient safety	55	52.9%
Medication usage	5	4.8%
Dispensing time	15	14.4%
Pharmacy work flow	29	27.9%

Table 8 Perspective of pharmacists regarding major process affected by illegible prescription of regular pharmacy activities

According to 55 respondents, or 52.9% of the total, the main impact of prescription illegibility is on patient safety. Hence, unclear or illegible prescriptions may result in mistakes made when administering medication, putting patients at risk. Furthermore, as mentioned by 29 respondents (27.9%), it also affects pharmacy workflow by interfering with the timely processing of prescriptions. Only 5 replies (4.8%) indicated that it had a somewhat lesser impact on medication use, even if it may also affect the dispensing time (15 responses, 14.4%). For patient safety and the efficient running of pharmacies, it is important that prescriptions are legible.

In conclusion, patient safety and pharmacy workflow are both significantly affected by prescription illegibility. Managing illegible prescriptions is essential to ensuring secure delivery of medications and improving pharmacy processes. Improving prescription clarity is essential for upgrading the overall healthcare quality.

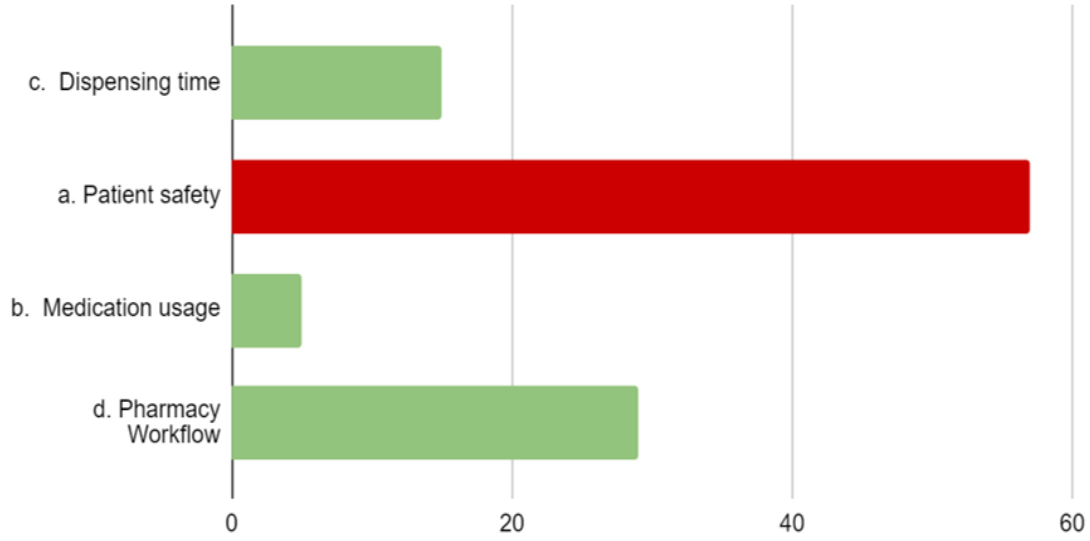


Figure 12 Perspective of pharmacists regarding major process affected by illegible prescription of regular pharmacy activities

8. What do you do when you come across such illegible prescription?

RESPONSES	FREQUENCY	FREQUENCY PERCENTAGE
Reject them	2	1.9%
Seeking help from colleagues or supervisors	35	33.7%

Contact the prescriber for conformation	66	63.5%
Ignore the confusion and go with own decision	1	1%

Table 9 Pharmacists course of action when presented with unreadable prescriptions

In order to ensure correctness in the medications dispensing, the majority of respondents (66, 63.5%) choose to contact the prescriber for confirmation when they discover illegible prescriptions. Another popular strategy is to ask for help from colleagues or supervisors; 35 respondents (33.7%) mentioned doing so in order to use group knowledge to interpret unclear instructions. Just a little portion (2, 1.9%) decide to flatly refuse these prescriptions, and a smaller portion (1, 1%) admit that they occasionally ignore the uncertainty and make their own decisions.

So, to ensure accuracy and patient safety, respondents' preferred course of action when presented with unreadable prescriptions is to contact the prescriber for confirmation. It's also common to ask for help from superiors or colleagues in order to benefit from group knowledge. It is uncommon to refuse prescriptions that are not readable, but in order to reduce dangers, it is essential to give priority to correctness and clarity while dispensing medications

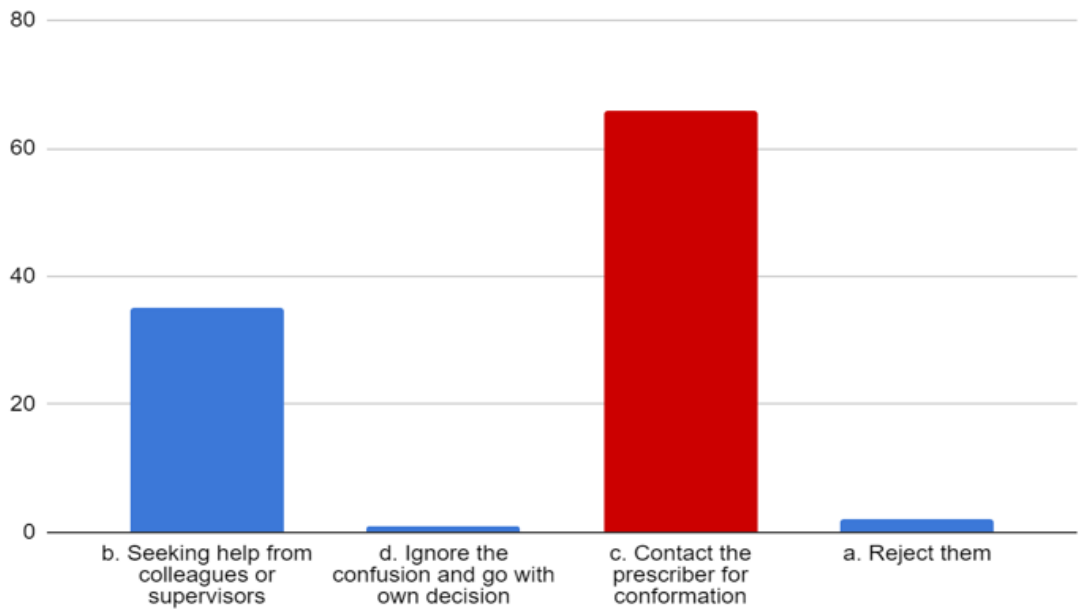


Figure 13 Pharmacists course of action when presented with unreadable prescriptions

9. Which type of error is most commonly associated with illegible prescriptions?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Dosage error	23	22.1%
Administration error	5	4.8%
Dispensing error	67	64.4%
Drug interaction error	9	8.7%

Table 10 Perspective of pharmacists regarding most common error associated with illegible prescriptions

As per the table, dispensing errors account for 64.4% of the responses and are the most common type of error with illegible prescriptions. This suggests that the most frequent error type that occurs when pharmacists are unable to read prescription is dispensing errors. Compared to dispensing errors, dosage errors (22.1%), drug interaction errors (8.7%), and administration errors (4.8%) are less common. This emphasizes the necessity of writing prescriptions in a clear and readable manner in order to reduce the possibility of medication errors and guarantee patient safety. Prescriptions that are difficult to read increase the risk of misunderstanding and dispensing errors, which can have serious consequences for the health of the patient. Therefore, in order to improve patient care and reduce the possibility of medication-related errors, healthcare providers need to give legibility first priority when prescribing medications.

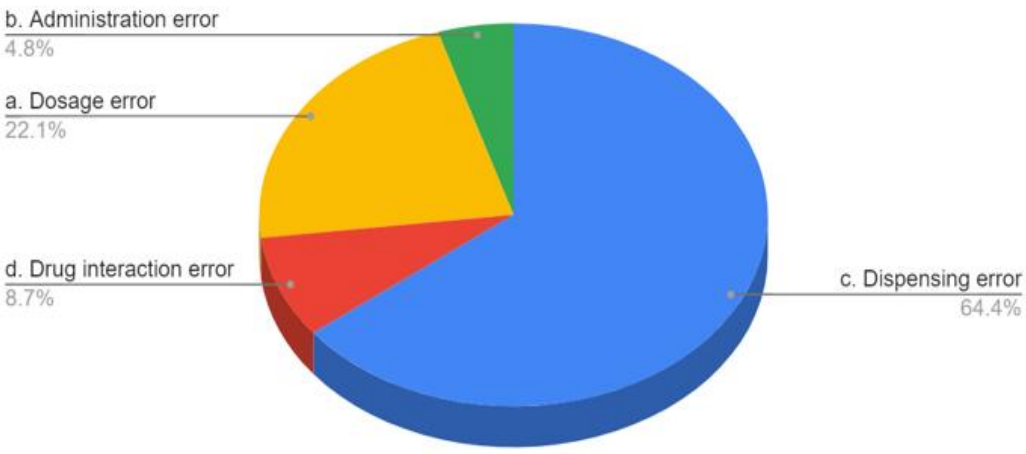


Figure 14 Perspective of pharmacists regarding most common error associated with illegible prescription

10. On a daily basis, what percent of prescription that you receive are found to be illegible?

SCORE	PERCENTAGE OF ILLEGIBILITY	NO. OF RESPONSES FROM PHARMACISTS
5	<10%	24
4	10-30%	43
3	30-50%	26
2	50-80%	8
1	>80%	3

Table 11 Legibility scoring

The table summarizes the percentage of illegibility of prescriptions and its corresponding legibility scoring and the no. of responses for each score. Prescriptions with scores of 5 or 4 are mostly legible, indicating relatively low levels of illegibility. A score of 3 denotes a significant level of illegibility, meaning that a sizable percentage of prescriptions need special attention because they are difficult to read. Pharmacists face a tremendous difficulty in accurately dispensing medicines when they encounter scores of 1 or 2, which indicate high levels of illegibility.

Out of the 24 pharmacists that rated their experience with illegible prescriptions a score of 5, fewer than 10% of the time they experienced unreadable prescriptions. 10 to 30 percent of the prescriptions handled by the largest group of 43 pharmacists (score of 4) are illegible. With a score of 3, 26 pharmacists report that 30–50% of prescriptions are illegible. A smaller number of 8 pharmacists scored 2, indicating 50–80% illegibility. The last result shows that 3 pharmacists gave their experience a score of 1, meaning that over 80% of the prescriptions they work with are not legible. A significant number of prescriptions are difficult to read. According to the data, with a significant percentage of those falling into the moderate to high illegibility range. This emphasizes the significance of improving prescription readability in order to improve patient safety and guarantee proper distribution of medications.

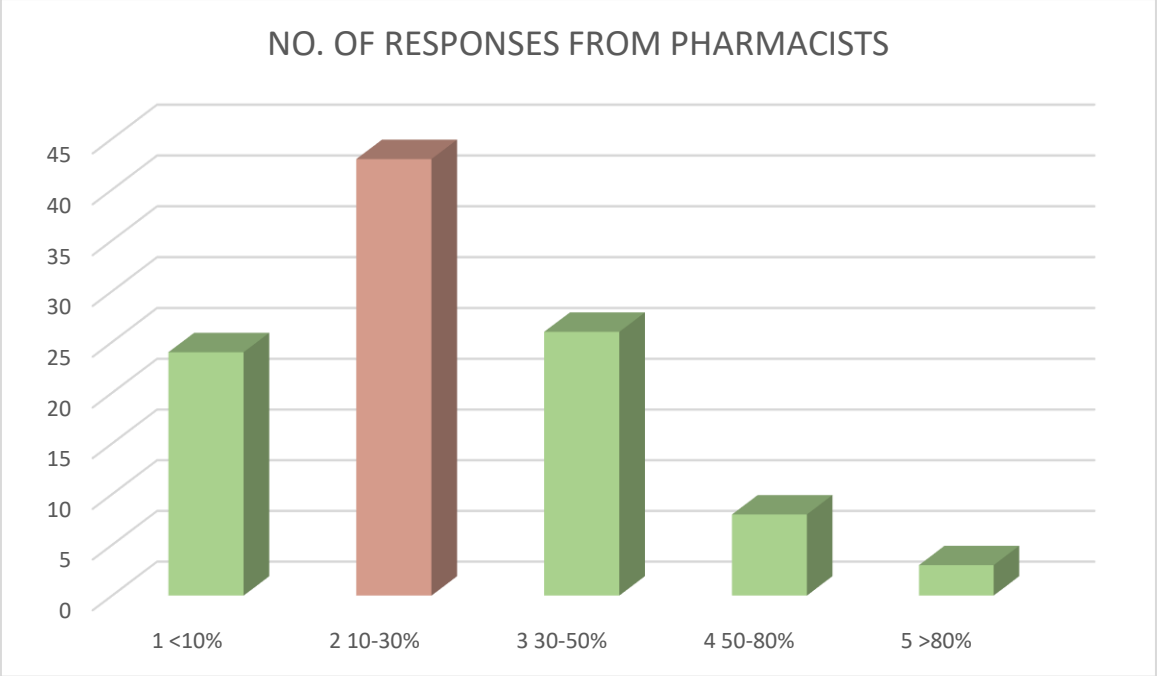


Figure 15 Legibility scoring

11. What will be the major advantage of digitalizing prescription?

RESPONSES	FREQUENCY	FREQUENCY PERCENTAGE
Clear and readable prescription	40	38.5%
Lesser chance of error	35	33.7%
Easy to maintain	5	4.8%
Quick and effective processing	24	23.1%

Table 12 Response of respondents regarding advantages of digitalizing prescription

As indicated by 40 respondents (38.5%), the primary benefit of digitalizing prescriptions is the clarity and readability they give. This solves the problem of illegible prescriptions, improving patient safety by ensuring correct interpretation. According to 35 respondents (33.7%), digital prescriptions also provide a lower possibility of error, which enhances patient safety and lowers risk associated with medication. While some respondents highlighted the advantages of simple maintenance (5, 4.8%) and efficient, quick processing (24, 23.1%), the main benefit of digital

prescriptions continues to be greater legibility and reduced rates of error. As the comments suggest, the main benefit of digitalizing prescriptions is their improved readability and clarity. Digital prescriptions significantly enhance patient safety by solving the problem of illegible handwriting and ensuring accurate interpretation. They also decrease the possibility of medication dispensing errors, which enhances patient safety. The most significant advantage of digital prescriptions is their ability to increase clarity and reduce errors, which eventually raises the standard of healthcare service. Other advantages include easy maintenance and the speedy processing.

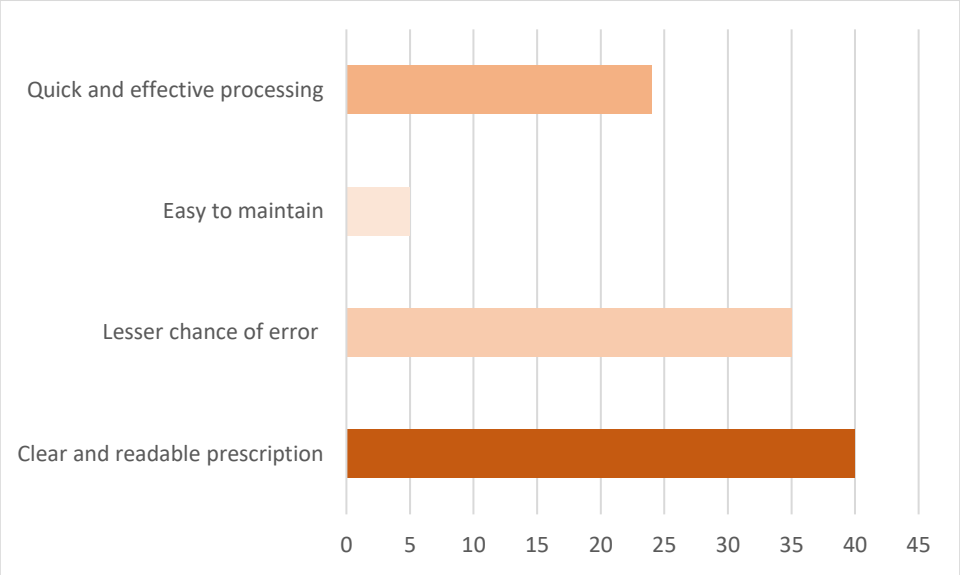


Figure 16 Response of respondents regarding advantages of digitalizing prescription

12. Which of the following electronic methods do you follow in you practice?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Electronic prescribing	14	13.5%
Electronic patient records	11	10.6%
Computerised physician order entry	7	6.7%
All the above	65	62.5%
None	7	6.7%

Table 13 Electronic methods followed in community pharmacies

Community pharmacies have been implementing electronic methods in their daily activities and from the responses it is evident that the majority of respondents 62.5% use all three electronic methods (Electronic prescribing, patient records and CPOE) in their practice. 13.5% of the respondents use computerized prescription orders, 10.6% keep electronic patient records, 6.7% use computerized physician order entry (CPOE), and 6.7% don't use any kind of technology at all in their practice.

The results of the questionnaire highlight an ongoing trend in healthcare settings toward the use of electronic methods. It's clear that healthcare providers including pharmacists are realizing the importance of digital solutions for improving patient care and operational efficiency.

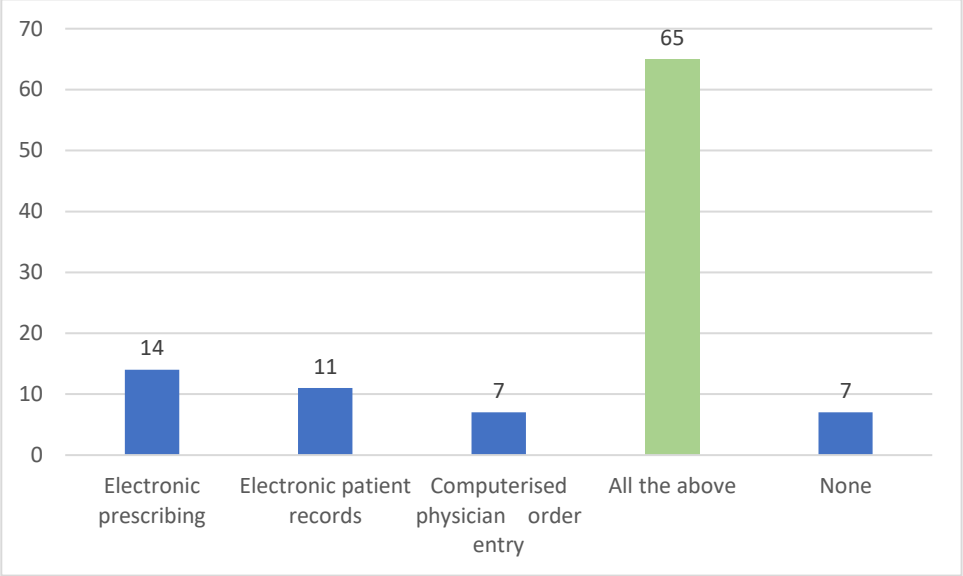


Figure 17 Electronic methods followed in community pharmacies

13. Which method do you find most efficient in reducing errors?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Physical prescription	4	3.8%
Scanned prescriptions via email	2	1.9%
Telephonic instructions from the prescriber	2	1.9%
Electronic prescriptions	96	92.3%

Table 14 Response regarding the efficient methods for reducing errors

With 92.3% of respondents supporting electronic prescriptions, the data clearly shows that this is the most effective way to reduce errors. This high proportion shows how widely electronic prescription systems have been utilized to reduce medication errors. On the other hand, just 3.8%, 1.9%, and 1.9% of respondents chose paper prescriptions, scanned prescriptions via email, and telephone instructions from the physician, respectively. These choices were significantly less popular than the others. Considering that they have limitations in terms of readability, accessibility, and efficiency as compared to electronic prescription systems, these relatively low percentages indicate that traditional approaches are used less frequently for mistake prevention.

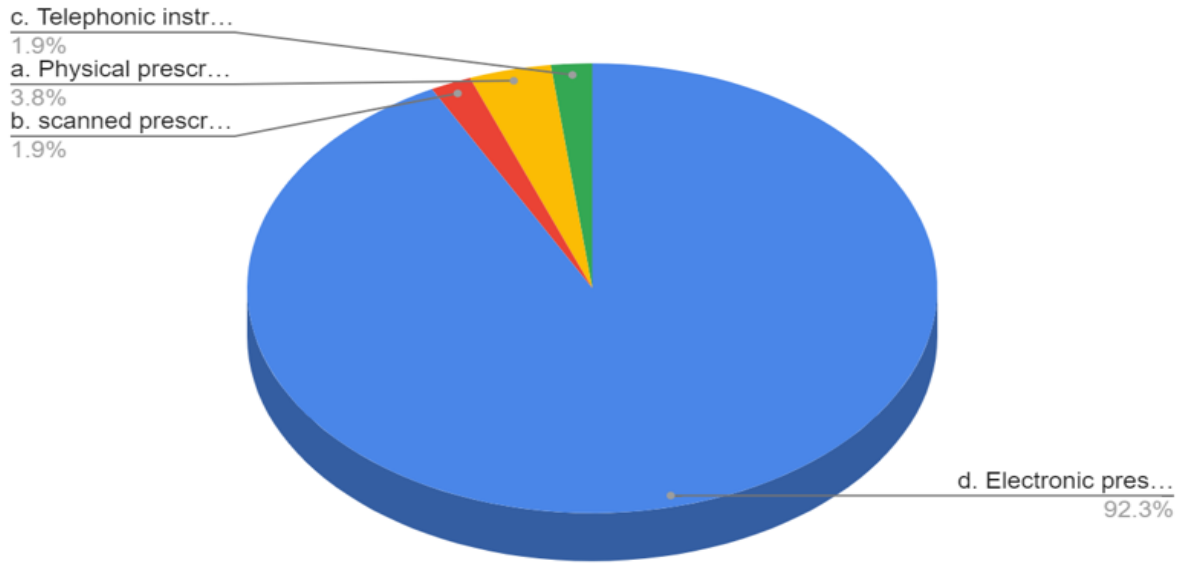


Figure 18 Response regarding the efficient methods for reducing errors

14. What do you think will be the major disadvantage of digitalizing prescriptions?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Technical Failure/Software issue	76	73.1%
Unable to receive prescription in case of failure	14	13.5%
Unable to revert back to the prescriber	1	1%
Not able to access patient record in case of failure	13	12.5%

Table 15 Responses regarding disadvantages of digitalizing prescriptions

According to the study, 73.1% of respondents believe that the main drawback of digitized prescriptions will be software issues or technical failures. The issue probably originates from the use of technology, which occasionally has faults or malfunctions that could interfere with the prescription procedure. Furthermore, a lesser proportion of participants (13.5%) express concern regarding their inability to find prescription in the case of an issue, highlighting their dependence on digital platforms for contact and prescription delivery. Additionally, a significant minority of respondents just 1% are concerned that they won't be able to connect back with the prescriber in case of a digital prescription presents an issue, indicating possible difficulties with explanation or communication.

Overall, these replies indicate that although there are many advantages to digitized prescriptions, such as decreased errors and increased productivity, concern regarding system failures and technical stability are still common among healthcare professionals.

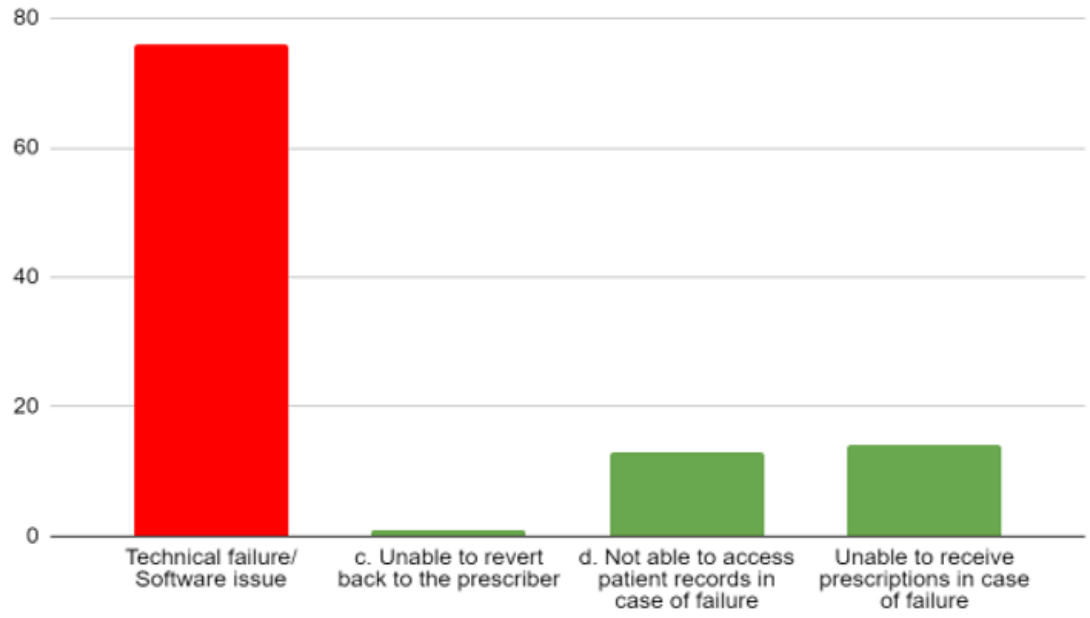


Figure 19 Responses regarding disadvantages of digitalizing prescriptions

15. What action do you think should be taken during such technical failure?

RESPONSES	FREQUENCY	PERCENTAGE FREQUENCY
Notify the customer about it.	12	11.5%
Establish alternative channel for communicating with the prescriber	52	50%
Stick on the manual processing for the time being	13	12.5%
Dispense manually and update the record later	27	26%

Table 16 Perspective of respondents regarding actions for solving technical failure

The responses emphasize how crucial it is to handle technological difficulties that arise while digitization prescriptions. Patient safety, continuous care, and effective healthcare delivery are prioritized with a range of suggested interventions. Prescription information should be accessible to users continuously even in the event of technological malfunctions, according to half of the respondents, who also support creating alternate channels of communication with prescribers. Notably, 11.5% of respondents indicated informing patients about the problem, demonstrating the significance of transparency and patient communication. It is clear that they are prepared to adjust as 26% of respondents preferred manual dispensing with a promise to modify electronic data later and 12.5% suggested staying with manual processing for the time being. Together, these answers highlight that how crucial it is to manage technical challenges with flexibility, emergency preparation, and proactive communication in order to maintain patient safety and healthcare delivery.

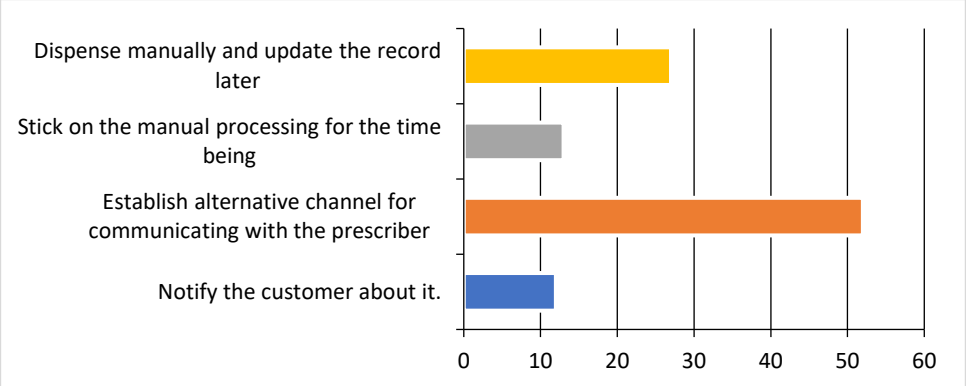


Figure 20 Perspective of respondents regarding actions for solving technical failure

16. Give an example on how illegible prescriptions affect patient safety and overall health outcomes? What was your response in this scenario?

Respondents were asked about their opinion on impact of illegible prescription on patient safety and health outcomes including examples. They were also about their response in such situations. 94 out of 104 participants responded to the question and all responses were coded into 5 thematic categories and presented. Tab.17

Code	Theme	Responses
A	Dispensing error	17
B	Dosage error	19
C	Patient harm	33
D	Medication error	16
E	Reduced workflow	9

Table 17 Thematic categories of effect of illegible prescription on patient safety and health outcomes

With a significant probability of dosage and dispensing errors that might have major health effects, illegible prescriptions represent a significant risk to patient safety. They also cause workflow disruptions in pharmacies, which lowers efficiency. Misinterpretation may lead to the incorrect drug being prescribed or to the improper dosage being given, both of which may result in hospitalization or even death. Patient harm appears frequently (33 responses); in some cases, pharmacists have to ask prescribers for clarification in order to prevent serious mistakes. Prescriptions that are unclear can lead to medication errors and insufficient therapy, which increases medical conditions. Pharmacists misread prescription information, leading to incorrect medicine distribution and the need to ask prescribers for clarification. This causes dispensing errors, including 17 responses. These errors may result in improper care and worsened health consequences for the patients. 19 responses were noted about dosage errors. These errors occur when dosage units or drug forms are misinterpreted, leading to either an under- or overdose that can cause undesirable side effects or therapeutic failures. Additionally, illegible prescriptions slow down workflow efficiency by requiring pharmacists to spend more time interpreting handwritten prescriptions or contacting prescribers for clarification. This causes a delay in the dispensing procedure and increases the possibility of mistakes. Examples include missing doses of insulin, interpreting Tablet Sompraz IT as Sompraz.

17. What are the changes you observed in patient satisfaction or safety outcomes when switching to digital prescription systems?

Code	Theme	Responses
A	Accuracy	23
B	Convenience	22
C	Safety	29
D	Satisfaction	16

Table 18 Thematic categories of changes observed in patient safety and satisfaction

Thematic analysis of responses regarding changes observed in patient satisfaction or safety outcomes when switching to digital prescription system was conducted. 90 participants responded and the responses were categorized into 4 primary themes: Accuracy, convenience, safety and satisfaction. 23 responses were noted on accuracy. The accuracy of medication dispensing is significantly increased by setting up a digital prescription system. Error risk is decreased by the system's extensive detailing of drug names, doses, and frequencies. Precise and readable prescriptions make it easier for patients and pharmacists to verify and dispense medications accurately. Patients' and healthcare professionals' convenience is greatly increased by the system. It is clear from the 22 responses. By reducing wait periods, the streamlined procedure guarantees timely dispensing, which increases patient satisfaction. Patients are able to understand the medication they receive because to the system's simplicity and convenience of use, which speeds up and improves the accuracy of administration. Because of their enhanced productivity, pharmacists are able to safely and quickly service a large number of patients. The switch to digital prescription systems has also resulted in notable improvements in patient satisfaction and safety. By improving accuracy and readability, these technologies significantly decrease medication errors and adverse drug incidents. All things considered, digital prescription systems improve patient trust, improve health outcomes, and make the process of distributing medications safer and more effective.

18. What are the advantages of implementing electronic prescribing systems for pharmacists? How does it impact patient care?

Respondents were asked about their opinion on advantages of implementing electronic prescription system for pharmacists and their impact on patient care. 97 responses were coded

using the themes legible prescription, workflow efficiency, reduction of error, improved patient outcomes.

Code	Theme	Responses
A	Legible prescription	20
B	Workflow efficiency	37
C	Reduction of error	18
D	Improved patient outcomes	22

Table 19 Thematic categories of advantages of implementing electronic prescribing systems

Several advantages of electronic prescription systems were mentioned by respondents. 20 respondents cited legibility of prescriptions as the main benefit, since it lowers the possibility of errors and misinterpretations due to illegible handwriting. Pharmacists will be able to read prescriptions more simply and easily due to the improved clarity. The most often mentioned advantage was workflow efficiency, as noted by 37 respondents who indicated that using electronic systems makes writing prescriptions easier. This results in shorter patient wait times, faster dispensing times, and more effective pharmacy operations overall. Medication dispensing is made more accurate and efficient by automation and integration with patient information. The reduction in errors was highlighted by eighteen respondents as an essential benefit. 22 respondents emphasized improved patient outcome, pointing out that electronic prescribing ensures quick and accurate prescription filling, which improves health outcomes. Electronic systems promote improved communication between pharmacists and healthcare professionals, which improves patient care and drug administration. In conclusion, the adoption of electronic prescription systems has several advantages, such as improved patient outcomes, reduced errors, increased workflow efficiency, and clearer and more accurate prescriptions and these systems help provide patients with safer and more efficient treatment.

19. What are the changes you observed in workflow efficiency since the adoption of digital prescription systems?

Code	Theme	Responses
A	Improved Workflow and Efficiency	72
B	Increased Accuracy and Safety	9

C	Enhanced Communication and Coordination	1
D	Reduced Administrative Burden and Time Savings	14

Table 20 Thematic categories of the changes observed in workflow efficiency since the adoption of digital prescription systems

The changes observed in workflow efficiency since the adoption of digital prescription was thematically analysed. 96 responses were categorized into 4 themes: Improved Workflow and Efficiency, Increased Accuracy and Safety, Enhanced Communication and Coordination and Reduced Administrative Burden and Time Savings. Out of 96 responses, improved workflow and efficiency (72) were mentioned as an important advantage. Faster drug delivery and simpler procedures resulted from these responds, which also highlighted shorter processing times, easier prescription management, and faster dispensing. 14 respondents also emphasized the benefits of Reduced Administrative Burden and Time Savings, highlighting advantages including less paperwork, better time management, and more efficiency. Nine answers emphasized a reduction in errors, improved patient safety, and decreased prescription negligence while discussing increased accuracy and safety. The possibility for better communication and time management was highlighted by the one and only response that referred to "Enhanced Communication and Coordination." In general, the analysis indicates a strong agreement about the beneficial effects of digital prescription systems on workflow efficiency, including increases in speed, accuracy, and decrease of administrative effort.

20. What are the main challenges you faced when switching from paper based to digital prescription?

Code	Theme	Responses
A	Technical issues	45
B	Lack of knowledge and training	18
C	Resistance to change	17
D	Implementing cost	3

Table 21 Thematic categories of challenges faced when switching from paper based to digital prescription

83 participants responded to the question regarding the challenges faced when switching from paper to digital prescriptions. The responses were coded into 4 thematic categories including technical issues, lack of training and knowledge, resistance to change and implementing cost. There are numerous challenges in different theme areas while switching from paper-based to digital prescriptions. Technical problems (45 responses) are the main obstacle; these include software bugs, technological failures, network problems, and software malfunctions. In order to reduce these issues, which disrupt processes, adequate training and technical assistance are required. Another barrier is a lack of knowledge and training (18 responses), which makes software integration and utilization challenging, especially for healthcare personnel who are not proficient with technology. Effective communication and training (17 responses) initiatives are necessary to create acceptance since resistance to change makes the shift much more difficult, especially among older generation doctors or workers who are used to traditional practices. The issue of implementation costs(3 responses) also comes up, with the requirement for efficient staff training and early setup expenditures adding to the overall financial burden. Planning, communication, technical assistance, and thorough training must be the most important things in order to effectively complete this transformation. The quality of patient care may be increased by healthcare professionals by systematically addressing these issues and maximizing the benefits of digital healthcare technology.

CHAPTER 5

5. CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The study provides information about the difficulties and impacts of illegible prescriptions as well as their switch to digital prescription systems. Among the 105 participants, a considerable majority (80.8%) recognized the following reasons for unreadable prescriptions: confusing symbols or abbreviations, incomplete information, and problems with the quality of the ink. Furthermore, 48.1% of pharmacists said they occasionally experienced unreadable prescriptions, and 97.1% said they had trouble understanding prescriptions. According to 67.3% of those examined, this frequently resulted in prescription processing problems. Patient harm was found to be the main risk associated with illegible prescriptions (56.7%), followed by dispensing errors (25%). The efficiency of workflow was severely impaired by illegible prescriptions, as 16.3% required clarification from prescribers and 48.1% experienced delays in medicine delivery. The procedures most impacted by illegible prescriptions were workflow (27.9%) and patient safety (52.9%). 63.5% of pharmacists said they preferred to get in contact with the prescriber to get confirmation in such cases. When it came to prescription error that were not readable, dispensing errors accounted for the majority (64.4%). Despite these obstacles, 92.3% of respondents supported the switch to digital prescriptions because they thought it would reduce errors; yet, technological problems were viewed as the main drawback by 73.1% of respondents. On the other hand, respondents attributed digital prescriptions with increasing accuracy (23), convenience (22), safety (29), and satisfaction (16). Following adoption, there was a noticeable gain in workflow efficiency (72 responses), along with a decrease in administrative burdens (14 responses) and an increase in accuracy (9 responses). Technical issues, a lack of information and training, resistance to change, and implementation costs were among the difficulties experienced throughout the transformation. Enhancing patient safety and healthcare delivery and optimizing the advantages of digital prescription systems require addressing these issues with efficient training, communication, and technical support.

5.2 CONCLUSION

The study emphasizes the significant problems that illegible prescriptions represent and the resulting effects they have on patient safety, workflow effectiveness, and the provision of healthcare including community pharmacies. A majority of pharmacists encounter prescriptions that are difficult to read and understand, it is clear that this problem has wide-ranging

consequences. Illegible prescriptions create a significant risk to patients, with dispensing errors being a particularly serious consequence. The inefficiencies in the system, such as the requirement for clarification and the delays in the supply of medications, highlight the importance of the intervention. The interruption to patient safety and the effectiveness of the process further emphasizes the need for implementation of digital prescription systems. Although participants expressed concerns about technological barriers, the widespread acceptance of digital prescriptions suggests a knowledge of its capacity to reduce errors and improve all aspects of healthcare practice. Positive effects of digitization are highlighted by the post-adoption benefits, which include reduced administrative challenges and increased workflow efficiency.

Although participants expressed concerns about technological barriers, the widespread acceptance of digital prescriptions suggests a knowledge of its capacity to reduce errors and improve all aspects of healthcare practice. Positive effects of digitization are highlighted by the post-adoption benefits, which include reduced administrative challenges and increased workflow efficiency. But in order to effectively implement digital prescription systems, a number of challenges must be overcome, such as poor technology, inadequate training, resistance to change, and implementation costs. A coordinated effort including effective communication, training, and technical assistance is needed to overcome these challenges.
In summary, the use of digital prescription systems presents significant opportunities for improving patient safety, streamlining workflows, and improving healthcare delivery. Stakeholders may fully realize the possibilities of digitalization by implementing broad approaches to solve the limitations identified in this research.

5.3 LIMITATIONS AND FUTURE RESEARCH

Although this study highlights the difficulties and advantages of digital prescription systems, it has some limitations. Even while the sample size of 105 participants is informative, it could not adequately represent the range of viewpoints and experiences among the many stakeholders in prescription management. Additionally, using self-reported data increases the risk of bias and could not accurately represent the complexity of implementation in the real world. Furthermore, there may be limitations to the findings' generalizability because contextual elements including organizations culture, technology infrastructure, and legal frameworks were not thoroughly investigated. By using more extensive and varied samples, adding quantitative measurements, and taking contextual variables into account, future research might overcome these

challenges. Further research should also examine the long-term effects of digitization, qualitative perspectives on the observations of participants, and external validation. Investigating these subjects may result in a better understanding of the effects of digital prescription systems and help develop approaches to increase their acceptance and efficacy in medical practice.

5.4 RECOMMENDATIONS

The study's results and conclusions lead to the following recommendations being implemented out to improve the efficacy and implementation of digital prescription systems: Provide thorough educational programs to guarantee that all staff members are proficient in the use of digital prescription systems. Technical issues, fixing problems, and best practices for maintaining patient confidentiality and data integrity should all be included in training. Invest in reliable program that's easy to use to reduce technical problems and improve user experience. Create a framework for ongoing monitoring and assessment to evaluate the effectiveness of the digital prescription system. Measure advancements in patient safety, workflow efficiency, and error reduction with quantitative and qualitative indications.

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7.APPENDIX

Questionnaire for survey

Dear Participant,

My name is Govind Vinodkumar, a postgraduate student studying Digital Transformation (Life Science) at Griffith college, Dublin.

As a part of my research dissertation, I am assessing the Assessment of impact of digital revolution on prescription legibility and dispensing efficiency in community pharmacies in Kerala state of India in partial fulfilment of the requirements for my master's degree. I would be grateful if you could take 5 to 10 minutes to complete the survey. This is entirely voluntary anonymized and confidential. Responses collected from the survey will be used solely for my research dissertation and stored in line with general data protection regulation (GDPR)

By ticking the boxes below, you are consenting to your participation in the survey.

I Understand the purpose of the study and consent to participating in this survey.

I consent to using the information I provide for the sole purpose of this study.

1. what is meant by illegible prescription?
    a. Prescription handwritten in unreadable handwriting.
    b. Prescription with confusing symbols or abbreviations.
    c. Prescription that lacks necessary information or has spelling mistakes.
    d. Prescription that is difficult to read due to smudged or faded ink.
    e. All the above
2. How often do you come across prescriptions that are illegible in your practice?
    a. Never
    b. Rarely
    c. Occasionally
    d. Often
    e. always
3. Have you ever had difficulty in reading or understanding a prescription?
    a. Yes
    b. No
4. Have you ever made an error in processing a prescription due to poor handwriting?

a. Yes
b. No

5. What do you think is the major risk associated with such prescriptions?
    a. Delay processing
    b. Dispensing error
    c. Reduced work efficacy
    d. Patient harm
6. How does illegible prescriptions reflect on the work flow?
    a. Difficulty in decision making
    b. Need for enquiring with the prescriber
    c. Getting caught up on the prescription for longer period
    d. Not able to dispense the medication to the patient in a timely manner
7. What is the major process affected by prescription illegibility on regular activities and drug dispensing efficiency?
    a. Patient safety
    b. Medication usage
    c. Dispensing time
    d. Pharmacy workflow
8. What do you do when you come across such illegible prescription?
    a. Reject them
    b. Seeking help from colleagues or supervisors
    c. Contact the prescriber for conformation
    d. Ignore the confusion and go with own decision
9. Which type of error is most commonly associated with illegible prescriptions?
    a. Dosage error
    b. Administration error
    c. Dispensing error
    d. Drug interaction error
10. On a daily basis, what percent of prescriptions that you receive are found to be illegible?
    a. Less than 10%
    b. 10 – 30%
    c. 30 – 50%
    d. 50 – 80%

e. More than 80%

11. What will be the major advantage of digitalizing prescriptions?
    a. Clear and readable
    b. Lesser chance of error
    c. Easy to maintain records
    d. Quick and efficient processing
12. Which of the following electronic methods do you follow in your practice?
    a. Electronic prescribing
    b. Digitalised patient records
    c. Computerized physician order entry
    d. All the above
    e. None
13. Which method do you find most efficient in reducing errors?
    a. Physical prescription
    b. Sending prescriptions via E-mail
    c. Telephonic instructions from the prescriber
    d. Electronic Prescriptions

14. What do you think will be the major disadvantage of digitalising prescriptions?
    a. Technical failure/ software issues
    b. Unable to receive prescriptions in case of failure
    c. Unable to revert back to the prescriber
    d. Not able to access patient records in case of failure
15. what action do you think should be taken during such technical failure?
    a. Notify the customers about it
    b. Establish alternative communication channels with prescribers
    c. Stick on to manual processing for the time being
    d. Dispense manually and update the record later.

Comment the opinion from your personal experience or knowledge (question 16 – 20)

16. Give an example on how illegible prescriptions affect patient safety and overall health outcomes? What was your response in this scenario?

17. What are the changes you observed in patient satisfaction or safety outcome when switching to digital prescription system?
18. What are the advantages of implementing electronic prescribing systems for pharmacists? How does it impact patient care?
19. What are the changes you observed in workflow efficiency since the adoption of digital prescription systems?
20. What are the main challenges you faced when switching from paper based to digital prescription?

Thank you for your participation.