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EVALUATING THE IMPACT OF ELECTRONIC PRESCRIPTION SERVICES ON WORKFLOW EFFICIENCIES IN COMMUNITY PHARMACIES OF DUBLIN, IRELAND.

This dissertation was submitted to Griffith College Dublin, Ireland in partial fulfillment of the requirements for the award of a master's degree in Pharmaceutical Business and Technology

By, **ARDRA VATTAMKANDATHIL TOMY**

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CANDIDATE DECLARATION

"I hereby declare that this dissertation entitled "Evaluating the Impact of Electronic Prescription Services on Workflow Efficiencies in Community Pharmacies of Dublin, Ireland", submitted in partial fulfilment of the M.Sc. in Digital Transformation(Life Sciences), is entirely my own, according to my personal study and research, and I acknowledged all material and sources used for the purposes of the study purpose. I also certify that I have not copied in part or whole or otherwise plagiarised the work of anyone else, including other students."

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List of Abbreviation

EPS: Electronic Prescription Services

SSO: Social Security Officer

EHR: Electronic Health Record

UTAUT: Unified Theory Of Acceptance And Use Of Technology

CDSS: Clinical Decision Support System

ICT: Information And Communication Technology

TAM: Technology Acceptance Model

ABSTRACT

EVALUATING THE IMPACT OF ELECTRONIC PRESCRIPTION SERVICES ON WORKFLOW EFFICIENCIES IN COMMUNITY PHARMACIES OF DUBLIN, IRELAND.

Ardra Vattamkandathil Tomy

The integration of Electronic Prescription Services (EPS) represents a significant advancement in the healthcare sector, designed to enhance the accuracy and efficiency of prescription management. By enabling the electronic transmission of prescriptions from healthcare providers to pharmacies, EPS aims to reduce the errors associated with traditional paper-based prescriptions and streamline pharmacy operations. Despite its potential benefits, the implementation of EPS presents various challenges, including technical integration and the need for comprehensive staff training.

This research investigates the impact of Electronic Prescription Services (EPS) on community pharmacies in Dublin, Ireland, examining areas such as prescription accuracy, workflow efficiency, pharmacist satisfaction, and implementation challenges. EPS, an advancement in healthcare, facilitates the electronic transmission of prescriptions from healthcare providers to pharmacies, aiming to enhance patient safety, streamline operations, and reduce errors compared to traditional paper prescriptions. Despite EPS's potential benefits, including improved prescription accuracy and operational efficiency, community pharmacies face challenges such as technical integration issues and the need for effective staff training. This study employs a quantitative methodology, using surveys distributed to pharmacists and pharmacy staff, to evaluate these impacts comprehensively.

Adopting a pragmatic research philosophy and an inductive approach, the study collects and analyzes primary data to understand the operational changes brought about by EPS. Data analysis, performed using JASP software, involved descriptive and inferential statistical techniques, including Chi-square and Kendall's Tau tests, to assess relationships between EPS implementation and various performance metrics.

The findings reveal significant associations: improved communication with prescribers correlates moderately with reduced prescription errors, and overall pharmacist satisfaction is strongly associated with the ease of EPS use and improvements in medication inventory management. Workflow efficiency showed notable improvements in prescription processing time, daily volume, patient waiting time, and counselling ability, though increased processing time was linked to reduced efficiency. Confidence in EPS is high, particularly regarding its role in identifying potential medication interactions.

The study concludes that EPS positively impacts several facets of pharmacy operations, enhancing prescription accuracy, workflow efficiency, and pharmacist satisfaction, while increasing confidence in the system. Nonetheless, further attention is needed to address training and technical challenges associated with EPS implementation.

1.INTRODUCTION

1.1 Overview

The Electronic Prescription Service is a system for issuing prescriptions whereby the prescriptions are transmitted electronically from a prescriber, for example., GP or dentist to the desired pharmacy by the patient. It is one of the measures of the development of the healthcare industry in the digital era, which considers the aspects of effectiveness, convenience, and safety of prescribing and dispensing. By enabling the electronic transfer of prescriptions from healthcare practitioners to pharmacies, Electronic Prescription Services (EPS) have completely changed the healthcare system by replacing error-prone paper-based procedures. This change started in the early 2000s and has been gradually implemented in several nations, including Ireland. EPS strives to improve patient safety, streamline pharmacy processes, and maintain healthcare expenditures. Community pharmacies are essential for providing readily accessible pharmaceutical and counselling services. By decreasing prescription errors and optimizing the prescription filling process, EPS increases accuracy and efficiency while allowing the pharmacists to concentrate more on patient care(Grammatikopoulou *et al.*, 2024). It also improves safety by securely transferring prescription data, which reduces the possibility of misuse.

Despite these advantages, community pharmacies face difficulties while implementing EPS. Implementing EPS may be delayed by technical problems like integrating it with current systems and guaranteeing dependable internet connectivity. The initial outlay for infrastructure and technology might be high, and personnel training and system adaptation are additional tasks that demand attention. In several European countries, the progress of ePrescribing and the electronic transmission of prescriptions (ETP) remains limited due to a variety of challenges, including organizational, legal, technical, and other barriers (Brennan, 2015). In particular, in Dublin, Ireland, where adoption experiences may differ, these difficulties emphasize the necessity for quantitative research to assess the true impact of EPS on workflow efficiency. Dublin, with its varying preference of community pharmacies, provides a perfect site for researching the impact of EPS. This study looks at changes in prescription processing times, mistake reductions, and the

experiences and satisfaction levels of pharmacy employees. It will also identify challenges faced during EPS implementation. The study's purpose is to provide actionable insights on how to optimise EPS use and enhance pharmacy operations in Dublin.

1.2Purpose of the Study

The primary purpose of this dissertation is to evaluate the impact of Electronic Prescription Services (EPS) on workflow efficiencies in community pharmacies in Dublin, Ireland. Medication errors represent a significant category of healthcare mistakes, with conventional handwritten prescriptions being especially susceptible to errors because of incomplete orders, illegible handwriting, and missing patient data. The problem is made worse by the reality that these problems often go ignored or underreported. By investigating the effects of EPS, this study aims to determine whether digital prescriptions can mitigate these risks, improve the accuracy of prescriptions, enhance workflow efficiency, and increase pharmacist satisfaction, thereby contributing to safer and more efficient healthcare delivery.

Understanding the effectiveness of EPS in improving pharmacy workflows is crucial for optimizing operations and enhancing patient care. This study is significant because it provides empirical evidence on the practical implications of EPS implementation, helping to identify areas for improvement and informing best practices. By evaluating the impact of EPS on prescription accuracy, pharmacist satisfaction, and workflow efficiency, this research aims to contribute to the development of strategies that maximize the benefits of EPS in community pharmacies.

1.3 Key Objectives of this Proposed Research

The main goal of this study is to assess the impact of Electronic Prescription Services (EPS) on the efficiency of workflows in community pharmacies in Dublin, Ireland. To achieve this goal, the research focuses on four specific objectives:

1.3.1.Evaluate Prescription Accuracy:

Purpose: To determine how the use of EPS affects the accuracy of prescriptions.

Expected Outcome: By assessing the impact of EPS on prescription accuracy, the study aims to identify a reduction in prescription errors. This evaluation will consider the extent to which EPS can minimize manual entry mistakes, misinterpretations, and other common errors in the traditional prescription process.

1.3.2.Analyze Pharmacist Satisfaction:

Purpose: To measure the satisfaction levels of pharmacists who utilize EPS.

Expected Outcome: This objective will involve gauging pharmacists' contentment with various aspects of EPS, such as its user-friendliness, reliability, and the quality of support provided. The findings are expected to highlight the factors that contribute to a positive or negative user experience, which can inform improvements and encourage wider adoption.

1.3.3.Identify Barriers and Challenges:

Purpose: To uncover the primary obstacles and difficulties pharmacists encounter when implementing and using EPS.

Expected Outcome: By identifying these barriers, such as technical issues, resistance to change, or lack of training, the research aims to provide insights into what hampers the effective use of EPS. Understanding these challenges is crucial for developing strategies to overcome them and ensure successful implementation.

1.3.4.Measure Workflow Efficiency Improvement:

Purpose: To quantify the enhancements in workflow efficiency that result from using EPS.

Expected Outcome: This objective involves analyzing metrics such as prescription processing times and patient waiting times to determine the extent to which EPS improves operational efficiency in pharmacies. The study aims to provide concrete data on time savings and productivity gains, demonstrating the practical benefits of EPS.

By addressing these objectives, the research will provide a comprehensive evaluation of how EPS impacts community pharmacies in Dublin. The findings are expected to offer

valuable insights for policymakers, healthcare providers, and pharmacists, guiding future improvements and wider adoption of EPS in the healthcare sector.

1.4 Research Question and Hypothesis

To achieve the objectives of evaluating the impact of Electronic Prescription Services (EPS) on community pharmacies in Dublin, Ireland, the study is guided by a specific research question: "How does the implementation of Electronic Prescription Services impact workflow efficiencies, prescription accuracy, and pharmacist satisfaction in community pharmacies of Dublin, Ireland?" This question aims to explore the overall effect of EPS on three critical areas within community pharmacies. It seeks to understand how EPS influences the time and processes involved in handling prescriptions (workflow efficiencies), reduces prescription errors (prescription accuracy), and affects the contentment of pharmacists with the system (pharmacist satisfaction).

Based on this research question, the study tests the hypothesis that the implementation of EPS in community pharmacies significantly improves workflow efficiency, prescription accuracy, and pharmacist satisfaction. This hypothesis proposes a positive relationship between the adoption of EPS and improvements in these three areas. It suggests that EPS will streamline pharmacy operations, leading to quicker prescription processing and reduced patient waiting times (workflow efficiency), enhance the accuracy of prescriptions by minimizing errors related to manual entry and misinterpretation (prescription accuracy), and result in higher levels of satisfaction among pharmacists due to the benefits provided by EPS, such as ease of use and reliable support (pharmacist satisfaction). By investigating this hypothesis, the study aims to provide empirical evidence on the effectiveness of EPS in enhancing the operational aspects of community pharmacies, contributing to better patient care and pharmacy performance.

1.5 Structure of the Dissertation

This dissertation is structured into six chapters, each designed to build a comprehensive understanding of the impact of Electronic Prescription Services (EPS) on community pharmacies in Dublin, Ireland. The detailed breakdown of each chapter is as follows:

Chapter 1: Introduction

The first chapter sets the stage for the entire dissertation by providing the necessary background and context for the research. It explains the significance of studying EPS in the context of community pharmacies, highlighting the potential benefits and challenges associated with its implementation. This chapter also outlines the primary aims and specific objectives of the study, along with the central research question. Additionally, it provides an overview of the dissertation's structure, guiding the reader through the logical flow of the research.

Chapter 2: Literature Review

Chapter 2 delves into existing literature on EPS, exploring various studies and reports that examine its implementation and impact on pharmacy operations. This review identifies key themes and findings from previous research, such as improvements in prescription accuracy and workflow efficiency, as well as barriers to adoption. By synthesizing this information, the literature review highlights gaps in the current knowledge and positions the present study within the broader academic and practical context. It sets the foundation for understanding how the research contributes to and expands upon existing work.

Chapter 3: Methodology

The third chapter outlines the research design and methodological approach used in the study. It details the quantitative research approach, explaining why this method is suitable for evaluating the impact of EPS. The chapter describes the data collection methods, specifically the use of surveys to gather information from pharmacists and pharmacy staff. It also explains the sampling strategy, data collection procedures, and the analytical techniques employed to process and interpret the data. This section ensures transparency and reproducibility, allowing other researchers to understand and potentially replicate the study.

Chapter 4: Results

Chapter 4 presents the findings derived from the survey data. It systematically analyzes the impact of EPS on various aspects of pharmacy operations, including prescription accuracy, pharmacist satisfaction, workflow efficiency, and the barriers to implementation. The results are presented in a clear and organized manner, using tables, charts, and graphs where appropriate to illustrate key points. This chapter provides a factual basis for the subsequent discussion, offering empirical evidence on the effects of EPS. The results are interpreted and contextualized within the broader literature. This chapter discusses the implications of the findings, relating them back to the research objectives and question. It explores the practical significance of the results for pharmacy operations and healthcare delivery, addressing any unexpected outcomes and their potential reasons. The discussion also considers the limitations of the study and suggests how these might impact the interpretation of the results. This section connects the empirical findings with theoretical concepts, providing a deeper understanding of the study's contributions.

Chapter 6: Conclusion and Recommendations

The final chapter summarizes the key findings of the research and their implications for practice and policy. It offers practical recommendations for community pharmacies and healthcare policymakers on how to optimize the implementation and use of EPS. This chapter also suggests avenues for future research, highlighting areas where further investigation could build on the current study's findings. The conclusion reinforces the study's significance, emphasizing how it adds to the understanding of EPS and its potential to enhance pharmacy operations and patient care.Together, these chapters provide a structured and detailed examination of the impact of EPS on community pharmacies, offering insights that are both academically valuable and practically relevant.

1.6 Conclusion

This introductory chapter establishes the context for an in-depth examination of the effects of Electronic Prescription Services (EPS) on community pharmacies in Dublin. It highlights a significant gap in the existing literature, emphasizing the need for

comprehensive research in this area. By filling this gap, the study aims to generate valuable insights that can inform and improve the implementation and effectiveness of EPS. These insights are expected to lead to enhanced pharmacy practices and better patient care outcomes. The subsequent chapters will expand on this foundation, providing a detailed analysis and discussion of the research findings, thus contributing to a deeper understanding of EPS's impact on the healthcare sector.

2. LITERATURE REVIEW

2.1 Introduction

The following literature review aims at reviewing on how Electronic Prescription Services (EPS) have affected the displayed workflow pattern in community pharmacy settings in Dublin, Ireland. In line with this, it focuses on evaluating the literature on EPS so as to determine how it contributes to increasing prescription processing time, decreasing the rate of errors and ultimately improving the working of pharmacies and the satisfaction of patients.

2.2 Review of the previous papers

Raeesi, Abbasi and Khajouei, 2021. Evaluating physicians' perspectives on the efficiency and effectiveness of the electronic prescribing system

Since the use of the ESPs follows certain objectives, their end-users' views can help evaluate the effectiveness of the EPS. The objectives of this study were namely; To assess physicians' satisfaction on the efficiency and effectiveness of the electronic prescribing system. The present work was carried out on all physicians who used the electronic prescription system in clinics and hospitals of the treatment deputy of the SSO in clinics and hospitals of Sistan and Baluchistan province in Iran (Raeesi, Abbasi and Khajouei, 2021). Data were collected using a self-administered questionnaire containing three sections: Here are the particularities of each part of the questionnaire used: I) six concerning demographic data and clinical experience, II) specific questions on the Likert scale about physicians' efficiency (19 questions) and efficacy (13 questions) opinions and III) LA-Likert questions about the benefits and drawbacks of the electronic prescribing system. The mean and standard deviation of efficiency and effectiveness of electronic prescribing system were 3.68±067 and 3.84±0.65 respectively. The dimension of patient safety received the highest score of all the

dimensions with an average mean score of 4.0 ± 0.64. As many as 55 participants (79%) estimated the efficiency and effectiveness of this system as high. Most (63 out of the 70) of the physicians agreed with the statement that the electronic prescribing system aids in a better medication prescription given that it comes with alerts and history of patients' medication(Raeesi, Abbasi and Khajouei, 2021). Some of the results revealed that the most physicians perceived that the efficiency and effectiveness of the Iran's SSO electronic prescribing system to be high. Especially, physicians stated that the implementation of this system resulted in patients' safety and cost saving.

Hareem et al., 2024. Electronic health records and e-prescribing in Australia: An exploration of technological utilisation in Australian community pharmacies.

This paper aimed to explore three key areas about EHR and e-prescribing systems for community pharmacies in Australia; the level of implementation; perceived benefits and challenges; and how it affected its daily business practice and work flows, and to have qualitative evidence from the community pharmacists (Hareem*et al.,* 2024). An online survey that adopted a mixed-method approach was conducted among community pharmacists across Australia with a view of comparing the extent of use of EHR and e-prescribing systems, the impact of these systems as well as the benefits and the challenges that come with the use of these systems. Descriptive analysis of the results was done with reference to the age and gender of the pharmacists and the region they work in; metropolitan or regional. Through the application of the chi-square test, it was possible to determine the association of these demographic factors with the utilisation and operation of EHR and e-prescribing systems. The survey recruited 120 community pharmacists in Australia. Among them 67% said they experienced usability and efficiency problems with EHR systems(Hareem*et al.,* 2024). On e-prescribing, 58% of the pharmacists experienced delays because of slow performance of the software in use while 42% reported on data transmission errors. However, there were several challenges on e-prescribing whereby 11% indicated that the system was ambiguous, 45% complained of slow system response, 27% said the system was freeze frequently while 20% reported that the system locked often(Hareem*et al.,* 2024). The problems with prescription quantity differences and the reprinting process have been reported which may directs to the certain changes in the approach to handling of the work and the organization of the program. No statistically tested correlation was found between the use and the problems in interacting with EHR and e-prescribing systems and the

demographic characteristics of the age, gender and location ($p > 0.05$), which underscores the need for the effective healthcare solutions that would meet the needs of all pharmacists, including divided by various demographic characteristics(Hareem*et al.,* 2024). Despite possible benefits in patient care, EHR and e-prescribing in Australian community pharmacies raises issues in data completeness, technical problems and usability issues. To make integration effective it is equally important that its plan is user friendly, standard and well supported. Thus, although the requirements for pharmacists are becoming higher, the digital transformation enhances the productivity and the quality of the services provided.

Marcilly et al., 2023. Improving the usability and usefulness of computerized decision support systems for medication review by clinical pharmacists: A convergent, parallel evaluation.

CDSSs assist computerised clinical pharmacists at the hospital to do medication reviews and can hence be viewed as instruments for enhancing medication safety. But poor usability may be counterproductive and lessen both efficacy and consumers' willingness to use them. This study is intending to assess the acceptability and perceived relevancy of a CDSS for medication review by hospital-based pharmacists as well as develop recommendation on how the acceptability of the CDSS may be enhanced (Marcilly*et al.,* 2023). Essentially, the researchers conducted a parallel, convergent assessment. First of all, three researchers collectively performed heuristic assessment of the CDSS. Secondly, all the clinical pharmacists who utilised the CDSS completed Usefulness, Satisfaction and Ease of Use (USE) questionnaire. Finally, the participants were interviewed through semi-structured interviews for the pharmacists which made them to express their views and feelings. Based on the results of the heuristic evaluation, recommendations of improvements to CDSS were made(Marcilly*et al.,* 2023). The researchers carried out an analysis of the collected USE questionnaire data using statistics. Interviews of the officials and practitioners of Schools Division were assessed using the unified theory of acceptance and use of technology (UTAUT) and the task-technology fit model. Conclusions and recommendations of these three methods were then compared in terms of similarities and differences in order to look at the challenges of CDSS usability and usefulness and create an index of change for the CDSS. According to the findings; the number of usability issues identified was 47; these included graphical user interface issues, the requirements of the pharmacists, and the

medication review model that was incorporated in the CDSS(Marcilly*et al.,* 2023). Thus, it is possible to conclude only the "usefulness" dimension of USE was not given positive marks. As it has been described before, all the UTAUT dimensions showed presence in the interviews as well as the task-technology fit dimension. When comparing the results obtained from all three approaches, the authors were able to distinguish four issues and define 23 guidelines for them.

Williams et al., 2022. Optimizing hospital electronic prescribing systems: a systematic scoping review

Much investment has been made in ePrescribing globally, however most ePrescribing programs are not reporting safety, quality or efficiency improvements. The aim of this work was to provide policy makers with recommendations regarding how to protect and enhance the value of costly hospital ePrescribing systems(Williams *et al.,* 2022). The researchers employed the practice of a systematic scoping review of the identified literature using the databases of the MEDLINE, Embase, and CINAHL. The authors sought for qualitative primary records on the effectiveness of ePrescribing and samples were identified and reviewed independently with the objective of ensuring data heterogeneity before data extraction was done until data saturation was obtained. Data was analysing theoretically and thematically while adopting a medicine life cycle approach combined with consultation with advisories. Two authors screened 23,609 records and selected 1367 potentially eligible cross-sectional studies (Williams *et al.,* 2022). The analysis of themes was based on 76 research papers of which 48 were conducted in the United States. Key approaches to optimization included the following: include management of stakeholders, system or process redesign, technological solutions and training and development packages. Of these, 26 are single-component interventions that aimed at optimising the technology used in prescription by addressing a single step out of the process. Multicomponent interventions (n=50) employed a combination of the optimisation techniques, that, often, addressed several stages in the medicines management cycle(Williams *et al.,* 2022). The researchers found out a number of strategies which could be used to improve the operation of ePrescribing systems. Suggestions for the improvement of ePrescribing include effective engagement of stakeholders with an aim of redefining the way the service is delivered, and the integration of new technologies together with supporting training interventions, to affect multiple dimensions of the medicines management continuum.

Bilgener and Bulut, 2021. Evaluation of electronic prescriptions in Turkey: A community pharmacy perspective.

the research aim of the present study was to identify the opinion of pharmacists – the key adopters of e-prescribing practices in Turkey–regarding the roles of a prescription application. Questionnaire was constructed, so as to assess pharmacists' perception regarding Turkish e-prescribing practices and the sampling technique employed was stratified and systematic random sampling (Bilgener and Bulut, 2021). Of the pharmacists 378 filled in the questionnaire. Pharmacists reported that the average level of satisfaction of e-prescription was 4.4 ± 0.8. While 52.4% of the participating pharmacists responded that they experienced no issues concerning the e-prescription application, 47.6% of the pharmacists noted that they encountered problems. Most of the issues raised concerning e-prescription practices or systems were originated by the physicians who input the prescriptions in to the system(Bilgener and Bulut, 2021). The most frequently encountered (17.4%) issue was the difficulty of interpreting the content of an e-prescription as it was written by the physicians. The most often cited benefit of the e-prescribing practice according to the pharmacists was the amplification of the prescription processes. The e-prescription practice is beneficial in almost every aspect regarding the pharmacies and the medicine delivery to the patients and the most of the pharmacists found that e-prescription practice was highly satisfactory(Bilgener and Bulut, 2021). With the advancement in electronic and information technologies, the availability and the range of information resources and diversity enhance the expectations and the utilisation levels of users in such systems; adjustments or enhancements are vital to steadily enhance the performance of the e-prescribing system(Bilgener and Bulut, 2021).

Hareem et al., 2023. Benefits and barriers associated with e-prescribing in community pharmacy–A systematic review

The use of the electronic prescription is increasing, this has been occasioned by the lock down measures that occurred due to COVID-19 pandemic. Yet, as these prescriptions become virtually integrated into daily practice of clinicians, the summarized body of knowledge concerning difficulties and benefits of implementing electronic prescribing systems in the working environment of community pharmacists seems rather scarce(Hareem*et al.,* 2023). Therefore, the purpose of this paper is to systematically

review the community pharmacists' perception of barriers and enablers to electronic prescribing to establish the many-fold need to understand how the use of E-prescribing affects the workflow and decision making of the pharmacists hence the quality of patient care to be provided. The PubMed, Embase and CINAHL databases were searched from 1/1/2000 to 25/10/ 2022 using the following terms: electronic prescribing, computerised physician order entry, community/retail pharmacy, pharmacists. Eligible for systemic review, 28 clinical studies were identified(Hareem*et al.,* 2023). In these studies, design, integration, attitude towards e-prescribing technology, information quality, work-flow, productivity and availability of accessible resources were seen to enable e-prescribing system by community pharmacists. Finally, the included studies highlighted that such systems should be backed up with technological support for its implementation. The design characteristics enhance the desirable impact of e-prescribing technology to a very large extent(Hareem*et al.,* 2023). As suggested from our literature review, poorly designed e-prescribing system might have a negative effect on the quality of care, implementation, and users' satisfaction. On the other hand, it was established that a well design system can go a long way in facilitating such improvements.

Ogundipe, Sim and Emmerton, 2023. Health information communication technology evaluation frameworks for pharmacist prescribing: a systematic scoping review.

ICT is evidently in use for pharmacists in their current practice and in the development of new roles. Prescribing is one such role that mobilises clinical guidelines as well as documentation of decisions, often through ICT. The development and refinement of ICT should be produced and progressing by the framework of evaluation that describe or define features of ICT and its implementation. With regard to evaluation frameworks, these should specifically be tailored to health stakeholder and the pharmacy practice with regard to pharmacist prescribing (Ogundipe, Sim and Emmerton, 2023). According to the above-mentioned aim, Therefore, the aim of this work is to critically search for evaluation frameworks in the health-related literature focusing on frameworks and or models for the development, implementation and evaluation of pharmacist prescribing. Electronic databases searched included CINAHL, Cochrane Library, EMBASE, Medline (Ovid), ProQuest, Scopus, Web of Science and grey literature with a combination of keywords: 'ICT' 'utilization' 'usability' and 'evaluation framework'.

Criteria related to title and abstracts of a potential source were employed in the process of screening. Assessed frameworks were discussed in relation to their relevance to the practice of pharmacy(Ogundipe, Sim and Emmerton, 2023). Fourteen papers were included and all together 22 articles for the analysis, which reported the development or use of 20 frameworks. Each of the frameworks was established with general practice in mind and not pharmacy practice in particular. More specifically, the Technology Acceptance Model TAM that explains use behaviour, behavioural intention, perceived usefulness and perceived ease of use was the most frequently applied model(Ogundipe, Sim and Emmerton, 2023). Some assessment tools that have considered user and organisational factors in health ICT utility include the Information System Success (ISS) and Human-Organization and Technology Fit (HOT-fit) The following can consider the above limitation of TAM factors: This raises the need for an evaluation framework that will complement the system under review which will however not be easy going due to the heterogenicity and complexities of the health care system especially the modern pharmacy practice.

Lester et al., 2020. Detecting potential medication selection errors during outpatient pharmacy processing of electronic prescriptions with the RxNorm application programming interface: retrospective observational cohort study

Medication errors are pervasive. The secure and computer-interpretable prescriptions referred to as the e-prescriptions are the electronic versions of prescriptions written in clinics with the intent of prompting the outpatient pharmacy dispensing of medicines. On receipt, the pharmacy staff do a transcription work to choose the prerequisite medications to facilitate the processing of e-prescriptions within the dispensing software (Lester*et al.,* 2020). Pharmacists have to, individually, double check the medications that are selected to meet the e-prescriptions before dispensing to the patient. While most of the double-checks done by pharmacist are helpful in identifying medication selection errors, the process of choosing a drug from a computer remains vulnerable to error because of the simple reasons that the pharmacists are working under heavy workload, inattention and fatigue. Health information technology must be used to enhance medication selection reconciliation and recognition of errors to enhance patient safety(Lester*et al.,* 2020). The purpose of this work was to investigate the effectiveness of the automated double-check for pharmacy prescription records for detecting possible

medication selection mistakes in outpatient pharmacies using the RxNorm application programming interface.

The researchers used cross-sectional data of 537,710 pairs of e-prescriptions and dispensing data from one mail-order pharmacy that ranged from January 2017 to October 2018. The NDCs for each pair were procured from the RxNorm Application Programming Interface (API) of the National Library of Medicine. The API included RxNorm concept unique identifier (RxCUI) semantic clinical drug (SCD) codes for every NDC. When the SCD identifiers of the e-prescription NDC were compared to the SCD identifiers of the pharmacy dispensing record NDC(Lester*et al.,* 2020). An error matrix for mismatched SCD pairs was derived from the SCD pairs based on hand-labeling. For these data, performance measures were computed on the total matching and unique pairs of NDCs in the e-prescription-to-dispensing record matching algorithm established. The researchers used 527,881 pairs of e-prescription records and pharmacy dispensing records. Four clinically relevant examples of RxCUIs with different identifiers were found (three for a different ingredient and one for a different strength). Of lesser importance, 546 other instances of mismatched RxCUIs were also identified by these case definitions. All of the RxCUIs of the NDC pairs were withing a very close range (28,817/28,787, which is99.90 - 525,270/527,009, which is 99.67%). In this case, sensitivity of the RxNorm was at 1, the false-positive rate ranging from 0.00104 to 0.00312, specificity was scored at 0.99896 to 0.99688, precision of the API was 0.00727 to 0.04255 while the F1 score ranged from 0.01444 to 0.08163(Lester*et al.,* 2020). Thus, the researchers matched 872 pairs of records lacking an RxCUI.

2.3 Overall discussion

2.3.1 The concept of Electronic Prescription Services (EPS)

The Electronic Prescription Service is a system for issuing prescriptions whereby the prescriptions are transmitted electronically from a prescriber, for example., GP or dentist to the desired pharmacy by the patient. It is one of the measures of the development of the healthcare industry in the digital era, which considers the aspects of effectiveness, convenience, and safety of prescribing and dispensing. Campanella*et al.* (2021) mentioned that, by doing away with paper prescriptions EPS also prevents cases of lost or tampered prescriptions as well as cases of prescription fraud. The electronic

system helps to expedite the process and makes sure that the prescription gets to the pharmacy almost immediately cutting the time patients spend waiting. Mallhi*et al.* (2020) opined that, this also promotes convenience, since patients are at liberty to select the pharmacy of their choice, say near their workplace or home, and refills their medicines without waiting.

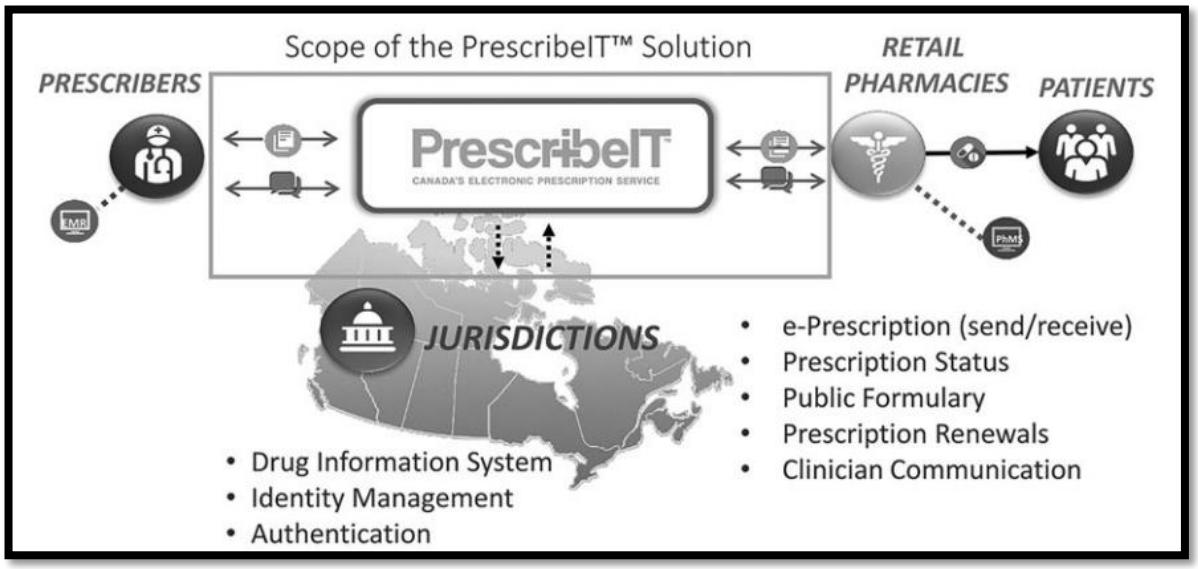


Figure 1: The overall structure of an EPS (PrescribeIT)

(Source: Aldughayfiq and Sampalli, 2021)

Reduced patient risk is another major advantage of EPS. This is due to the fact that through electronic transferring of prescriptions there will be little or no possibilities of many errors arising from writing or transcribing. It also enables more efficient tracking and thus auditing of prescribes thus enables prescribing doctors to monitor a patient's record of prescriptions and be in a position to check whether there are repeated prescribes or if prescriptions are being exploited. To the healthcare providers, EPS has the advantage of minimizing on the time and effort spent on paperwork and the simplification of prescriptions. Hassan*et al.*(2021) commented that, dispensing systems are another area where care home patients and pharmacy stakeholders gain as they are able to be procured in a more efficient way hence cutting down the amount of time taken to attend to patients and pharmacy personnel. Ogundipe, Sim and Emmerton (2023) idealised that, EPS can be seen to be more convenient and flexible from the patient's point of view. It is easier for repeat prescriptions to be controlled and patients no longer need to attend their GP for a paper prescription. This is advantageous mainly

for the patients with chronic diseases who need to have continuous supply of their medications.

2.3.2 How the use of EPS affects the accuracy of prescriptions

The adoption of Electronic Prescription Services (EPS) causes a major effect on prescription accuracy since it weighs on a lot of potential blunders correlated to the paper-based systems. In our study, evaluating the effects of EPS on prescription accuracy to distinguish a decrease in prescription errors, especially concerning manual data entry, illegible handwriting interpretation, and incorrect cross-communication between prescribers and pharmacies. Another important benefit of using EPS is the decrease of prescription errors by a large margin. González-Bueno*et al.* (2022) showed that, electronic prescribing systems can cut prescribing mistakes by 85% compared to handwritten prescriptions. Pillinger*et al.* (2023) also revealed that, the EPS implementation helped in slashing of medication errors by 43 especially where complex dosing was involved or use of risky medications.

The most common mistakes made by the doctors include poor prescription writing, unclear dosage information, or use of wrong abbreviations. In EPS, such risks are eliminated for the prescriptions are transmitted electronically with standard format hence avoiding blurred information. Mallhiet al. (2020) commented that, it also has several operational checks to notify the prescribers with matters which could include the likeliness of a particular drug to cause an interaction with other drugs, or if the dosage is wrong, hence better accuracy. This is because, in standard systems, there is often manual entry of prescriptions which is another common root cause of prescription errors. These errors may manifest at some point of prescription, such as when the prescribing healthcare provider generates the prescription or at the time when the pharmacists input the data in their database. EPS thereby reduces these manual entry points because prescribers' systems transfer the information directly to the pharmacy system. According to Abdel-Qader*et al.* (2020), it can be concluded that it map an electronic prescribing system reduced the manual entries error by 66% thus enhancing the probability of accurate and safer ordering of drugs. EPS also help in minimizing some of the common prescriptive mistakes, more so; When prescriptions are handwritten there is usually some ambiguity that can lead to some mistakes in dispensing of drugs. For example, Bruthans(2020) reported that, between 5% to 15% of

prescriptions written by hand had errors because of ambiguous instructions. EPS does this wonderfully since it normalizes the communication of prescriptions. Prescription is sent to pharmacists as a typed and well-structured message, making confusion and misunderstanding of dosage impossible, therefore, patients get the right dosage of the required medicine.

The cumulative effect that EPS has on medication safety is therefore very significant. Through the elimination of mistakes, EPS offers the opportunity to improve the situation for the patients. Research in American Journal of Health-System Pharmacy proved that prescriptions that were in electronic format eradicated the prevalence of ADE by half. The patient also benefits from this because they are not often readmitted to the hospital, thereby enhancing the general quality of healthcare services.

2.3.3 The satisfaction levels of pharmacists who utilize EPS

The level of satisfaction that has been identified among the pharmacists who are using the EPS is high this is due to different reasons including the ease of using the application, its reliability and the quality of the support offered. Watcharapinchaiet al. (2022) ascertained that, when evaluating these aspects, it can be stated that EPS has a number of characteristics that can be beneficial in creating a favourable users' experience while the existent shortcomings should not be overlooked. These factors can help in future improvements of the system to ensure that more universities in the country embrace the system.

It may be therefore worth stating that pharmacists find EPS to be user friendly as it enhances the prescription dispensing process. Similar results were obtained in study conducted by Tobaiqy*et al.* (2023), in the UK whereby over 70% of the respondents observed that the use of EPS was easy to adopt and had enhanced efficiency in their working. The pharmacists can get the prescription information in the digital format for easy and fast way of accessing and verifying them we do not spend much time trying to understand what has been written by hands and reduce cases of manually entry of data. According to pharmacists, EPS is time saving and decreases the possibilities of making mistakes, and therefore a helpful tool in working with. In addition to that, Hashmi*et al.* (2021) mentioned that, another contributory to high satisfaction levels is ease of use due to an ergonomic design of the software for EPS. Some of the JMSs possess features such as auto updates, self-checking option, and compatibility with the current pharmacy

MIS. They enhance the many operations that ease the work of a pharmacist and reduce the time spent performing routine tasks.

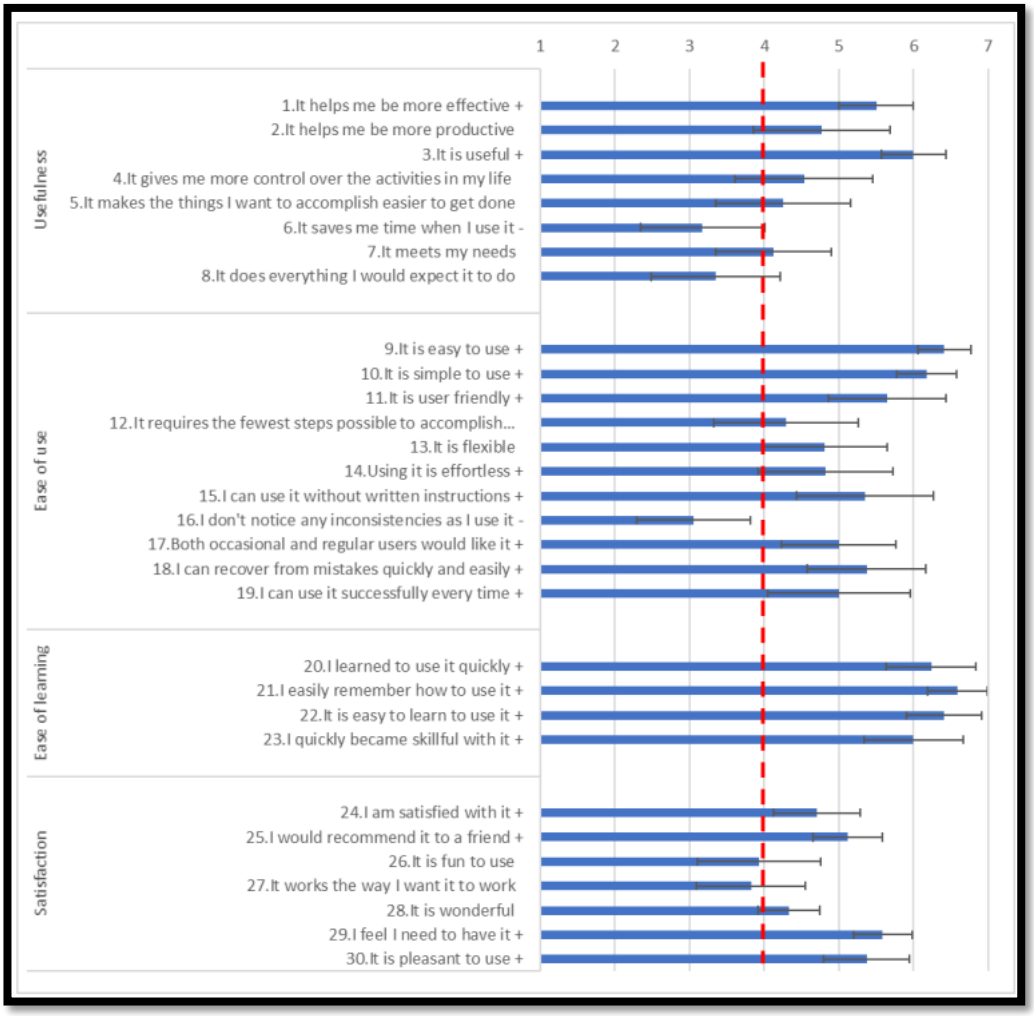


Figure 2: The pharmacists' perceptions of usability

(Source: Marcilly*et al.,* 2023)

The current research established satisfaction with EPS by pharmacists and this encompasses reliability. Regarding the EPS, pharmacists by and large affirm that it is a trust-worthy systems that irons out the transfer of prescriptions from healthcare providers to a pharmacy accurately and rapidly. Tobaiqy*et al.* (2023) reported that 82% of pharmacists interviewed believed that EPS had made the risk of lost prescriptions more manageable and enhanced the efficient and precise dispensing of medicines. The decline in prescription errors that could be attributed to the dependability of the EPS system remains a factor that enhances one's experiences. Sometimes, problems might be encountered with system-discordant downtimes or occasional delayed receipt of

electronic prescriptions. Almaghaslah*et al.* (2022) pointed out that, about 10% of pharmacist have experienced interruption because of some technical problems related to EPS but they were very rare.

Another factor determining pharmacists' satisfaction levels is the quality of support given to EPS, EPS being the standing for electronic prescription services. Tobaiqy*et al.* (2023) idealised that, the majority of pharmacists expressed no significant problem in dealing with technical support when experiencing difficulties concerning EPS: in particular, 75% perceived that they had received timely and efficient support. Online training materials, help desks, and other software support aids supplement the program making the overall user experience even more delightful. However, some of the participants claimed that EPS has been effective in removing some prescription errors, but some pharmacists want EPS to provide more individual attention especially at the onset of the system. This way, it may be possible to offset many of the frustrations that pharmacists may have during implementation and enhance the spread of the system.

2.3.4 The primary obstacles and difficulties pharmacists encounter when implementing and using EPS

Several challenges and barriers arise and make it difficult for pharmacists to implement and use the Electronic Prescription Service (EPS). Some of these challenges include the technical difficulties, resistance to change, and inadequate training as some of the factors that limit the efficient implementation of EPS.

Technical issues

These include technical factors that are considered to be major challenges to efficiency of implementation of EPS. Challenges that range from system downtimes, slow connection, and software malfunctions will hamper the dispensing and in effect, affect patient care delivery. Fung*et al.* (2020) identified that, 15% of the pharmacists claimed that they witnessed frequent technical issues while using EPS; it is even more frequently noted in crowded hours. Such problems can be frustrating and may make users not to perceive the system as reliable.

Resistance to change

Lack of willingness to change is also a challenge that pharmacists encounter on their way to EPS implementation. There are often distinct discomforts associated with change for some pharmacists especially those whose practice has been developed using traditional paper-based methods. Fears of complexifies in the digital networks and the perceived disruption of conventional working practice that EPS brings can reduce the appetite for embracing it. Hareem*et al.* (2023) revealed that 1040 pharmacists are reluctant to make the final shift to EPS owing to concerns relating to the steep learning curve that is required in making such transitions.

Lack of training

Lack of training is another factor that is clear; employees are not taken through the right processes to enable them effectively and efficiently implement the sought change. Lack of adequate training to use EPS may make the pharmacists working in such outlets ineffectual in their operation of the system hence making it ineffective. Hays*et al.* (2020) mentioned that, it was determined that 30% of pharmacists stated they received inadequate training during EPS implementation, though having significant effects on their confidence and their efficiency of using the EPS system.

2.3.5 The enhancements in workflow efficiency that result from using EPS

EPS proves highly beneficial in organisational improvement in terms of prescription workflows within the settings, reflected in technical aspects such as the duration of prescription processing and mean patient waiting for prescriptions. Fung*et al.* (2020) mentioned that, in prescribers' offices, EPS also electronically sends prescriptions from prescribers' offices to pharmacies to save time on manual entry and to check handwritten scripts.

Prescription Processing Times

Research shows that EPS may even cut prescription processing time by up to 30%. In research done by Osmani*et al.* (2023), they found that pharmacists who implemented EPS could handle prescription orders at a faster rate of 25% compared to systems implemented on paper. This acceleration is because of the system's predesigned capability of receiving and verifying prescriptions in real-time and enable the pharmacists to start dispensing specified medication within a short-time.

Patient Waiting Times

In the same manner, patient waiting time is also improved according to the degree of EPS. In prescribing the drugs, EPS has helped ministers the time that patients spend in the various pharmacies waiting for their drugs to be dispensed. Based on a study by Hung*et al.* (2021), it was found that patient waiting time reduced by 20 percent for those pharmacies that implemented EPS to the fullest. Not only does it enhance the satisfaction level of the customers but it also gives the pharmacy more capability of attending to many clients within a specific time.

Josendal and Bergmo(2021) opined that, implementing of EPS makes this process more effective, for example, decreases in prescription processing and patient waiting time increases productivity and comforts patient, again such pros evidence the pragmatic values of this system.

2.3.6 Theoretical Underpinning

Technology Acceptance Model

The Technology Acceptance Model (TAM) suggests that pharmacists' acceptance and effective use of EPS depend on two key factors: these two factors are known as perceived usefulness and perceived ease of use. Again, if pharmacists are convinced that EPS will make their work quicker or easier to accomplish, and is not burdensome in terms of implementation, then this commonality will induce them to adopt EPS and incorporate it into their work (Mogaji*et al.,* 2024). TAM contributes to understanding how favourable M/E of EPS translates to higher satisfaction and hence, utilisation in the pharmacy industry.

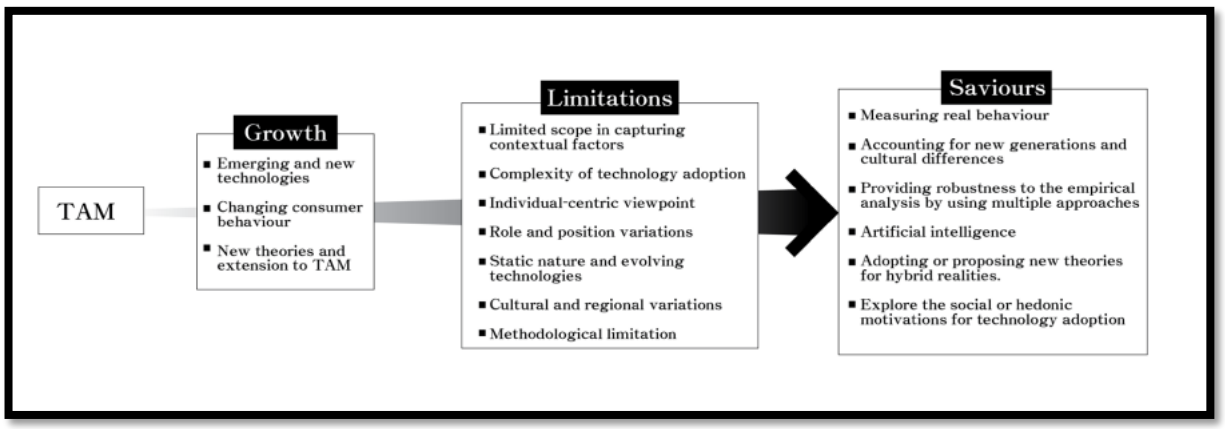


Figure 3: Technology Acceptance Model

(Source: Mogaji*et al.,* 2024)

Diffusion of Innovation Theory

According to the Diffusion of Innovations Theory, the adoption of EPS can be said to have gone through the process of diffusion whereby earlier users encourage others to adopt the system (Turin*et al.,* 2023). To this theory, the success of implementation of EPS will depend with the reception made by the members of the pharmacy community. Overcoming of resistance and other issues like training and technical support are other important factor for widespread diffusion and sustainability.

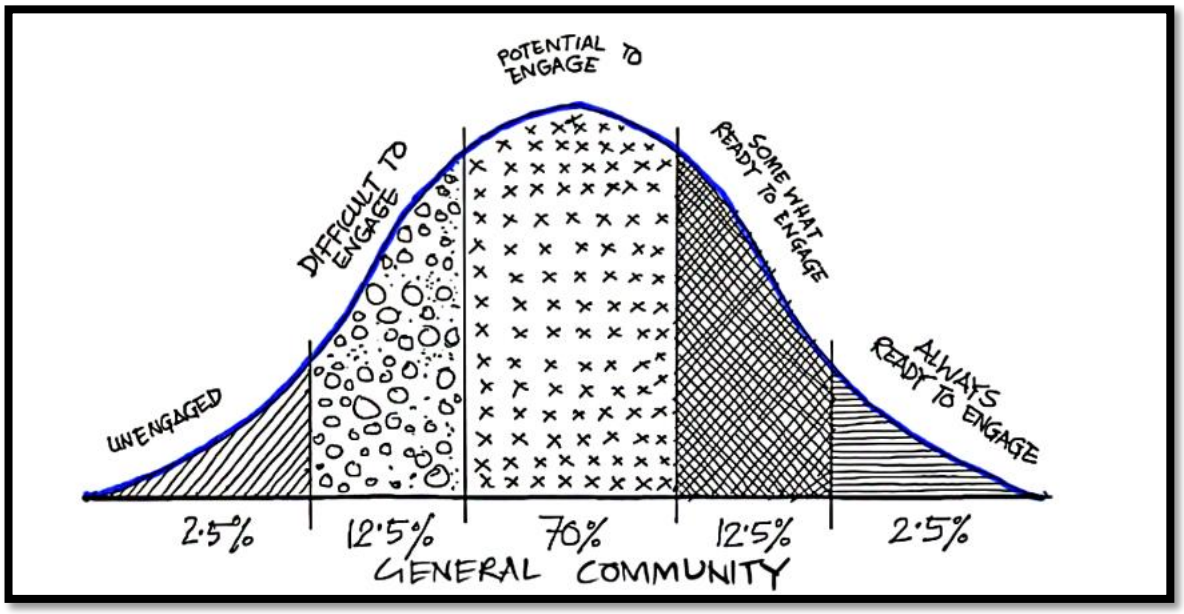


Figure 4: Diffusion of Innovation Theory

(Source: Turin*et al.,* 2023)

2.3.7 Literature Gap

EPS has been covered in the literature mainly in terms of its technical concern like the reduction of prescription errors and improvement in the process of prescription. Nevertheless, there is a relative scarcity of studies investigating people factors that underpin the uptake and utilisation of the technology in pharmacies (Williams *et al.,* 2022). Namely, studies in the extant literature are deficient in comprehensiveness of pharmacists' attitude regarding EPS, their level of satisfaction and the issues they

encounter throughout the process of implementation of such system (Hareem*et al.,* 2023). Whereas, several technical factors are reported in the literature, the impact of factors such as resistance to change, adequacy of training and extent of support required for successful implementation of EPS remain relatively untearable in the literature. Moreover, there are only a few studies which explore the sustainable effects of EPS on patients' outcome apart from the increase in efficiency (Hareem*et al.,* 2024). These human aspects are important to unravel to craft effective strategies on how to improve the uptake and use of the EPS to the extent that it optimally transforms the functioning of pharmacies and patient care.

2.3.8 Conceptual Framework

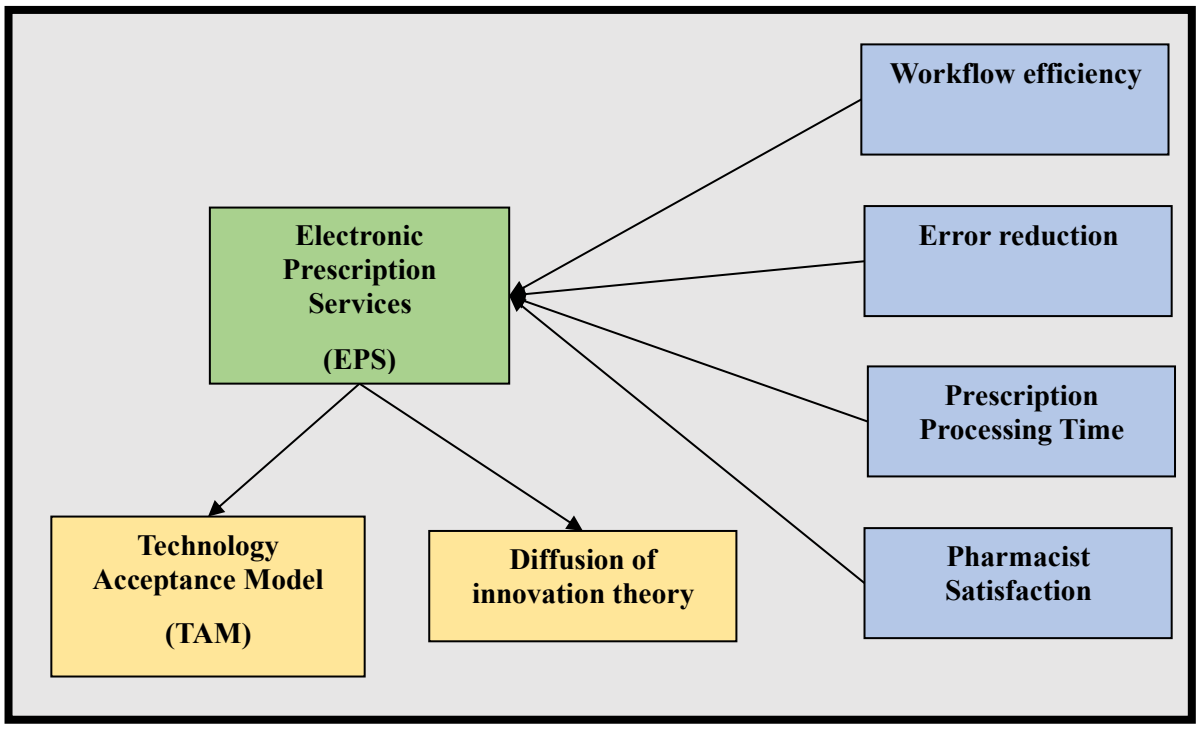


Figure 5: The Conceptual Framework

(Source: Created by the researcher)

2.4 Summary

From the EPS research, this paper elicits the findings of how EPS has helped in eradicating prescription mistakes while at the same time enhancing the functionality of the pharmacies. Yet about the human part of the equation, there is more ignorance regarding factors influencing the adoption, including resistance, training. These gaps

can be filled to improve on the use of EPS and the effectiveness with which it improves the care of patients.

3. METHODOLOGY

3.1 Introduction

This research is focused on evaluating the impacts of electronic prescription services on workflow efficiencies in community pharmacies. This is country-specific research and the country of focus is Ireland and more specifically Dublin has been emphasised in this research. In the previous chapters fundamental targets of this research are presented along with a brief review of existing literature on this topic. This approach develops a knowledge base regarding the research topic, which helps researchers to proceed further with this research. In this chapter, methodological approaches, used in this research are described along with justifications for choosing those approaches for this research.

3.2 Research onion

This research methodology has been developed by using Saunders research onion. This is a model widely used for the development of research methodology. This model provides a systematic approach to develop an effective methodological approach. There are seven main layers within the research onion and those are "1) research philosophy 2) research approaches 3) approaches to theory development; 4) research strategy; 5) methodological choice; 6) time horizons; 7) techniques and procedures" (Pandey and Pandey, 2021). In the beginning of a research, researchers decide the most suitable approaches depending on the research type and topic. Figure 3.4.1 presents the research onion developed by Saunders and the entire methodological approach of this research has been developed by following this model.

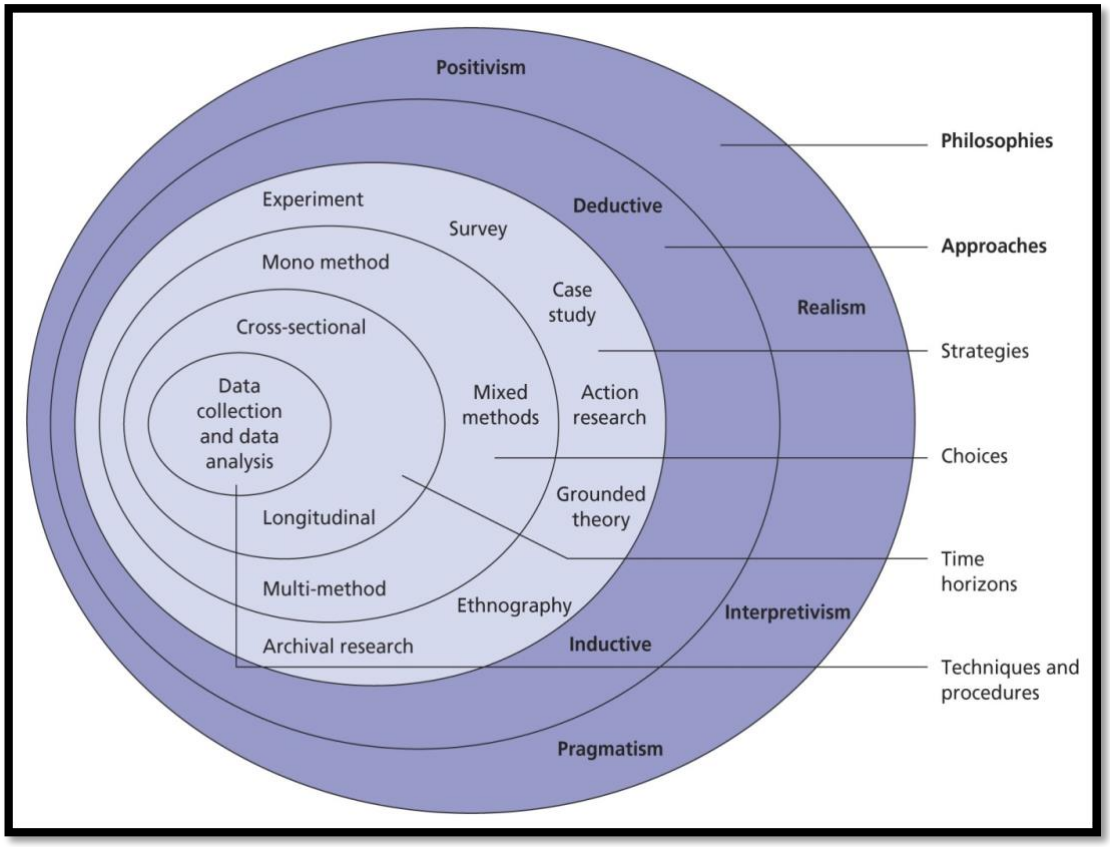


Figure 6: Research onion

(Source: Lê and Schmid, 2022)

3.3 Research philosophy

Research philosophy is the set of principles, assumptions and beliefs to guide the entire research process and the researchers. In other words, research philosophy is the set of beliefs regarding the research pathway through which the research can be contacted successfully. There are mainly four types of research philosophies and those are "positivist research philosophy, interpretivist research philosophy, pragmatism research philosophy, and realistic research philosophy" and those approaches should be described briefly to understand the reason behind the choice of the most suitable research philosophy for this research (Clark *et al.*, 2021). Positivism research philosophy is about understanding the social world in an objective way and here researchers behave as objective analysts. On the other hand, interpretivism research philosophy possesses a different idea. It states that the social world and its issues should be viewed in subjective ways. Pragmatism research philosophy is about dealing with the fact. As per this idea, research philosophy should be decided depending on the research topic. Most

importantly, practical results are considered important in this research. Next, the concept of realistic research philosophy is the combination of positivism and interpretivism research philosophies (Vaughn and Jacquez, 2020).

Now, in this research pragmatism research philosophy has been used. Now, this is a country-specific research and here the country of focus is Ireland and more specifically the city Dublin has been focused in this research. The aim of this research is to evaluate the impacts of electronic prescription services on workflow efficiencies in local community pharmacies. This means the research focuses on a real-time social aspect which requires a realistic research approach and that is the main reason behind choosing this research philosophy for this research. This research philosophy helps to focus on the real-world implications of e-prescribing adoption. Apart from that, the research philosophy helps in "evaluating prescription accuracy, analysing pharmacist satisfaction, identifying associated barriers and challenges, and measuring workflow efficiency" (Busetto, Wick and Gumbinger, 2020). Overall, pragmatism helps in evaluating the actual efficiency of e-prescribing services along with analysing pharmacist satisfaction, user interface design, perceived benefits of the process, technological, organisational, and regulatory challenges. Overall, the choice of this research philosophy helps to fulfil the objectives of this research.

3.4 Research approach

Research approach is about choosing the most suitable approaches for collection, analysis, and interpretation of data. There are mainly two research approaches and those are Inductive research approach and Deductive research approach. Inductive research approach is about starting from gathering data from different sources and then developing theories, patterns, and hypotheses from those collected patterns (Hendren *et al.,* 2023). On the other hand, deductive research approach is about analysing and validating collected data by using standard theories and frameworks. Among these two research approaches, for this research Inductive research approach has been chosen because of the alignment of the concept with the research topic. It is already discussed that the aim of the research is to evaluate the impacts of electronic prescription services on workflow efficiencies in local community pharmacies and this research requires real-time data (Islam and Aldaihani, 2022). By using inductive research approach hypotheses can be developed from collected datasets and those ideas can be implemented in practical fields.

3.5 Research strategy

Research strategy is about the plan, researchers develop before beginning the research to conduct it on schedule and as per research objectives. As per Saunders research onion there are different research strategies to conduct successful research and those include experiments, surveys, focusing on case studies, archival research, ethnography and others (Dawadi, Shrestha and Giri, 2021). This particular research has been conducted by using surveys. Surveys are usually conducted by involving close-ended questions provided with options and this technique helps in collecting real-time data within short spans. Other research strategies including case studies, archival research, ethnography are mostly suitable for research projects that are conducted through a secondary data collection process. For primary data collection, surveys and interviews are the majorly used approaches. Among these techniques, surveys are more cost-effective, simpler and take less time compared to interviews and these are the reasons behind choosing surveys over interviews (Cui *et al.,* 2023).

3.6 Research method

It should be kept in mind that the main aim of this research is to evaluate the impacts of electronic prescription services on workflow efficiencies in community pharmacies of Dublin, Ireland. It is already discussed that the research is focused on some important social aspects including pharmacist satisfaction, challenges in using the digital system, measuring workflow efficiencies and others. Now, in the context of research methods it must be discussed that there are mainly three types of research methods and those are mono method, mixed method and multi method. The Mono method is about using a single technique for answering research questions (Sardana *et al.,* 2023). The mixed method of research is about answering research questions by using both quantitative and qualitative techniques. The multi method of research is about involving multiple methods to answer the research questions of a single research. This research has been conducted by following a mono method and surveys are conducted for primary data collection. The Mono method has been used to avoid complications because in the other two methods there are much more complications because of the presence of multiple approaches (Dehalwar and Sharma, 2023). This research topic already involves components like the use of modern technologies, public health, healthcare workforce and others. Public health requires

effective solutions through this research and that is why, the mono method has been used to avoid complications and obtain accurate results.

Apart from that, research methods can be divided into two other categories and those are qualitative and quantitative methods. The former one is concerned about proceeding through non-numerical approaches while the later one deals with numeric and reaching the results. This research has been conducted by using a quantitative approach (Dubey and Kothari, 2022). This approach deals with numeric and statistical data sets and is considered to be more efficient to present accurate results. In later sections data collection process and data analysis processes are discussed in further details.

3.7 Data collection process

It is already discussed that a primary data collection process is used in this research and more specifically surveys are used. As per the research topic primary data collection is required because the research topic is certainly unexplored and that is why, involving stakeholders directly is necessary for the research (Coe *et al.,* 2021). Before discussing the data collection process in detail, the sampling process should be discussed first. Some pharmacies from Dublin's community pharmacies are chosen to represent the category within this research. In this case, a random sampling method has been used. Random sampling is about choosing participants for research who can be the representatives of the entire community (Kara *et al.,* 2021). This approach helps to obtain accurate results validated for all the stakeholders of the community. After selecting participants, an online survey has been conducted.

Online surveys provide flexibility to the participants to answer those questions as per their conveniences. Five close-ended questions were sent to those participants and they were instructed to revert those questionnaires after answering. Reminders were sent to individuals to ensure maximum participation. Apart from that, researchers individually communicated with the participants to ensure that all of them understood those questions properly (Sardana *et al.,* 2023). However, in surveys there are possibilities of inaccurate data collection because of lack of understanding and the only scope of answering through given options. Researchers of this research have taken active measures to eliminate those shortcomings. In this context, it should be noted that data collection is an important part of research because, depending on collected data, results of the research are concluded (Dawadi, Shrestha and Giri, 2021). The results of this research provide strong insights on

the impacts of e-prescribing services on workflow efficiencies and the readiness of Dublin to adopt e-prescribing services.

3.8 Data analysis technique

This research has been conducted through a primary data collection process and a quantitative research approach. In the previous section, it is shown that primary data sets were successfully collected from participants and were analyzed in a quantitative manner. An overall quantitative approach has been employed, with the data analysis conducted using specific statistical methods in the JASP software.

The data analysis began with a data cleaning process to ensure accuracy by examining “missing values, outliers, and inconsistencies” (Dawadi, Shrestha, and Giri, 2021). Following this, the responses were coded for effective quantitative analysis. Graphical methods, such as bar charts, and pie charts were employed to visualize the distribution of data, trends, and relationships among variables. For inferential statistical analysis, a Chi-square test was utilized to identify relationships between categorical variables related to the system of e-prescribing adoption (Busetto, Wick, and Gumbinger, 2020). Additionally, the Kendall's Tau test was used to measure the strength and direction of the association between ordinal variables, providing further insight into correlations within the dataset.

The purpose of using these statistical and graphical methods was to obtain accurate, visually interpretable results that contribute to understanding the factors influencing e-prescribing adoption. The findings derived from these analyses are presented in the next chapter, with results shown through summary tables, graphs, and narrative summaries (Busetto, Wick, and Gumbinger, 2020). These results highlight limitations in providing effective services through e-prescribing systems and its impact on pharmacy workflows. The methodology was designed and implemented effectively, leading to reliable and valid results from this research.

3.9 Ethical considerations of this research methodology

This research has been conducted through a primary data collection process and the process itself should maintain some ethical considerations. Apart from that, collected datasets are analysed through the thematic analysis technique which also entails some shortcomings and requires some ethical principles to maintain. Firstly, before selection

of the participants they should be completely informed about the entire research process, its objectives and their roles in this research (Cui *et al.*, 2023). Next, after selection of those participants in the research process participants should be asked to submit consent letters showing their agreement towards participating in this research. These two steps are important to conduct a primary data collection process providing complete flexibility to the participants. In general, in primary data collection maintaining confidentiality is a matter of concern. Identity of the participants who have participated in this research should not be disclosed throughout the research and after the research also (Hendren *et al.*, 2023). Along with that, the responses of those participants should also be kept confidential.

Apart from that, researchers of this research have ensured that participants remain completely informed about all steps of research throughout the process. Besides, the participants had the flexibility to escape the process in the middle of the research in case of any uncomforting. Overall, the purpose was to provide enough flexibility and safety to the participants during and after the research. Maintaining ethical standards is important to obtain successful, valuable and reliable research (Hendren *et al.*, 2023). Legal complications can be avoided by following this approach and validity of the research increases. Next, thematic analysis technique has been used in this research and in the final step of this analysis researchers need to explain the patterns and data. At this point there is a chance that biassed results are concluded through the research. That is why researchers should remain alert at this stage to obtain accurate results (Busetto, Wick and Gumbinger, 2020). Overall, ethical considerations improve the quality of the research and discussion on those standards increases the reliability of the research.

3.10 Methodological limitation

This research has been conducted through surveys and surveys have some methodological limitations. In surveys participants may face difficulties to understand the questions and their requirements for answers. Besides, in surveys that contain close-ended questions participants face difficulties to express their answers accurately. That is why ambiguous responses can be collected through surveys which may deviate final results from actual ones. As a result, surveys show potential limitations as a process of data collection (Busetto, Wick and Gumbinger, 2020).

3.11 Chapter summary

This chapter contains a detailed discussion on the methodological approaches used to conduct this research. From this discussion readers can understand the pathway of research. Besides, detailed discussion on research methodology especially, ethical considerations and methodological limitations enhance the reliability of the research. In this chapter, different methodological approaches are discussed along with justifications and those guide the readers to align with research objectives. The next chapter contains analysis and results of the research obtained by following these methodological approaches.

4: RESULTS AND FINDINGS

The population of the study is community pharmacist, pharmacy technician, or support staff member working in a community pharmacy in Dublin, Ireland. Working together with neighbourhood pharmacies, a sample of forty-five individuals is discovered. The study's participants voluntarily enrolled, and their signed consent is obtained. Participants are given access to a 25-question online survey that combines an open-ended and LIKERT style. All tests are done at 5% level of significance.

4.1 Demographics

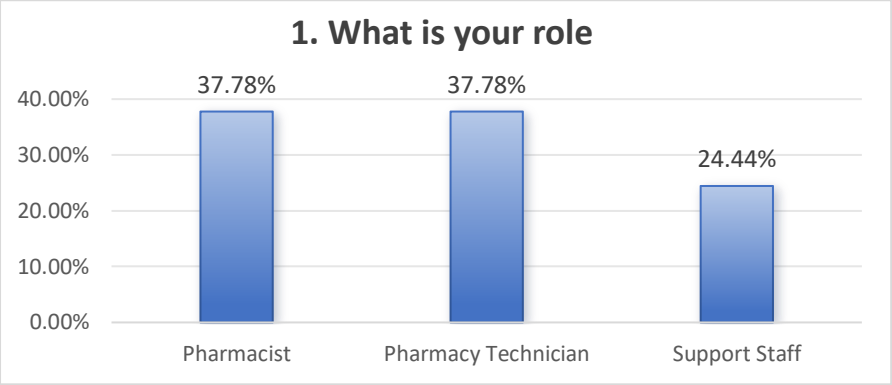


Fig. 7

Among the 45 participants, there are Pharmacists and Pharmacy Technicians 37.78% each. 24.44% of the participants are support staff.

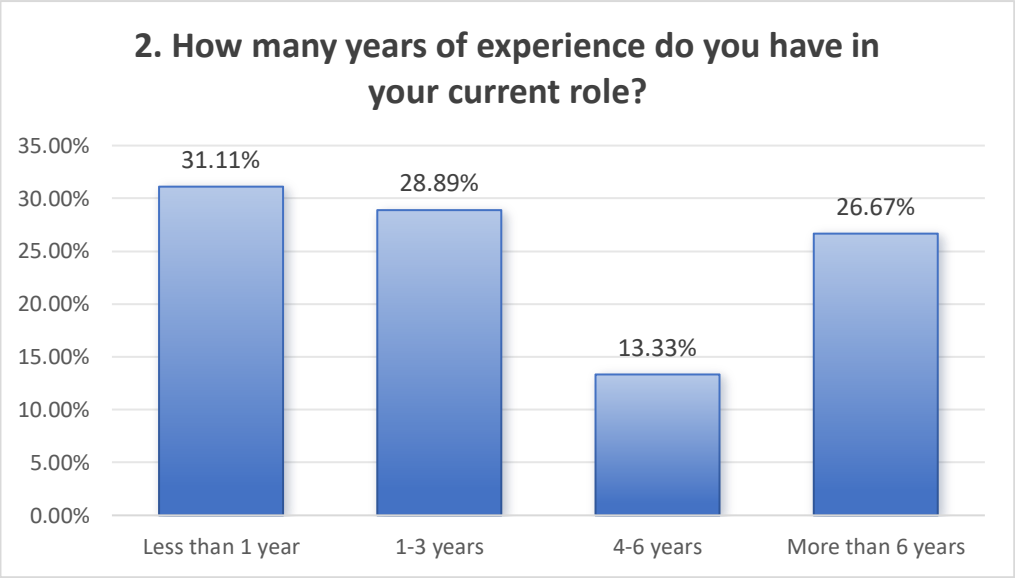


Fig. 8

26.67 % are work in the current role for a span more than 6 years. 31.11% spent less than an year in the current role. 28.89% worked for 1-3 years and 13.33% worked in between 4 and 6years.

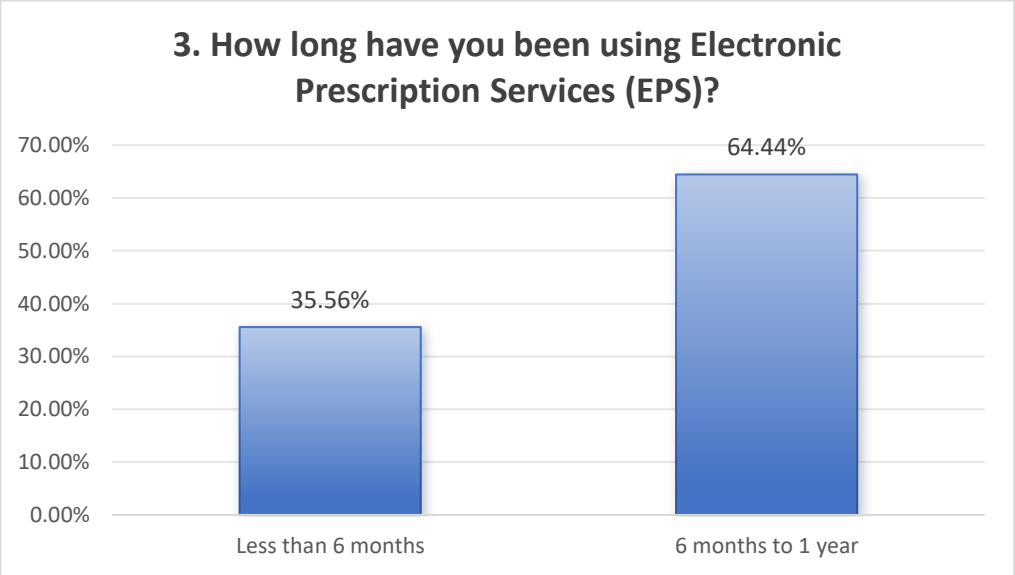


Fig. 9

64.44% of the respondents are using EPS for 6 months to 1 year. The percentage of participants utilising EPS less than 6 months is 35.56%.

4.2 Graphical Analysis

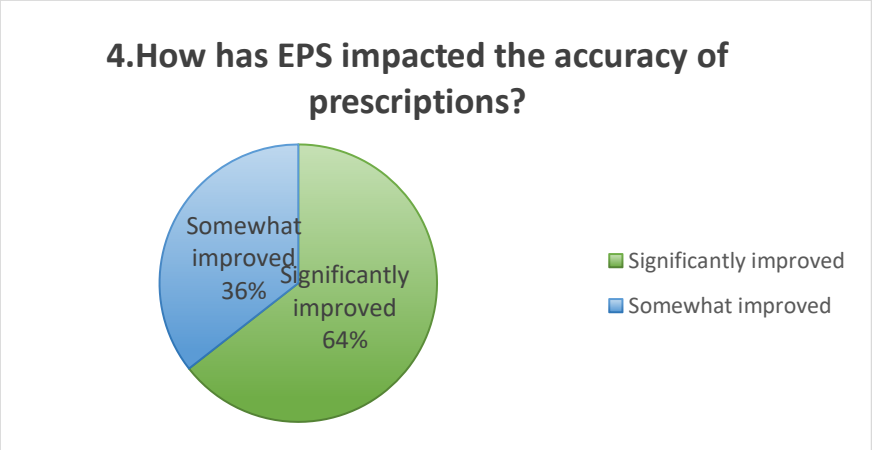


Fig. 10

For question 4, 'How has EPS impacted the accuracy of prescriptions?', all participants responded that it improves the prescription. 64% of the participants agreed that EPS significantly improved the accuracy of the prescription, and 36% of participants agreed that EPS somewhat enhanced the accuracy of the prescription.

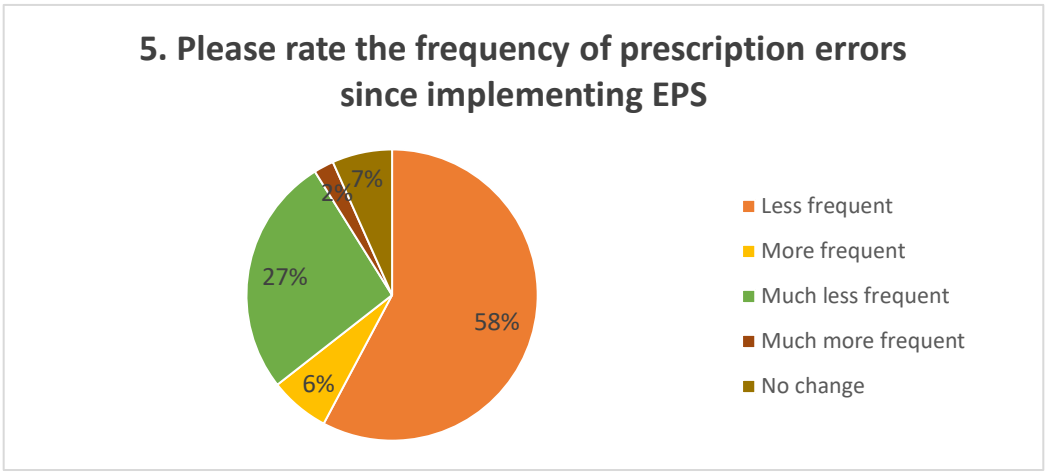


Fig. 11

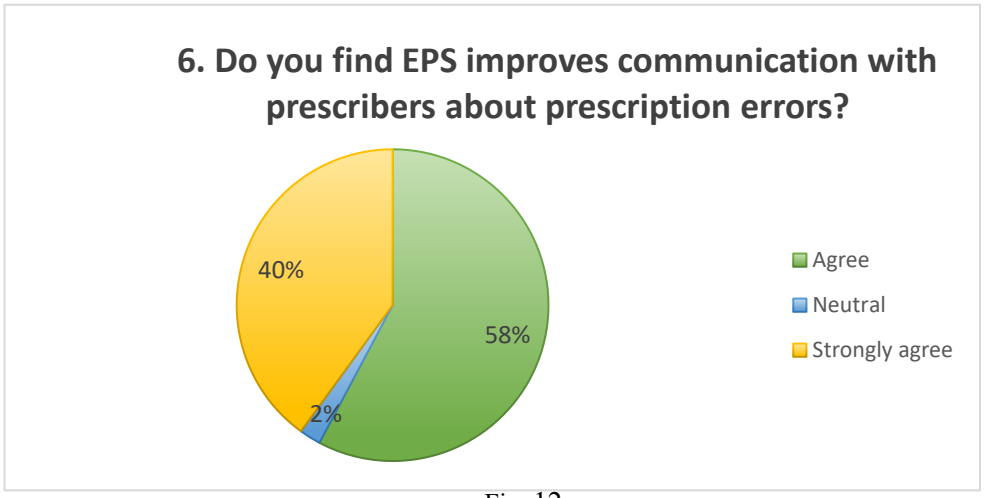
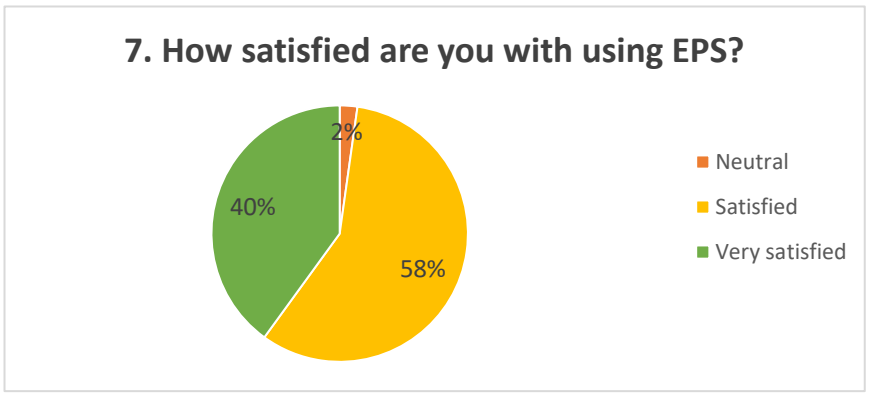


Fig. 12

Fig. 13



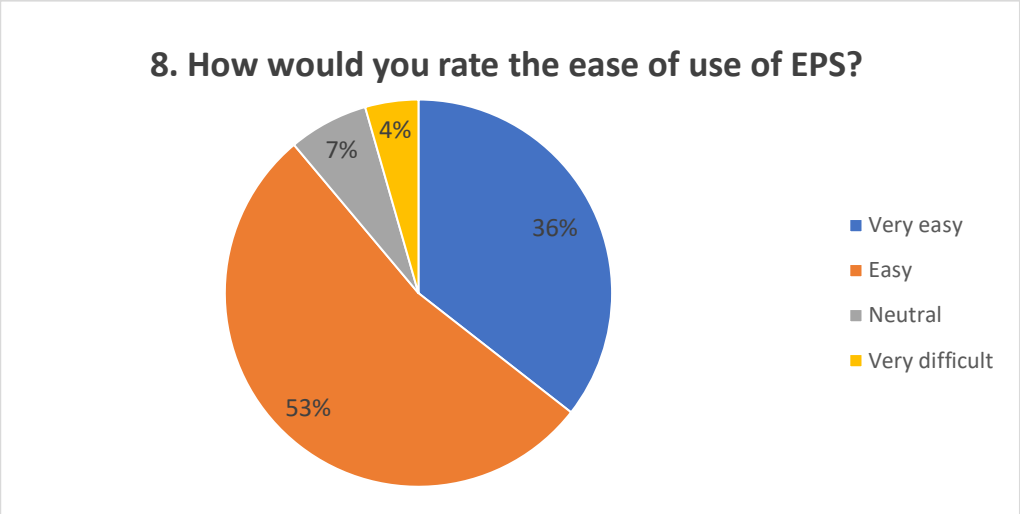


Fig. 14

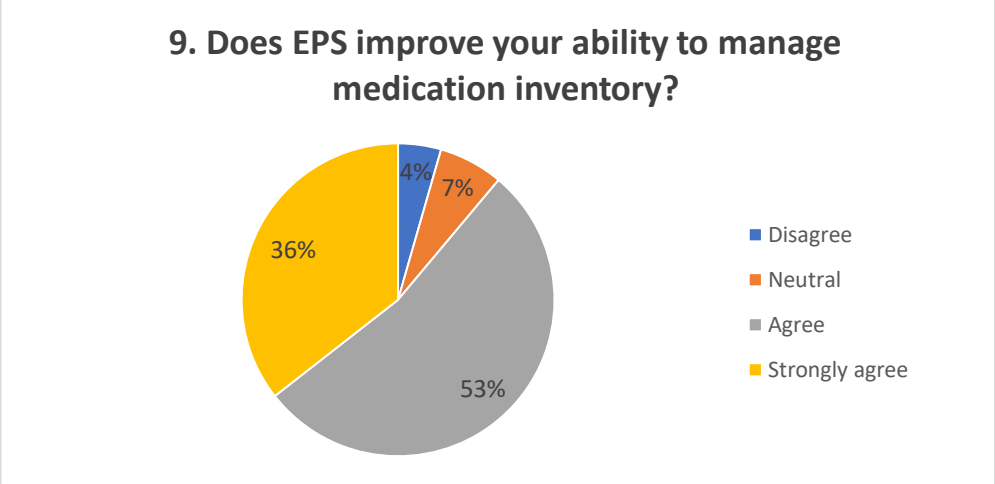
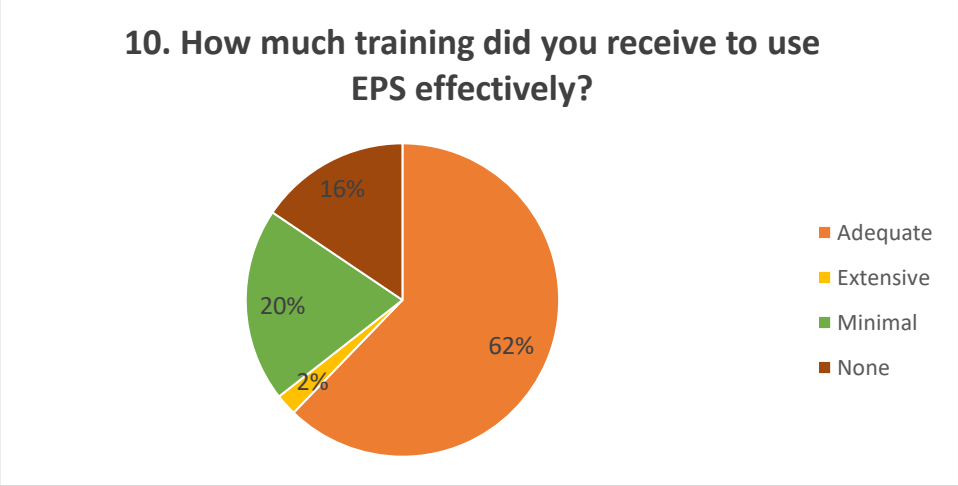


Fig. 15

Fig. 16



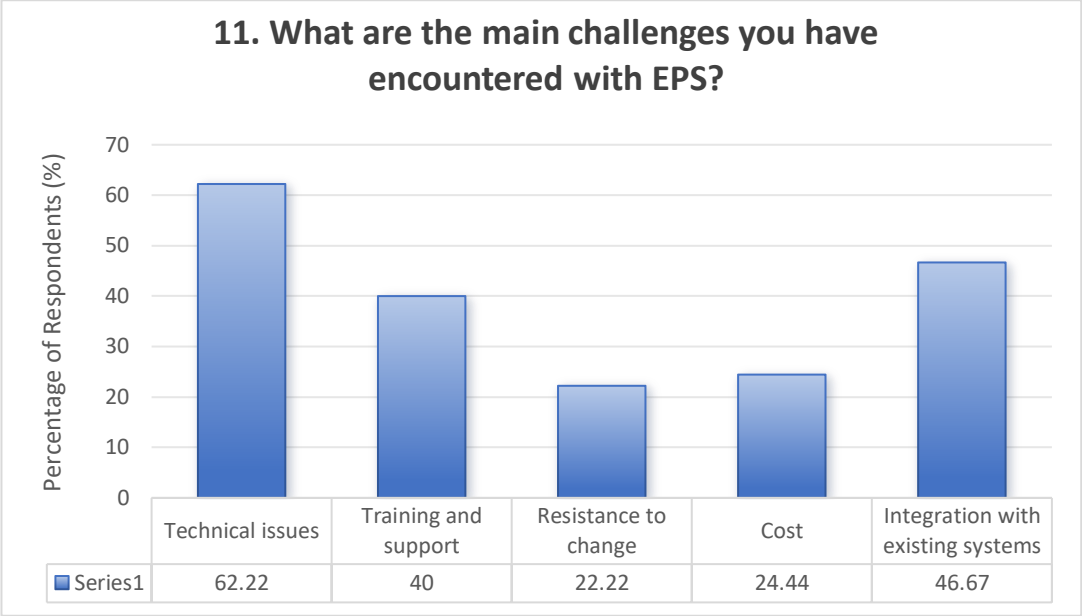

11. What are the main challenges you have encountered with EPS?
Percentage of Respondents (%)
70
60
50
40
30
20
10
0
Technical issues
Training and support
Resistance to change
Cost
Integration with existing systems
Series1
62.22
40
22.22
24.44
46.67

Fig. 17

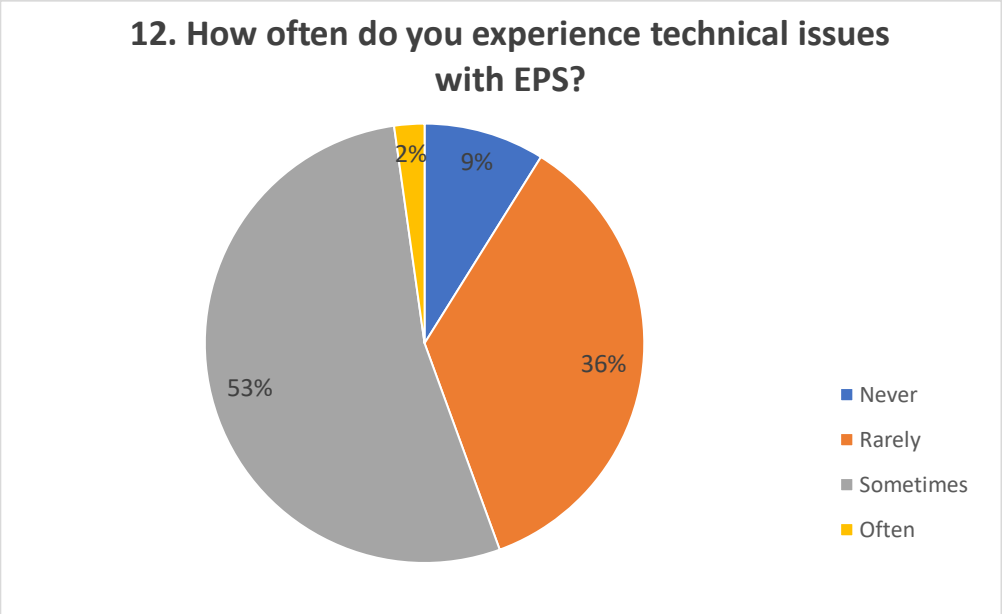

12. How often do you experience technical issues with EPS?
2%
9%
36%
53%
Never
Rarely
Sometimes
Often

Fig. 18

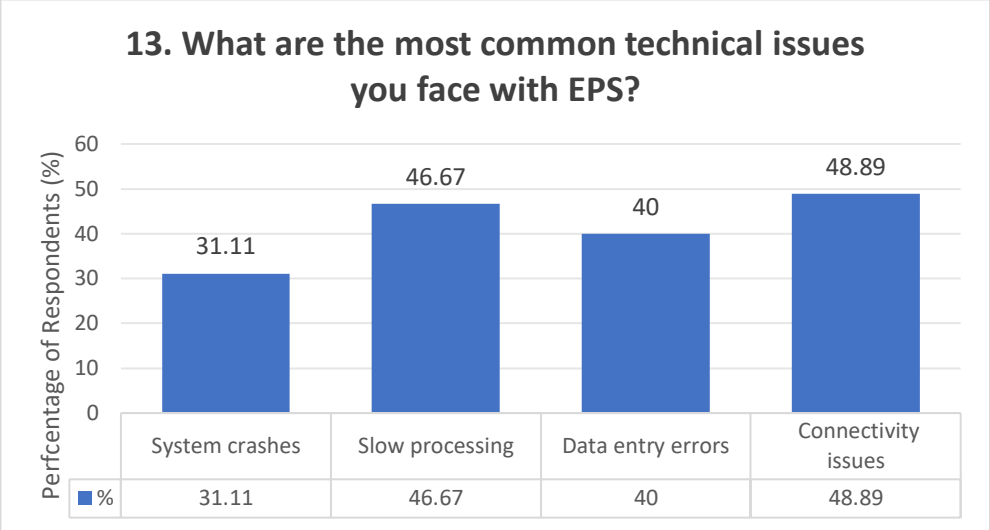

13. What are the most common technical issues you face with EPS?
Perfcentage of Respondents (%)
60
50
40
30
20
10
0
31.11
46.67
40
48.89
System crashes
Slow processing
Data entry errors
Connectivity issues
%
31.11
46.67
40
48.89

Fig. 19

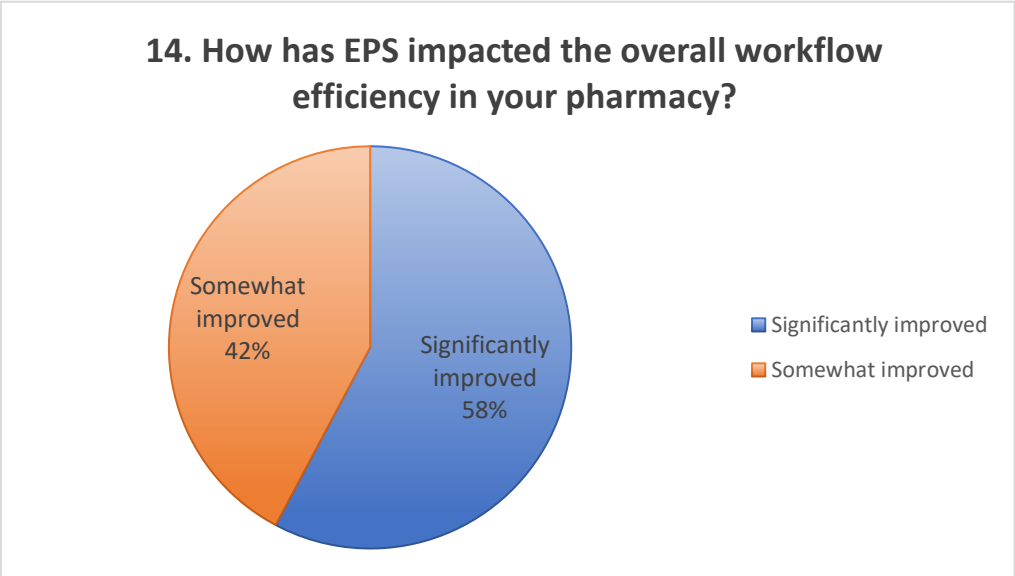

14. How has EPS impacted the overall workflow efficiency in your pharmacy?
Somewhat improved 42%
Significantly improved 58%
Significantly improved
Somewhat improved

Fig. 20

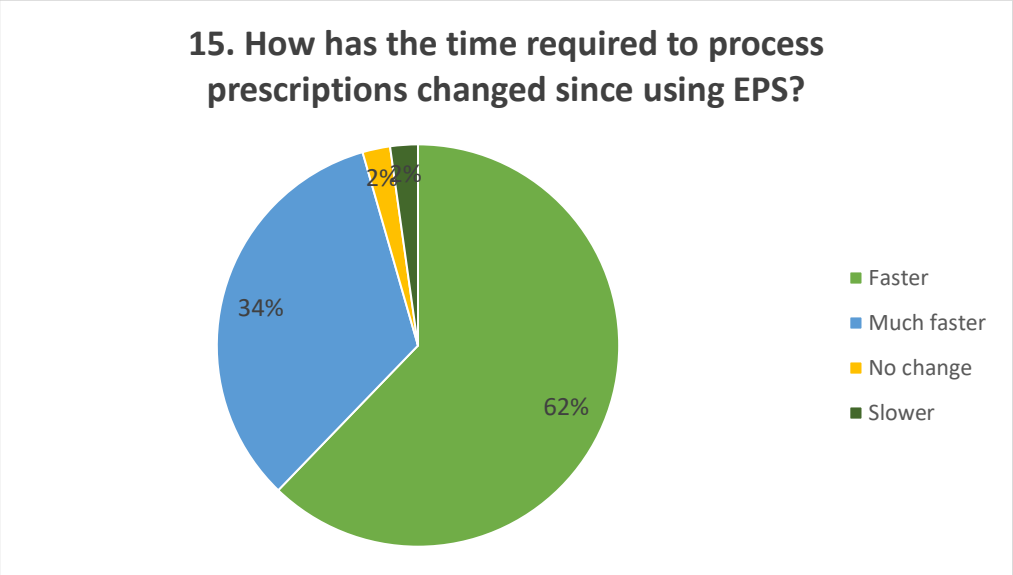


Fig. 21

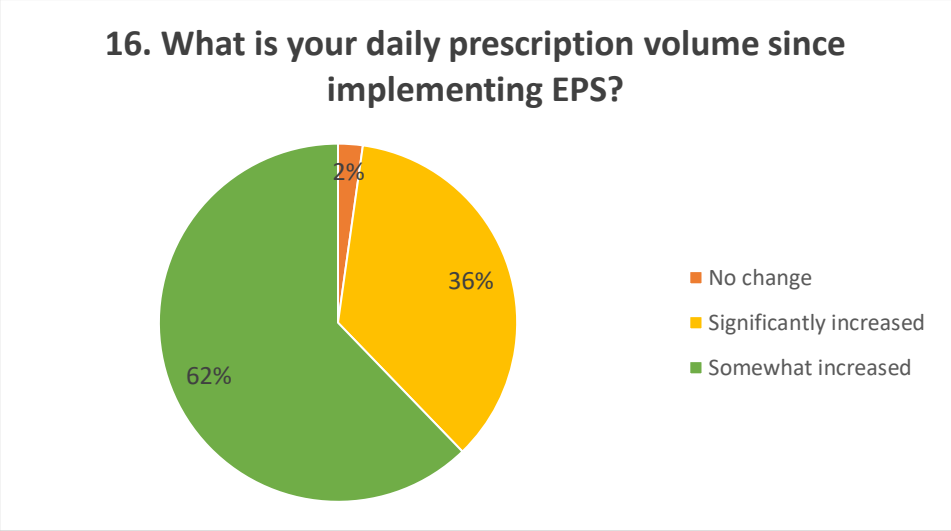


Fig. 22

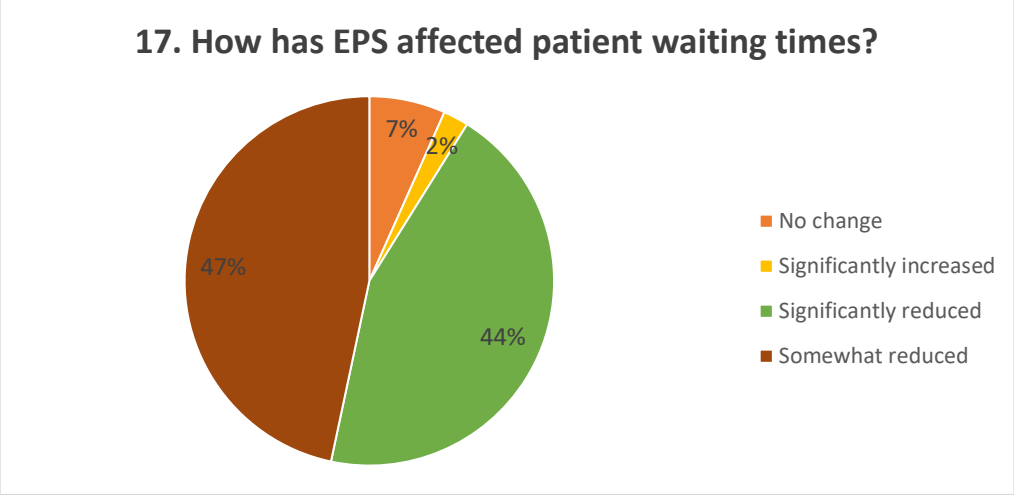


Fig. 23

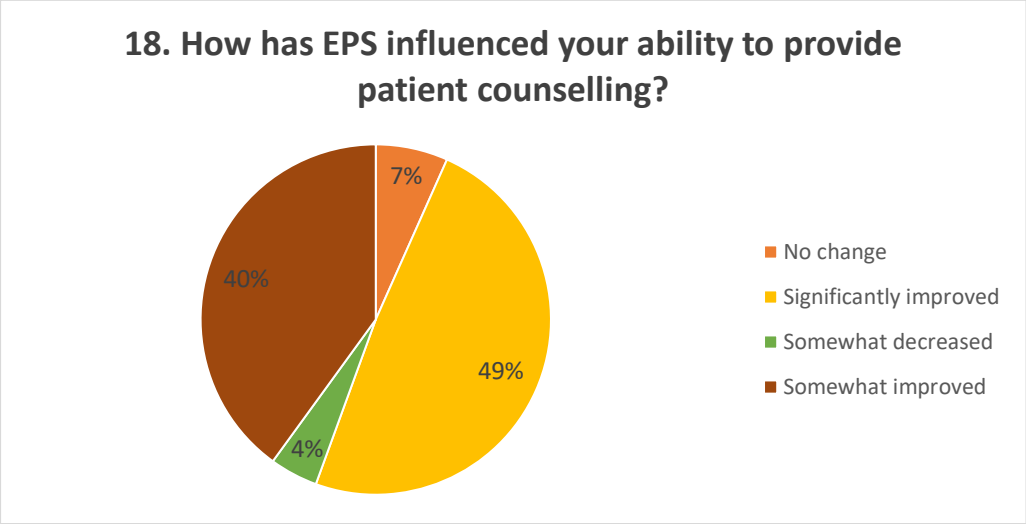


Fig. 24

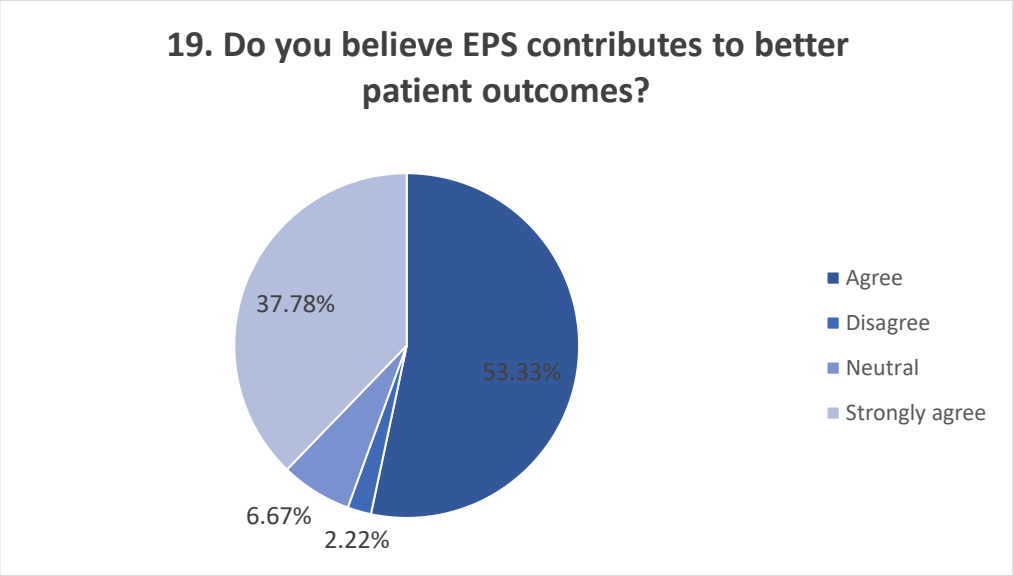
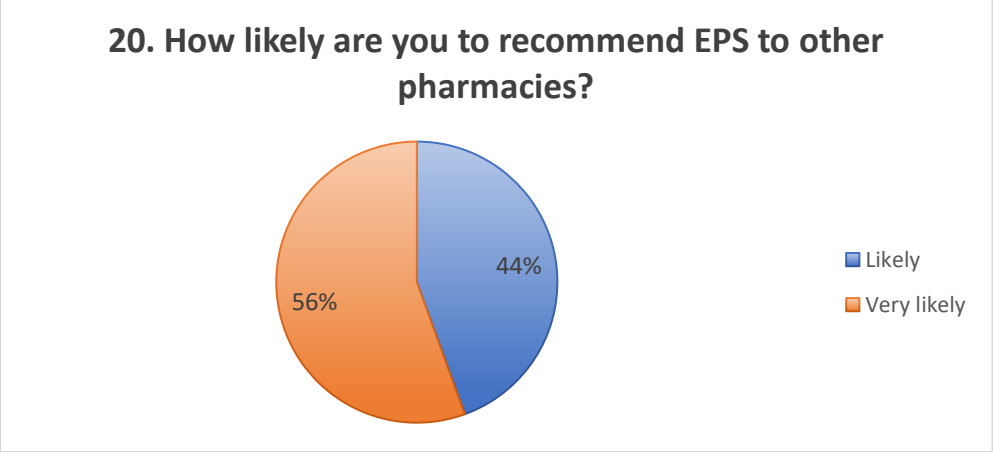


Fig. 25

Fig. 26



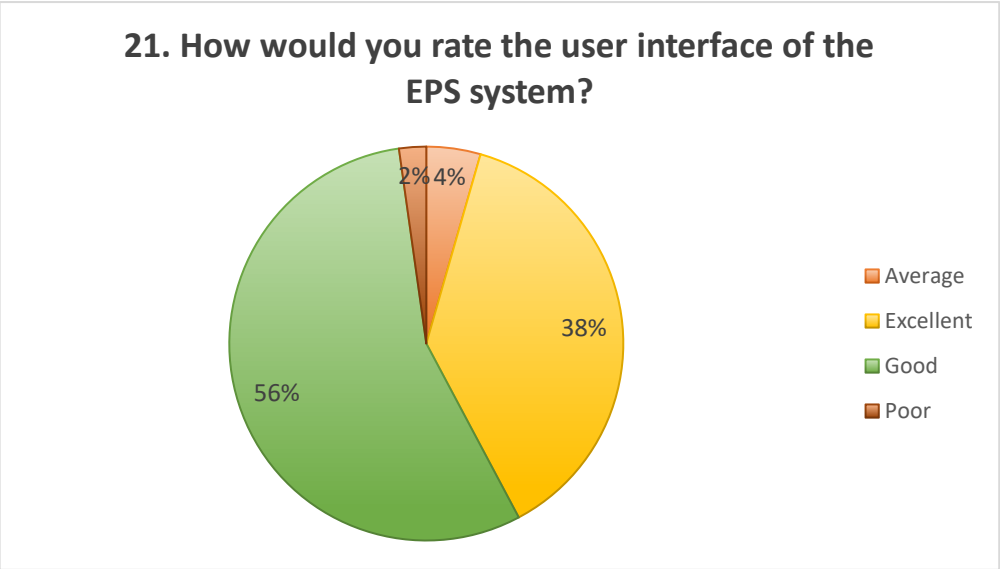

21. How would you rate the user interface of the EPS system?
2%
4%
38%
56%
Average
Excellent
Good
Poor

Fig. 27

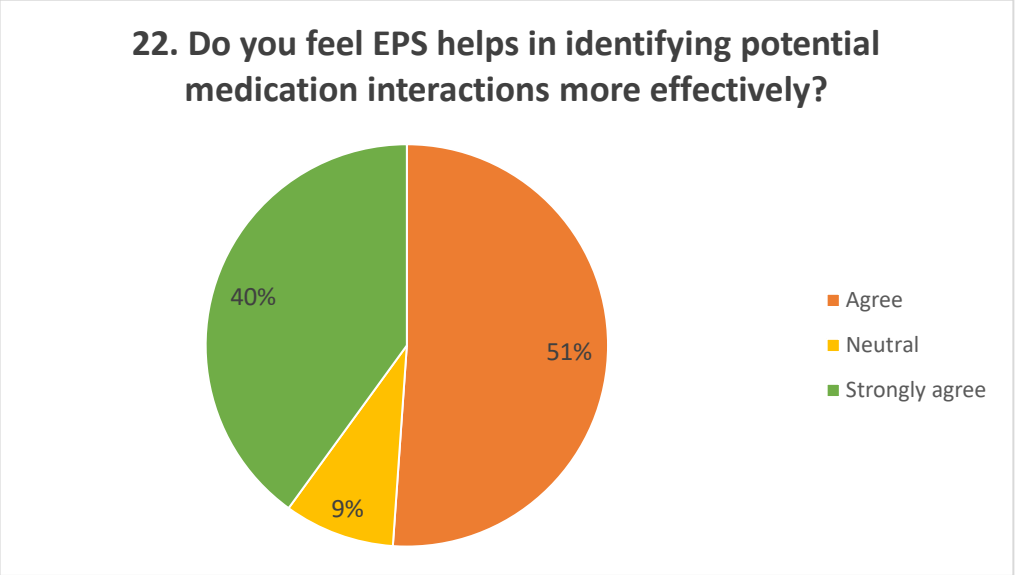

22. Do you feel EPS helps in identifying potential medication interactions more effectively?
40%
51%
9%
Agree
Neutral
Strongly agree

Fig. 28

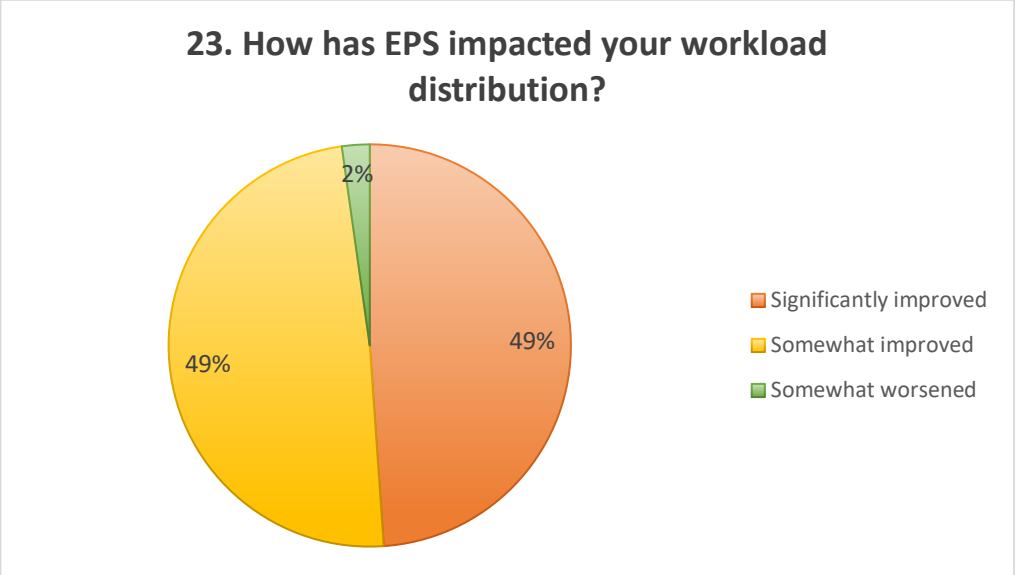

23. How has EPS impacted your workload distribution?
2%
49%
49%
Significantly improved
Somewhat improved
Somewhat worsened

Fig. 29

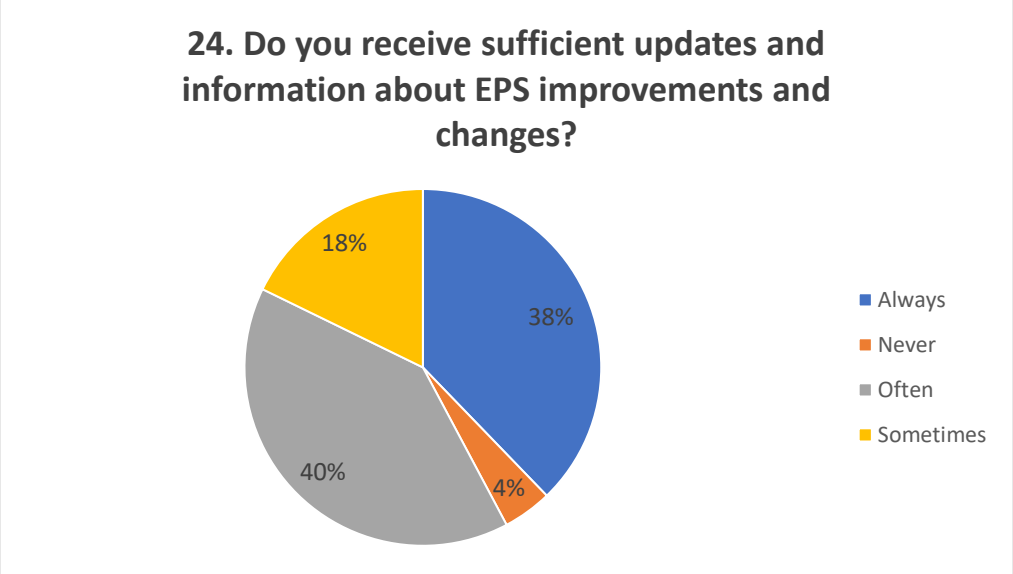

24. Do you receive sufficient updates and information about EPS improvements and changes?
18%
38%
40%
4%
Always
Never
Often
Sometimes

Fig. 30

4.3 Statistical Analysis

4.3.1 Prescription Accuracy

- **Frequency of prescription errors & Improvement in communication with describers about prescription errors**

The contingency table is created to measure the frequency of prescription errors after EPS and Improve communication with describers about prescription errors. The chi-square test of independence is done to test the association between these two variables.

Improvement in communication	Frequency of prescription errors since implementing EPS.					
	Less frequent	More frequent	Much less frequent	Much more frequent	No change	Total
Agree	22	1	4	0	1	28
Neutral	2	1	0	0	0	3
Strongly agree	2	1	8	1	2	14
Total	26	3	12	1	3	45

Table 1

For the Chi- square test independence, the hypotheses are as follows.

H_0: There is no association between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors.

H_1: There is an association between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors.

The test is carried out at a 5% level of significance. Test outcomes are in Table 2. As the p-value is smaller than 0.05, the null hypothesis is rejected at a 5% level of

significance. Hence there is an association between the frequency of prescription errors after EPS and Improvement in communication with describers about prescription errors.

Chi-Squared Test			
	Value	**df**	**p**
X^2	21.648	8	0.006
N	45		

Table 2

For quantifying the association between the frequency of prescription error after EPS and Improvement in communication with describers about prescription errors, the Kendall Tau coefficient of association is calculated. The significance of the Kendall Tau coefficient is tested.

The hypotheses for testing the significance of Kendall Tau coefficient, τ are as follows;

H_0: Kendall Tau coefficient of association between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors, $\tau = 0$

H_1: Kendall Tau coefficient of association between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors, $\tau \neq 0$

The test outcomes are in table 3. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence Kendall Tau coefficient of association between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors is non- zero at 5% level of significance.

Therefore the estimate of Kendall Tau coefficient of association between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors calculated as 0.539 is significant at 5% level of significance.

Kendall's Tau

Kendall's Tau-b	Z	p
0.539	3.878	< .001

Table 3

Kendall Tau coefficient of association 0.539 indicate that there is moderate positive concordance (association) between frequency of prescription error after EPS and Improvement in communication with describers about prescription errors. It shows that eps system allows easier identification of errors and makes easier communication.

- **Impact of EPS on prescriptions accuracy and Improvement in communication with describers about prescription errors.**

The contingency table of the impact of EPS on prescriptions accuracy and Improvement in communication with describers about prescription errors is created(Table 6). Chi- Square test of test of independence is carried out testing the association between these two variables.

The χ^2 test outcomes are in table 4. As the p-value is greater than 0.05, the null hypothesis of association between impact of EPS on prescriptions accuracy and improvement in communication with describers about prescription errors accepted at 5% level of significance. Hence there is no assosiation between prescriptions accuracy and improvement in communication with describers about prescription errors.

	Improvement in communication after EPS			
Impact of EPS on prescriptions accuracy	**Agree**	**Neutral**	**Strongly agree**	**Total**
Significantly improved	15	2	12	29
Somewhat improved	13	1	2	16
Total	28	3	14	45

Table 4

Chi-Squared Test			
	Value	**df**	**p**
X^2	4.215	2	0.122
N	45		

Table 5

4.3.2 Pharmacist Satisfaction

- **Overall satisfaction and ease of using EPS**

The contingency table is created for overall satisfaction(Question 7) and ease of using EPS(Question 8). Chi- Square test of test of independence is carried out testing the association between these two variables.

	Ease of use of EPS				
Overall satisfaction	**Easy**	**Neutral**	**Very difficult**	**Very easy**	**Total**
Neutral	1	0	0	0	1
Satisfied	22	3	0	1	26
Very satisfied	3	0	1	14	18
Total	26	3	1	15	45

Table 6

For the Chi- square test independence, the hypotheses are as follows.

H_0: There is no association between overall satisfaction and ease of using EPS.

H_1: There is an association between overall satisfaction and ease of using EPS.

The test is carried out at 5% level of significance. Test outcomes are in table 7. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is an association between overall satisfaction and ease of using EPS.

Chi-Squared Tests			
	Value	**df**	**p**
X^2	30.289	6	< .001
N	45		

Table 7

For quantifying the association between overall satisfaction and ease of using EPS, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between overall satisfaction and ease of using EPS, $\tau = 0$

H_1: Kendall Tau coefficient of association between overall satisfaction and ease of using EPS, $\tau \neq 0$

The test outcomes are in table 8. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence Kendall Tau coefficient of association between overall satisfaction and ease of using EPS is non- zero at 5% level of significance.

Therefore the estimate of Kendall Tau coefficient of association between overall satisfaction and ease of using EPS calculated as 0.713 is significant at 5% level of significance.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.713	4.95	< .001

Table 8

Kendall Tau coefficient of association 0.713 indicate that there is strong positive association (concordance) between overall satisfaction and ease of using EPS. It shows that the more easier to use EPS, the more satisfied are the Pharmacist.

- **Overall satisfaction and Improvement in management of medication inventory**

The contingency table (Table 9) of overall satisfaction (Que.7) and improvement in management of medication inventor(Que. 9). Chi-Square test of test of independence is carried out testing the association between these two variables.

	Improvement in management of medication inventory				
Overall satisfaction	**Agree**	**Disagree**	**Neutral**	**Strongly agree**	**Total**
Neutral	1	0	0	0	1
Satisfied	18	2	3	3	26
Very satisfied	5	0	0	13	18
Total	24	2	3	16	45

Table 9

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between overall satisfaction and improvement in management of medication inventory.

H_1: There is an association between overall satisfaction and improvement in management of medication inventory.

Test outcomes are in table 10. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is an association between overall satisfaction and improvement in management of medication inventory.

Chi-Squared Test			
	Value	**df**	**p**
X^2	18.878	6	0.004
N	45		

Table 10

For quantifying the association between overall satisfaction and improvement in management of medication inventory, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between overall satisfaction and improvement in management of medication inventory,$\tau = 0$

H_1: Kendall Tau coefficient of association between overall satisfaction and improvement in management of medication inventory,$\tau \neq 0$

The test outcomes are in Table 11. As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence Kendall Tau coefficient of association between overall satisfaction and improvement in management of medication inventory is non- zero at 5% level of significance.

Kendall's Tau		
Kendall's Tau-b	Z	p
0.509	3.562	< .001

Table 11

Kendall Tau coefficient of association 0.509 indicate that there is moderate positive association (concordance) between overall satisfaction and improvement in management of medication inventory. It shows that the more improvement in management of medication inventory by use EPS, the more satisfied are the Pharmacist.

- **The ease of using EPS and Improvement in management of medication inventory**

The contingency table is created for improvement in management of medication inventory(Question 9) and ease of using EPS(Question 8). Chi- Square test of test of independence is carried out testing the association between these two variables.

	Improvement in management of medication inventory				
The ease of using EPS	Agree	Disagree	Neutral	Strongly agree	Total
Easy	18	1	3	4	26
Neutral	2	1	0	0	3
Very difficult	1	0	0	0	1
Very easy	3	0	0	12	15
Total	24	2	3	16	45

Table 12

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between the ease of using EPS and Improvement in management of medication inventory.

H_1: There is an association between the ease of using EPS and Improvement in management of medication inventory.

Test outcomes are in table 13. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is an association between the ease of using EPS and improvement in management of medication inventory.

Chi-Squared Tests			
	Value	**df**	**p**
X^2	26.154	9	0.002
N	45		

Table 13

For quantifying the association between overall satisfaction and improvement in management of medication inventory, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between he ease of using EPS and Improvement in management of medication inventory,$\tau = 0$

H_1: Kendall Tau coefficient of association between he ease of using EPS and Improvement in management of medication inventory,$\tau \neq 0$

The test outcomes are in Table 14. As the p-value is smaller than 0.05, the null hypothesis is rejected.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.473	3.387	< .001

Table 14

Therefore the estimate of Kendall Tau coefficient of association between the ease of using EPS and improvement in management of medication inventory is calculated as 0.473 is significant at 5% level of significance.

Kendall Tau coefficient of association 0.473 indicate that there is moderate positive association (concordance) between the ease of using EPS and improvement in management of medication inventory. It shows that the more ease of use of EPS, the more improvement in management of medication inventory by the Pharmacist.

4.3.3 Barriers and Challenges

- **Training on EPS and frequency of technical issues**

The contingency table is created for training on EPS (Question 10) and frequency of technical issues (Question 12). Chi- Square test of test of independence is carried out testing the association between these two variables.

	Frequency of technical issues with EPS				
Training on EPS	**Never**	**Often**	**Rarely**	**Sometimes**	**Total**
Adequate	3	1	9	15	28
Extensive	0	0	0	1	1
Minimal	0	0	5	4	9
Total	4	1	16	24	45

Table 15

The χ^2 test is carried out at 5% level of significance. Test outcomes are in table 16. As the p-value is greater than 0.05, the null hypothesis of there is no association between training on EPS and frequency of technical issues accepted at 5% level of significance. Hence there is no association between training on EPS and frequency of technical issues.

Chi-Squared Tests			
	Value	**df**	**p**
X^2	3.947	9	0.915
N	45		

Table 16

- **Training on EPS and main challenges**

Separate $\chi 2$ tests are carried out to identify if is there any association between training on EPS and main technical and non-technical challenges- Technical issues, Training and support, Resistance to change, Cost, and Integration with existing systems at a 5% level of significance. As the respective null hypotheses are rejected, data from this study doesn't support the hypothesis of an association between training on EPS and main challenges- Technical issues, Training and support, Resistance to change, Cost, and Integration with existing systems.

- **Training on EPS and technical challenges**

Separate $\chi 2$ tests are carried out to identify if is there any association between training on EPS and technical challenges- System crashes, Slow processing, Data entry errors, and Connectivity issues. As respective null hypotheses are rejected, it is reasonable to conclude that data collected through this study doesn't provide any evidence to prove an association between the training respondents received and any of the listed technical challenges.

4.3.4 Workflow Efficiency

- **Impact of EPS on overall workflow efficiency and change in processing time**

The contingency table is created for impact of EPS on overall workflow efficiency (Que. 14) and change in processing time(Que. 15). Chi- Square test of independence is carried out testing the association between these two variables at 5% level of significance.

	Impact of EPS on time required to process prescriptions				
Impact of EPS on overall workflow efficiency	**Faster**	**Much faster**	**No change**	**Slower**	**Total**
Significantly improved	12	14	0	0	26
Somewhat improved	16	1	1	1	19
Total	28	15	1	1	45

Table 17

For the test, the hypotheses are as follows.

H_0: There is no association between impact of EPS on overall workflow efficiency and change in processing time.

H_1: There is an association impact of EPS on overall workflow efficiency and change in processing time.

Chi-Squared Test			
	Value	**df**	**p**
X^2	13.065	3	0.004
N	45		

Table 18

Test outcomes are in Table 18. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is an association between impact of EPS on overall workflow efficiency and change in processing time is significant at 5% level of significance.

For quantifying the association between impact of EPS on overall workflow efficiency and change in processing time, the Kendall Tau coefficient of association is

calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between impact of EPS on overall workflow efficiency and change in processing time,$\tau = 0$

H_1: Kendall Tau coefficient of association between impact of EPS on overall workflow efficiency and change in processing time,$\tau \neq 0$

The test outcomes are in Table 19. As the p-value is smaller than 0.05, the null hypothesis is rejected.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
-0.32	-2.163	0.031

Table 19

Therefore the estimate of Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and change in processing time is calculated as 0.473 is significant at 5% level of significance.

Kendall Tau coefficient of association -0.32 indicate that there is moderate negative association (discordance) between impact of EPS on overall workflow efficiency and change in processing time. It shows that the more processing time, the lesser the overall workflow efficiency.

- **Impact of EPS on overall workflow efficiency and daily prescription volume**

The contingency table (Table 20) is created for impact of EPS on overall workflow efficiency (Que. 14) and daily prescription volume (Que. 16). Chi- Square test of test of independence is carried out testing the association between these two variables.

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between the impact of EPS on overall workflow efficiency and daily prescription volume.

H_1: There is an association between the impact of EPS on overall workflow efficiency and daily prescription volume.

Test outcomes are in Table 21. As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence there is an association between the impact of EPS on overall workflow efficiency and daily prescription volume.

	Impact of EPS on daily prescription volume			
Impact of EPS on overall workflow efficiency	**No change**	**Significantly increased**	**Somewhat increased**	**Total**
Significantly improved	0	15	11	26
Somewhat improved	1	1	17	19
Total	1	16	28	45

Table 20

Chi-Squared Tests			
	Value	**df**	**p**
X^2	13.78	2	0.001
N	45		

Table 21

For quantifying the association between the impact of EPS on overall workflow efficiency and daily prescription volume, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and daily prescription volume,$\tau = 0$

H_1: Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and daily prescription volume,$\tau \neq 0$

The test outcomes are in Table 22. As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and daily prescription volume is non- zero at 5% level of significance.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.442	2.963	0.003

Table 22

Kendall Tau coefficient of association 0.442 indicate that there is moderate positive association (concordance) between the impact of EPS on overall workflow efficiency and daily prescription volume. It shows that the more the impact of EPS on overall workflow efficiency, the more the impact of EPS on daily prescription volume.

- **Impact of EPS on overall workflow efficiency and patient's waiting time**

The contingency table (Table 23) is created for impact of EPS on overall workflow efficiency (Que. 14) and patient's waiting time (Que. 17). Chi- Square test of test of independence is carried out testing the association between these two variables.

	Impact of EPS on patient's waiting times				
Impact of EPS on overall workflow efficiency	**No change**	**Significantly increased**	**Significantly reduced**	**Somewhat reduced**	**Total**
Significantly improved	1	0	19	6	26
Somewhat improved	2	1	1	15	19
Total	3	1	20	21	45

Table 23

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between the impact of EPS on overall workflow efficiency and patient's waiting time.

H_1: There is an association between the impact of EPS on overall workflow efficiency and patient's waiting time.

Test outcomes are in Table 24. As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence there is an association between the impact of EPS on overall workflow efficiency and patient's waiting time.

	Value	df	p
X^2	20.805	3	< .001
N	45		

Table 24

For quantifying the association between the impact of EPS on overall workflow efficiency and patient's waiting time, the Kendall Tau coefficient of association is

calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and patient's waiting time,$\tau = 0$

H_1: Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and patient's waiting time,$\tau \neq 0$

The test outcomes are in table 25 As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and patient's waiting time is non- zero at 5% level of significance.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.41	2.82	0.005

Table 25

Kendall Tau coefficient of association 0.41 indicate that there is moderate positive association (concordance) between the impact of EPS on overall workflow efficiency and patient's waiting time. It shows that the more the impact of EPS on overall workflow efficiency, the more the impact of EPS on patient's waiting time.

- **Impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling**

The contingency table (Table 26) is created for impact of EPS on overall workflow efficiency (Que. 14) and Pharmacist's ability to provide patient counselling (Que. 19) . Chi- Square test of test of independence is carried out testing the association between these two variables.

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling.

H_1: There is an association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling.

The test outcomes are in Table 27. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence there is an association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling.

For quantifying the association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

	Impact of EPS on Pharmacist's ability to provide patient counselling				
Impact of EPS on overall workflow efficiency	**No change**	**Significantly improved**	**Somewhat decreased**	**Somewhat improved**	**Total**
Significantly improved	1	21	0	4	26
Somewhat improved	2	1	2	14	19
Total	3	22	2	18	45

Table 26

Chi-Squared Test			
	Value	**df**	**p**
X^2	25.601	3	< .001
N	45		

Table 27

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling,$\tau = 0$

H_1: Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling,$\tau \neq 0$

The test outcomes are in table 28. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence Kendall Tau coefficient of association between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling is non- zero at 5% level of significance.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.534	3.694	< .001

Table 28

Kendall Tau coefficient of association 0.534 indicate that there is moderate positive association (concordance) between the impact of EPS on overall workflow efficiency and Pharmacist's ability to provide patient counselling. It shows that the more the impact of EPS on overall workflow efficiency, the more the impact of EPS on Pharmacist's ability to provide patient counselling.

4.3.5 Confidence on EPS and other factors

- **Identification of potential medication interactions by EPS & Recommending EPS to other pharmacies**

The contingency table (Table 29) is created for identification of potential medication interactions (Que. 22) and recommending EPS to other pharmacies (Que. 20). Chi- Square test of test of independence is carried out testing the association between these two variables.

	Identification of potential medication interactions by EPS			
Recommending EPS to other pharmacies	**Agree**	**Neutral**	**Strongly agree**	**Total**
Likely	18	2	0	20
Very likely	5	2	18	25
Total	23	4	18	45

Table 29

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between identification of potential medication interactions and recommending EPS to other pharmacies.

H_1: There is an association between identification of potential medication interactions by EPS and recommending EPS to other pharmacies.

Chi-Squared Test			
	Value	**df**	**p**
X^2	25.102	2	< .001
N	45		

Table 30

Test outcomes are in table 30. As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence there is an association between identification of potential medication interactions by EPS and recommending EPS to other pharmacies at 5% level of significance.

For quantifying the association between identification of potential medication interactions by EPS and recommending EPS to other pharmacies, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: $\tau = 0$

H_1: $\tau \neq 0$

Where τ is the Kendall Tau coefficient of association between identification of potential medication interactions by EPS and recommending EPS to other pharmacies.

The test outcomes are in Table 31. As the p-value is smaller than 0.05, the null hypothesis is rejected. Hence Kendall Tau coefficient of association between identification of potential medication interactions by EPS and recommending EPS to other pharmacies is non- zero at 5% level of significance.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.718	4.922	< .001

Table 31

Therefore, the estimate of Kendall Tau coefficient of association between the ease of using EPS and Improvement in management of medication inventory is calculated as 0.718 is significant at 5% level of significance.

Kendall Tau coefficient of association 0.718 indicate that there is strong positive association (concordance) between the ease of using EPS and improvement in management of medication inventory. It indicates that if there is the more effectiveness from EPS in identification of potential medication interactions, the Pharmacist more likely to recommend it to other community pharmacies.

- **Sufficient updates and information on EPS & Rating on the user interface of the EPS system**

The contingency table (Table 32) is created for sufficient updates and information on EPS (Que. 24) and rating on the user interface of the EPS system (Que. 21). Chi-Square test of test of independence is carried out testing the association between these two variables.

The χ^2 test is carried out at 5% level of significance. For the test, the hypotheses are as follows.

H_0: There is no association between sufficient updates and information on EPS and rating on the user interface of the EPS system.

H_1: There is an association between sufficient updates and information on EPS and rating on the user interface of the EPS system.

The value of Chi- Square statistic is 47.496 with p- value < .001. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance.

For quantifying the association between sufficient updates and information on EPS and rating on the user interface of the EPS system, the Kendall Tau coefficient of association is calculated. The significance of Kendall Tau coefficient is tested at 5% level of significance.

	Rating on the user interface of the EPS system				
Sufficient updates and information on EPS	**Average**	**Excellent**	**Good**	**Poor**	**Total**
Always	0	14	3	0	17
Never	0	0	1	1	2
Often	2	3	13	0	18
Sometimes	0	0	8	0	8
Total	2	17	25	1	45

Table 32

The hypotheses for testing the significance of Kendall Tau coefficient,τ are as follows;

H_0: $\tau = 0$

H_1: $\tau \neq 0$

Where τ is the Kendall Tau coefficient of association between sufficient updates and information on EPS and rating on the user interface of the EPS system.

Kendall's Tau		
Kendall's Tau-b	**Z**	**p**
0.477	3.47	< .001

Table 33

The test outcomes are in table 33. As the p-value is smaller than 0.05, the null hypothesis is rejected at 5% level of significance. Hence Kendall Tau coefficient is non-zero at 5% level of significance.

The Kendall Tau coefficient of association 0.477 indicate that there is moderate positive association (concordance) between sufficient updates and information on EPS and rating on the user interface of the EPS system. It indicates that if there is the more sufficient updates and information on EPS, there would be more rating for the user interface of the EPS system, and vice versa.

5. CONCLUSIONS AND RECOMMENDATIONS

This study has revealed significant insights into the impact of Electronic Prescription Services (EPS) on community pharmacies in Dublin, highlighting both its benefits and challenges. EPS has notably improved prescription accuracy, with a significant majority of participants reporting a reduction in prescription errors and enhanced communication with prescribers. Additionally, the system has fostered high levels of pharmacist satisfaction, particularly in terms of ease of use and improvements in medication inventory management. However, the study also identified persistent challenges, including technical issues and integration difficulties, which continue to affect the overall efficiency and effectiveness of EPS.

5.1 Summary of Main Findings and Their Implications

5.1.1 Prescription Accuracy:

EPS significantly improved prescription accuracy, with 64% of participants reporting substantial improvement. Most respondents noted a marked reduction in prescription errors post-EPS implementation. A statistically significant association exists between reduced prescription errors and improved communication with prescribers, confirming that EPS enhances error management processes.

5.1.2 Pharmacist Satisfaction:

High levels of satisfaction with EPS were reported, with 98% of participants satisfied or very satisfied. The ease of using EPS was strongly associated with overall satisfaction, suggesting that user-friendliness is a crucial factor in its acceptance. EPS was found to moderately improve medication inventory management, further contributing to pharmacist satisfaction.

5.1.3 Barriers and Challenges:

Technical issues, integration challenges, and cost were identified as significant barriers to EPS implementation. Despite adequate training reported by most participants, technical challenges persisted, indicating a need for enhanced support and system robustness.

5.1.4 Workflow Efficiency:

EPS positively impacted workflow efficiency, with significant improvements in processing times, prescription volumes, and patient waiting times. The system also improved pharmacists' ability to provide patient counseling, with a moderate positive association between workflow efficiency and counseling capabilities.

5.1.5 Confidence in EPS:

A strong confidence in EPS was observed, with the majority of pharmacists recognizing its contribution to better patient outcomes and its effectiveness in identifying potential medication interactions. There is a significant association between the provision of regular updates on EPS and the positive rating of its user interface, highlighting the importance of continuous system improvements.

5.2 Summary of Differences Between Findings and Literature

- The findings of this study are largely consistent with existing literature, which emphasizes the benefits of EPS in improving prescription accuracy, workflow efficiency, and pharmacist satisfaction.
- However, the study revealed that technical and integration challenges remain persistent, despite adequate training—a point less emphasized in prior literature, which often assumes that training alone can mitigate these issues.
- The study also highlighted the strong link between regular updates on EPS and user satisfaction, a factor that is less explored in previous research.

5.3 Recommendations

Based on these findings, several practical and academic recommendations are proposed. Practically, there is a need for enhanced technical support and more advanced, ongoing

training programs to better equip pharmacists to handle the challenges associated with EPS. Additionally, regular updates and improvements to the EPS user interface and functionality should be prioritized to sustain and increase user satisfaction. Academically, further research should focus on exploring the specific technical and integration challenges faced by pharmacies using EPS and developing targeted solutions. Longitudinal studies could also provide valuable insights into the sustainability of EPS benefits over time, while comparative research across different settings could identify context-specific factors influencing its success.

5.4 Limitations and Contributions of the Research

5.4.1 Limitations:

- **Sample Size:** The study's findings are based on a sample of 45 participants, which may not fully represent the broader population of community pharmacies in Dublin.
- **Self-Reported Data:** The reliance on self-reported data through surveys may introduce biases, such as overreporting of satisfaction or underreporting of challenges.
- **Cross-Sectional Design:** The study's cross-sectional design provides a snapshot of EPS impacts, but it does not account for changes over time or the evolution of user experiences.

5.4.2 Contributions:

- **Empirical Insights:** The study provides empirical insights into the specific impacts of EPS on community pharmacies in Dublin, contributing to the growing body of research on digital health technologies.
- **Identification of Key Challenges:** The research highlights the persistent challenges in EPS implementation, particularly technical issues and integration difficulties, offering a foundation for future studies aimed at addressing these barriers.
- **Practical Implications:** The findings have practical implications for policymakers and healthcare providers, emphasizing the need for continuous support and system enhancements to maximize the benefits of EPS.

5.5 Suggestions for the future researchers

Future research should focus on addressing the technical and integration challenges of Electronic Prescription Systems (EPS), exploring solutions to issues such as system interoperability, connectivity problems, and data entry errors. Additionally, comparative studies across different regions or healthcare settings could offer a broader understanding of EPS impacts, highlighting context-specific factors like local regulations and healthcare infrastructure that influence its success. Moreover, further investigation into the direct impact of EPS on patient outcomes is essential. Such research could examine how improvements in prescription accuracy, workflow efficiency, and communication with prescribers contribute to better patient health and safety, providing valuable insights for the continued development and adoption of EPS.

5.6 Final Reflection

Completing this dissertation has been a transformative journey, offering me a deep understanding of the intricacies of EPS and its impact on pharmacy operations. Through rigorous research and analysis, I have not only gained valuable insights into the practical challenges and benefits of EPS but also developed a greater appreciation for the importance of continuous learning and adaptation in the rapidly evolving field of healthcare technology. This experience has reinforced my commitment to contributing to meaningful advancements in the healthcare sector, and I am eager to apply the knowledge and skills I have acquired in future endeavors.

6. REFERENCES

Abdel-Qader, D.H., Al Meslamani, A.Z., El-Shara', A.A., Ismael, N.S., Albassam, A., Lewis, P.J., Hamadi, S., Abbas, H.S., Al Mazrouei, N. and Mohamed Ibrahim, O., 2020. Investigating prescribing errors in the emergency department of a large governmental hospital in Jordan. *Journal of Pharmaceutical Health Services Research*, *11*(4), pp.375-382.

Aldughayfiq, B. and Sampalli, S., 2021. Digital health in physicians' and pharmacists' office: a comparative study of e-prescription systems' architecture and digital security in eight countries. *Omics: a journal of integrative biology*, *25*(2), pp.102-122.

Almaghaslah, D., Alsayari, A., Almaghaslah, S. and Alsanna, H., 2022, April. Patients' satisfaction with E-Prescribing (Wasfaty) in Saudi Arabia: a survey of country-level implementation. In *Healthcare* (Vol. 10, No. 5, p. 806). MDPI.

Bilgener, E. and Bulut, S., 2021. Evaluation of electronic prescriptions in Turkey: A community pharmacy perspective. *Health policy and technology*, *10*(1), pp.52-59.

Bruthans, J., 2020. The state of national electronic prescription systems in the EU in 2018 with special consideration given to interoperability issues. *International Journal of Medical Informatics*, *141*, p.104205.

Bruthans, J., 2020. The state of national electronic prescription systems in the EU in 2018 with special consideration given to interoperability issues. *International Journal of Medical Informatics*, *141*, p.104205.

Busetto, L., Wick, W. and Gumbinger, C., 2020. How to use and assess qualitative research methods. *Neurological Research and practice*, *2*(1), p.14.

Campanella, F., Serino, L., Mustilli, M., Crisci, A. and D'Ambra, A., 2021. The evaluation of performance in the European public e-health services sector by Generalized Estimating Equations. *Socio-Economic Planning Sciences*, *73*, p.100813.

Clark, T., Foster, L., Bryman, A. and Sloan, L., 2021. *Bryman's social research methods*. Oxford university press.

Coe, R., Waring, M., Hedges, L.V. and Ashley, L.D. eds., 2021. *Research methods and methodologies in education*. Sage.

Cui, J., Wang, Z., Ho, S.B. and Cambria, E., 2023. Survey on sentiment analysis: evolution of research methods and topics. *Artificial Intelligence Review*, *56*(8), pp.8469-8510.

Dawadi, S., Shrestha, S. and Giri, R.A., 2021. Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, *2*(2), pp.25-36.

Dehalwar, K. and Sharma, S.N., 2023. *Fundamentals of Research Writing and Uses of Research Methodologies*. Edupedia Publications Pvt Ltd.

Dubey, U.K.B. and Kothari, D.P., 2022. *Research methodology: Techniques and trends*. Chapman and Hall/CRC.

Fung, E.W.T., Au-Yeung, G.T.F., Tsoi, L.M., Qu, L., Cheng, T.K.W., Chong, D.W.K., Lam, T.T.N. and Cheung, Y.T., 2020. Pharmacists' perceptions of the benefits and challenges of electronic product information system implementation in Hong Kong: mixed-method study. *Journal of medical Internet research*, *22*(11), p.e20765.

González-Bueno, J., Sevilla-Sánchez, D., Puigoriol-Juvanteny, E., Molist-Brunet, N., Codina-Jané, C. and Espaulella-Panicot, J., 2022. Improving medication adherence and effective prescribing through a patient-centered prescription model in patients with multimorbidity. *European Journal of Clinical Pharmacology*, *78*(1), pp.127-137.

Hareem, A., Lee, J., Stupans, I., Park, A. and Wang, K., 2023. Benefits and barriers associated with e-prescribing in community pharmacy–A systematic review. *Exploratory Research in Clinical and Social Pharmacy*, p.100375.

Hareem, A., Stupans, I., Park, J.S., Stevens, J.E. and Wang, K., 2024. Electronic health records and e-prescribing in Australia: An exploration of technological utilisation in Australian community pharmacies. *International Journal of Medical Informatics*, *187*, p.105472.

Hashmi, F., Hassali, M.A., Saleem, F., Saeed, H., Islam, M., Malik, U.R., Atif, N. and Babar, Z.U.D., 2021. Perspectives of community pharmacists in Pakistan about practice change and implementation of extended pharmacy services: a mixed method study. *International Journal of Clinical Pharmacy*, pp.1-11.

Hassan, E., Tarek, H., Hazem, M., Bahnacy, S., Shaheen, L. and Elashmwai, W.H., 2021, January. Medical prescription recognition using machine learning. In *2021 IEEE 11th Annual Computing and Communication Workshop and Conference (CCWC)* (pp. 0973-0979). IEEE.

Hays, C., Sparrow, M., Taylor, S., Lindsay, D. and Glass, B., 2020. Pharmacists'"full scope of practice": Knowledge, attitudes and practices of rural and remote australian pharmacists. *Journal of Multidisciplinary Healthcare*, pp.1781-1789.

Hendren, K., Newcomer, K., Pandey, S.K., Smith, M. and Sumner, N., 2023. How qualitative research methods can be leveraged to strengthen mixed methods research in public policy and public administration?. *Public Administration Review*, *83*(3), pp.468-485.

Hung, D.Y., Truong, Q.A. and Liang, S.Y., 2021. Implementing lean quality improvement in primary care: impact on efficiency in performing common clinical tasks. *Journal of general internal medicine*, *36*, pp.274-279.

Islam, M.A. and Aldaihani, F.M.F., 2022. Justification for adopting qualitative research method, research approaches, sampling strategy, sample size, interview method, saturation, and data analysis. *Journal of International Business and Management*, *5*(1), pp.01-11.

Josendal, A.V. and Bergmo, T.S., 2021. From paper to E-prescribing of multidose drug dispensing: a qualitative study of workflow in a community care setting. *Pharmacy*, *9*(1), p.41.

Kara, H., Lemon, N., Mannay, D. and McPherson, M., 2021. Creative research methods in education: Principles and practices. In *Creative Research Methods in Education*. Policy Press.

Lê, J.K. and Schmid, T., 2022. The practice of innovating research methods. *Organizational Research Methods*, *25*(2), pp.308-336.

Lester, C.A., Tu, L., Ding, Y. and Flynn, A.J., 2020. Detecting potential medication selection errors during outpatient pharmacy processing of electronic prescriptions with the RxNorm application programming interface: retrospective observational cohort study. *JMIR medical informatics*, *8*(3), p.e16073.

Mallhi, T.H., Liaqat, A., Abid, A., Khan, Y.H., Alotaibi, N.H., Alzarea, A.I., Tanveer, N. and Khan, T.M., 2020. Multilevel engagements of pharmacists during the COVID-19 pandemic: the way forward. *Frontiers in public health*, *8*, p.561924.

Marcilly, R., Colliaux, J., Robert, L., Pelayo, S., Beuscart, J.B., Rousselière, C. and Décaudin, B., 2023. Improving the usability and usefulness of computerized decision support systems for medication review by clinical pharmacists: A convergent, parallel evaluation. *Research in Social and Administrative Pharmacy*, *19*(1), pp.144-154.

Mogaji, E., Viglia, G., Srivastava, P. and Dwivedi, Y.K., 2024. Is it the end of the technology acceptance model in the era of generative artificial intelligence?. *International Journal of Contemporary Hospitality Management*.

Ogundipe, A., Sim, T.F. and Emmerton, L., 2023. Health information communication technology evaluation frameworks for pharmacist prescribing: a systematic scoping review. *Research in Social and Administrative Pharmacy*, *19*(2), pp.218-234.

Osmani, F., Arab-Zozani, M., Shahali, Z. and Lotfi, F., 2023, May. Evaluation of the effectiveness of electronic prescription in reducing medical and medical errors (systematic review study). In *Annales PharmaceutiquesFrançaises* (Vol. 81, No. 3, pp. 433-445). Elsevier Masson.

Pandey, P. and Pandey, M.M., 2021. *Research methodology tools and techniques*. Bridge Center.

Pillinger, T., Howes, O.D., Correll, C.U., Leucht, S., Huhn, M., Schneider-Thoma, J., Gaughran, F., Jauhar, S., McGuire, P.K., Taylor, D.M. and Young, A.H., 2023. Antidepressant and antipsychotic side-effects and personalised prescribing: a systematic review and digital tool development. *The Lancet Psychiatry*.

Sardana, N., Shekoohi, S., Cornett, E.M. and Kaye, A.D., 2023. Qualitative and quantitative research methods. In *Substance use and addiction research* (pp. 65-69). Academic Press.

Tobaiqy, M., Ainousah, B.E., Alorfi, N.M., Alghamdi, A. and Alqutub, S.T., 2023. A Pilot Study to Assess Prescription Transfer and Medicines Collection through a New Electronic Prescription Service: A Cross-Sectional Survey.

Tobaiqy, M., Ainousah, B.E., Alorfi, N.M., Alghamdi, A. and Alqutub, S.T., 2023. A Study to Assess Prescription Transfer and Medicines Collection Through a New Electronic Prescription Service: A Cross-Sectional Survey. *International Journal of General Medicine*, pp.3689-3699.

Turin, T.C., Kazi, M., Rumana, N., Lasker, M.A.A. and Chowdhury, N., 2023. Employing diffusion of innovation theory for 'not missing the mass' in community-engaged research. *BMJ open*, *13*(8), p.e069680.

Vaughn, L.M. and Jacquez, F., 2020. Participatory research methods–choice points in the research process. *Journal of Participatory Research Methods*, *1*(1).

Watcharapinchai, W., Sillabutra, J., Soontornpipit, P. and Chootrakool, H., 2022. Electronic-Prescribing-System Protocol Development for Government Sector Outpatients and Private Drug Stores: Case Study in Kalasin Province, Thailand. *Thai Journal of Public Health*, *52*(3), pp.222-240.

Williams, J., Malden, S., Heeney, C., Bouamrane, M., Holder, M., Perera, U., Bates, D.W. and Sheikh, A., 2022. Optimizing hospital electronic prescribing systems: a systematic scoping review. *Journal of patient safety*, *18*(2), pp.e547-e562.

Brennan, J. (2015) Adoption of National Electronic Prescribing Services in Primary Care in Europe - Policy Lessons for Ireland. Doctoral Thesis Available to View and Download at the University of Limerick Institutional Repository. Link to Thesis: Https://Ulir.Ul.Ie/Handle/10344/4827.

Campbell, C., Morris, C. and McBain, L. (2021) 'Electronic Transmission of Prescriptions in Primary Care: Transformation, Timing and Teamwork'. Journal of Primary Health Care, 13(4), pp. 340–350. DOI: 10.1071/HC21050.

Farghali, A., Borycki, E. and Macdonald, S. (2022) 'Pharmacist's Perception of the Impact of Electronic Prescribing on Medication Errors and Productivity in Community Pharmacies'. DOI: 10.34105/j.kmel.2021.13.029.

Grammatikopoulou, M. et al. (2024) 'Electronic Prescription Systems in Greece: A Large-Scale Survey of Healthcare Professionals' Perceptions'. Archives of Public Health, 82(1), p. 68. DOI: 10.1186/s13690-024-01304-6.

APPENDIX

Innopharma education

GRIFFITH COLLEGE

Ethics Application & Declaration Form

DISSERTATION TITLE: EVALUATING THE IMPACT OF ELECTRONIC PRESCRIPTION SERVICES ON WORKFLOW EFFICIENCIES IN COMMUNITY PHARMACIES OF DUBLIN, IRELAND.

RESEARCHER'S NAME: ARDRA VATTAMKANDATHIL TOMY

PROGRAMME OF STUDY: MSc in Digital Transformation (Life Science)

SUPERVISOR'S NAME: PAUL BLUNNIE

DECLARATION:
The information in this application form is accurate to the best of my knowledge. I undertake to abide by the principles outlined by Innopharma/Griffith College ethics policy in my research dissertation. I confirm that I have completed a full ethics assessment for my research dissertation as per the college guidelines. I will not begin my primary research until such approval from my supervisor and/or ethics Committee has been obtained.
I pledge to carry out my research according to the Innopharma/Griffith College academic integrity standards. Any results presented in my dissertation will be from my own, original research, I will reference and/or acknowledge any material or sources used in its preparation and I will not plagiarise the work of anyone else.

For Student:

STUDENT SIGNATURE: 

DATE: 06-07-2024

The research contained within this research dissertation proposal has been approved.

For Supervisor:

Ethics Committee Approval Required: Yes ☐ No ☑

SUPERVISOR SIGNATURE: Paul Blunnie

DATE: 08/7/2024

For Ethics Committee (if required):

Ethics Committee Approval Given: Yes ☐ No ☐

ETHICS COMMITTEE MEMBER SIGNATURE:

DATE:

NOTE: Supervisors are responsible for ensuring their students fill in this form correctly and that all ethical areas have been considered.

SECTION 1: DESCRIPTION OF RESEARCH STUDY

1.1 Purpose and objectives of research

The aim of this study is to determine how Electronic Prescription Services (EPS) affect workflow efficiencies at community pharmacies in Dublin, Ireland. The goal of the study is to comprehend the benefits as well as challenges associated with using EPS.

Objectives: 1. Evaluate Prescription Accuracy: Evaluate error rates before and after EPS setting up to determine its impact on prescription accuracy.

2. Analyze Pharmacist Satisfaction: Determine how satisfied pharmacists are with EPS usage, giving special focus on EPS's usability, efficiency in terms of time, and general impact on their work.

3. Identify Barriers and Challenges: Describe the specific challenges and barriers faced in the setup and use of EPS, including suggestions for a more seamless integration.

4. Measure Workflow Efficiency Improvement: Evaluate the extent to which the EPS has improved workflow efficiency, taking into account improvements in daily prescription volume and prescription processing time.

By focusing on these objectives, the research will provide a thorough evaluation of EPS in community pharmacies, emphasizing its benefits as well as possible areas for improvement. Consequently, this will improve pharmacy procedures and improve patient care in Dublin, Ireland.

1.2 Research methodology:

A clear questionnaire about the impact of electronic prescription services (e-prescribing) on workflow efficiencies will be designed for the study. This questionnaire will be tested with a few pharmacists to ensure it is easy to understand. Once confirmed, a representative number of Dublin's community pharmacies will be chosen to participate. This sample will represent various pharmacy sizes and locations throughout the city. The data collection will include requesting pharmacists to complete the survey either online or in person. To ensure maximum participation, reminders will be sent to individuals who have not yet responded. Once collected, the data will be examined to determine how e-prescribing systems are used and perceived. This research will also analyse survey responses according to pharmacy factors such as size and location. The results of the survey will be interpreted and discussed to explain their implications for pharmacy practice and healthcare policy. Any study limitations will be addressed, and suggestions for improvement will be provided. The conclusion will summarize the key findings and offer strategies to enhance the adoption of

e-prescribing systems, considering how these findings may apply to pharmacies outside of Dublin. Ethical issues will be prioritized throughout the study process. An ethical committee will approve the study, and all participants will provide consent. Their information will be kept private and confidential. Finally, the study findings will be presented in a dissertation, which may be presented at conferences or published in academic journals. This will help to broaden our understanding of e-prescribing system adoption in community pharmacies and inform future work in this area.

SECTION 2: POSSIBLE ETHICAL ISSUES

Answer 'yes' or 'no' to the following questions.

SUBJECT MATTER

Does the research proposal involve:

Research into specific company activities that would be deemed sensitive or confidential	No
Research into politically and/or racially/ethnically and/or commercially sensitive areas	No
Sensitive, personal, professional or corporate issues	No

RESEARCH PROCEDURES

Does the research proposal involve:

Research that might damage the reputation of companies or participants	No
Research that may negatively affect the reputation of Griffith College/Innopharma	No
Use of personal records without consent	No
Use of company data without consent	No
The offer of any inducements to participate	No
Audio or visual recording without consent	No
Using a language other than English	No

PARTICIPANTS

Does the research proposal involve:

People who are not competent and/or fluent in English	No
Does your research group include any of the following vulnerable groups	No

(Adults with psychological impairments; Adults with learning difficulties; Adults under the protection/control /influence of others (e.g. in care/prison); Relatives of ill people (e.g. parents of sick children); Hospital or GP participants recruited in a medical facility; persons under the age of 18)

<u>If you have answered NO to ALL questions, please go straight to Section 4.</u>

<u>If you have answered YES to ANY question in SECTION 2, you must fill in SECTION 3.</u>

SECTION 3: STEPS TAKEN TO AVOID ETHICAL ISSUES

[Only fill in this section if you answered YES to ANY of the questions in Section 3. For example, if you answered yes to including participants who are not fluent in English, you might put forward a plan that offers your survey in two languages to take this into account. Another example could be a study where the researcher wants to include information about the care received by children with a long-term condition but it would not be ethical to approach the children directly but it might be acceptable to instead ask parents questions about their child's care.

If these plans are acceptable to your supervisor, you may not need to apply for ethical approval from the Ethics Committee].

3.1. If your ethics relates to ***Subject Matter***, outline your action plan to work around any sensitive issues.
3.2. If your ethics relates to ***Research Procedures***, outline your action plan to deal with possible ethical issues in your research procedures.
3.3. If your ethics relates to ***Participants***, outline how you will protect vulnerable persons or those that do not have English as their first language.

SECTION 4: ABOUT YOUR PARTICIPANTS

4.1. Outline your participant profile and why you have chosen them for this study

Participant Profile:
1. Community Pharmacists:
- Role: Licensed pharmacists working in community pharmacies.
- Location: Employed in community pharmacies across Dublin, Ireland.
- Responsibilities: Involved in the prescription process, patient interaction, and daily pharmacy operations.

2. Pharmacy Technicians and Support Staff:
- Role: Technicians and support staff assisting pharmacists in dispensing medications and managing workflow.
- Location: Working in community pharmacies in Dublin, Ireland.
- Responsibilities: Supporting pharmacists in prescription processing and managing pharmacy operations.
Rationale for Choosing These Participants:

1. Community Pharmacists:
- Expertise: Pharmacists are directly involved in the prescription process, making them key stakeholders in evaluating EPS impact on accuracy and workflow.
- Experience: Their professional insights and experiences are crucial for assessing the practical implications of EPS on daily operations and satisfaction levels.

2. Pharmacy Technicians and Support Staff:
-Operational Insight: Technicians and support staff play a significant role in the prescription workflow. Their experiences can provide valuable information on the operational challenges and efficiency improvements with EPS.
- Broader Perspective: Including support staff ensures a comprehensive evaluation of EPS impact across all levels of pharmacy operations.

4.2 How do you plan to gain access to/contact/approach your participant(s).

Participants will be contacted through professional networks, associations, and collaborations with local pharmacies in Dublin, Ireland. Direct invitations via email or personalized communication will be used to reach pharmacists, pharmacy technicians, and support staff involved in Electronic Prescription Services (EPS). All approaches will comply with ethical guidelines and institutional protocols for recruitment and informed consent.

SECTION 5: INFORMATION, CONSENT AND CONFIDENTIALITY

5.1 **Participant Information Letter (PIL) for participants**

[You must submit an information letter for participants with this application, as part of your appendices document. For online surveys, it is sufficient to include a paragraph summarising and explaining the purpose of the research at the beginning of the survey. In all other research e.g. interviews, phonecalls, a PIL should be provided to each participant before they are asked for their consent to take part. A template PIL is available in Moodle].

Please confirm below that your information letter covers:

Description of the research topic and method	Yes
Details of what participation will involve	Yes
Rights to anonymity	Yes
Confidentiality	Yes
Rights to withdraw from the research	Yes
The contact details of the researcher and supervisor (if necessary)	Yes

5.2 **Informed Consent Form (ICF) for participants**

[Informed consent is required for most research. For online surveys, it is sufficient to get the participant to tick two boxes at the beginning of the survey – one to state they understand the research and one to give consent. In all other research e.g. interviews, phonecalls, a signed consent form is required. If the data is gathered online e.g. zoom, a signed consent form can be scanned and sent to the researcher. A template ICF is available in Moodle. The signed ICFs, along with the surveys, audio files or interview notes etc. must be stored in the primary data folder on moodle and can be accessed by Innopharma staff for the purposes of verifying the authenticity of the research carried out and the data collected].

Please indicate below if your research requires a signed consent form by selecting the relevant option only:

No: my research study involves an online survey only and/or does not require signed consent

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SECTION 6: STORAGE OF DATA

[Please ensure that you are abiding by GDPR and the national Data protection laws https://www.hrb.ie/funding/gdpr-guidance-for-researchers/gdpr-and-health-research/).

*The student is responsible for storage of data and this will be handed over to the college in an electronic format as part of the thesis submission i.e. primary data and completed ICFs where applicable will be added to the primary data folder on moodle. The rationale is to keep data **as long as it is still useful** and there is an intention to use it further **for research** so if this is not the case then this can be stipulated here and a shorter retention period given.]*

6.1. How will you store the research data and for how long? How will you manage data protection issues?

Data Storage:

Digital Data:

- Storage Medium: Secure, encrypted cloud storage and local servers with restricted access.
- Backup: Regular backups will be made to prevent data loss, stored in a separate secure location.

Research data will be stored for a minimum of three years following the publication of the study results. This period allows for sufficient time to address any queries or follow-up research.

Data Protection Measures:

1. Confidentiality:
   - Anonymization: All personal identifiers will be removed or coded to protect participant identities.
   - Access Control: Data access will be restricted to authorized personnel involved in the research.

2. Compliance:
   - GDPR: Adherence to the General Data Protection Regulation (GDPR) for handling personal data, ensuring lawful, fair, and transparent processing.
   - Institutional Policies: Compliance with institutional guidelines and ethical standards for data protection.

3. Data Security:

- Encryption: All digital data will be encrypted both in transit and at rest.
- Secure Transfer: Use of secure transfer protocols (e.g., SFTP) for data sharing among research team members.

4. Participant Consent:
- Informed Consent: Participants will be informed about data storage, duration, and protection measures. Consent forms will outline how their data will be used and stored.
- Right to Withdraw: Participants will be informed of their right to withdraw their data from the study at any time.

5. Monitoring and Review:
- Regular Audits: Periodic audits of data storage and security practices to ensure compliance with data protection policies.
- Incident Response: Established protocols for responding to data breaches or unauthorized access incidents.

SECTION 7: NON-DISCLOSURE AGREEMENT & STUDENT CONSENT

7.1 **Non-Disclosure Agreement (NDA)**
Will the final dissertation contain any information pertaining to any source what would warrant the use of a Non-Disclosure Agreement (NDA) e.g. industry-based research?

No

7.2 **Student consent**
If a Non-Disclosure Agreement (NDA) is not required, does the Student consent to allow their completed dissertation to be held/published by Innopharma/Griffith College?

Yes

SECTION 8: RECORDING AND RETENTION OF DISSERTATION VIVA

8.1 **Viva Recording**
The Dissertation viva will be recorded. This recording may be used to facilitate assessment by Innopharma staff, a third reader if necessary and/or if requested by the external examiner for the Programme. The recording will be held in line with current GDPR guidelines and will not be made publicly available.

SECTION 9: DOCUMENT CHECKLIST

NOTE: Applicants must attach the following documents in electronic format to the appendix.

Which documents are added to the appendix? Please tick N/A if not applicable:

9.1 Participant Information Letter (PIL) for participant	Yes
9.2 Informed Consent Form (ICF) for participant	N/A
9.3 Questions/survey for interviewees/focus groups etc *(can be in draft form)*	Yes N/A
9.4 Any other documents e.g. Non-Disclosure Agreement	Yes N/A

I confirm that this application is complete and all required documents are included in the appendix.

For Student:

STUDENT SIGNATURE: 

DATE: 06-07-2024

Participant Information Letter

[TITLE OF THE STUDY]: EVALUATING THE IMPACT OF ELECTRONIC PRESCRIPTION SERVICES ON WORKFLOW EFFICIENCIES IN COMMUNITY PHARMACIES OF DUBLIN, IRELAND.

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or if you would like more information. Take time to decide whether or not to take part.

WHO I AM AND WHAT THIS STUDY IS ABOUT

My name is Ardra Vattamkandathil Tomy, and currently pursuing Master's in Digital Transformation in Life Science in Griffith College, Dublin.

The purpose of this study is to assess how Electronic Prescription Services (EPS) affect workflow efficiencies in community pharmacies in Dublin, Ireland. Evaluating the benefits and challenges of EPS implementation is the aim of this study. More specifically, i will assess prescription accuracy, analyse pharmacist satisfaction, identify challenges and barriers, and measure improvements in workflow efficiency.

This research is part of my coursework and will contribute towards earning my Master's in Digital Transformation in Life Science. The study seeks to provide valuable insights that can help optimize pharmacy practices and improve patient care in Dublin.

WHAT WOULD TAKING PART INVOLVE?

If you agree to take part in this study, you will be participating by completing a survey designed to gather information about your experiences and opinions regarding Electronic Prescription Services (EPS) in community pharmacies.

Survey Details:

- Description: The survey will consist of questions related to prescription accuracy, your satisfaction with EPS, any barriers or challenges you have encountered, and the impact of EPS on workflow efficiency.

- Time Commitment: The survey is expected to take approximately 15-20 minutes of your time.

- Format: The survey will be available online, and you can complete it at your convenience.

Impact on You and Your Life:

- Professional Insight: Your responses will provide valuable insights into the practical implications of EPS in community pharmacies.

- Minimal Disruption: Completing the survey can be done at a time and place that suits you, ensuring minimal disruption to your work and personal life.

- Confidentiality: All survey responses will be kept confidential and will be anonymized to protect your identity. The data collected will be used solely for research purposes and will not be shared outside of the research team.

Participation in this survey is entirely voluntary. You have the right to withdraw at any time without any consequences. Your input is highly valued, and your participation will contribute significantly to the understanding and improvement of electronic prescription services in community pharmacies. If you have any questions or concerns about the survey, please feel free to contact us.

WHY HAVE YOU BEEN INVITED TO TAKE PART?

You have been invited to take part in this research because you are a community pharmacist, pharmacy technician, or support staff member working in a community pharmacy in Dublin, Ireland. Your professional role and direct experience with Electronic Prescription Services (EPS) make your insights and opinions invaluable to this study.

We identified you through collaboration with local pharmacies. Your expertise and daily interactions with EPS provide a crucial perspective on how these services impact workflow efficiencies, prescription accuracy, and overall satisfaction in the pharmacy environment.

Your participation will help us gather comprehensive data that reflects the real-world experiences and challenges faced by pharmacy professionals like yourself. This, in turn, will contribute to improving the implementation and effectiveness of EPS in community pharmacies across Dublin.

DO YOU HAVE TO TAKE PART?

Please note:

- Participation is voluntary: Your decision to take part in this study is entirely your choice.

- No adverse consequences: If you decide not to participate, there will be no negative consequences for you, professionally or personally.

- Right to withdraw: You can withdraw your consent and discontinue participation at any time without any consequence.

- How to withdraw: If you wish to withdraw from the study, please contact ardratomy165@gmail.com

Your participation is greatly appreciated, but it is entirely up to you whether or not to take part. Your rights and well-being are our priority.

WHAT ARE THE POSSIBLE RISKS AND BENEFITS OF TAKING PART?

Possible Benefits:

1. Professional Contribution: Your insights will help improve understanding and implementation of Electronic Prescription Services (EPS) in community pharmacies.

2. Improved Practices: The findings could enhance pharmacy practices and patient care.

3. Professional Development: Reflecting on your experiences may benefit your professional growth.

Possible Risks:

1. Confidentiality: Minimal risk of data identification. We will anonymize all responses and use secure storage.

2. Psychological Discomfort: Minor discomfort from reflecting on your experiences. You can skip questions or withdraw at any time.

3. Professional Concerns: Sharing opinions might cause concern about repercussions. We assure confidentiality and anonymized reporting.

Mitigation Measures:

- Confidentiality: Strict data protection measures will be in place.

- Support: If you experience discomfort, support resources will be available, and you can withdraw without any consequence.

Your participation will contribute to meaningful improvements in pharmacy operations and patient care, and your well-being will be prioritized throughout the study.

WILL TAKING PART BE CONFIDENTIAL?

Your participation in this study will be kept strictly confidential. Here is how we will ensure your confidentiality and anonymity:

1.Anonymity: All survey responses will be anonymized. Identifiable information will be removed or coded to ensure that individual participants cannot be traced.

2.Data Storage:

- Digital Data: Stored securely on encrypted servers with restricted access.

3.Access to Data: Only the research team will have access to the collected data. Any confidential company data used will have prior authorization.

5. Breaking Confidentiality: Confidentiality may be broken if the researcher has a strong belief that there is a serious risk of harm or danger to the participant or another individual (e.g., physical, emotional, or sexual abuse, concerns for child protection, rape, self-harm, suicidal intent, or criminal activity) or if a serious crime has been committed. In such cases, appropriate authorities will be contacted.

6.Publication: The findings of the study will be reported in a way that does not identify individual participants. Anonymized data may be included in reports and publications.

Your privacy and the confidentiality of your information are paramount. We will take all necessary measures to ensure that your data is protected throughout the study.

HOW WILL INFORMATION YOU PROVIDE BE STORED AND PROTECTED?

Data Storage and Security:

- Location: Digital data will be stored on secure, encrypted servers.

- Security Arrangements: Digital data will be encrypted both in transit and at rest.

- Access: Only authorized members of the research team will have access to the data.

Data Retention Policy:

- Anonymized Data: Survey forms, with all identifying information removed, will be retained for a further two years after my degree is conferred.

- Freedom of Information: Under freedom of information legislation, you are entitled to access the information you have provided at any time.

Your data will be handled with the utmost care and security throughout the research process, ensuring your privacy and the confidentiality of your information.

WHAT WILL HAPPEN TO THE RESULTS OF THE STUDY?

The results of this study will be disseminated as follows:

- Dissertation Submission: The findings will primarily be submitted as part of my dissertation for Master's in Digital Transformation in Life science.

- College Library Access: All dissertation research projects and their content will be made accessible in the college library for academic reference.

- Online Repository: Depending on institutional policies, the dissertation may also be made available in online e-journals or repositories for wider access.

- Conferences: I may present the findings at relevant academic conferences or seminars to share insights with peers and professionals.

- Publications: There is potential for the research to be adapted and submitted for publication in academic journals to reach a broader audience.

- Teaching Use: The findings may inform future teaching materials or courses related to Electronic Prescription Services (EPS) in community pharmacies.

The aim is to contribute valuable insights to the field and facilitate discussions on improving pharmacy practices and patient care through EPS implementation.

WHO SHOULD YOU CONTACT FOR FURTHER INFORMATION?

For further information about this research study, please feel free to contact the primary researcher:

Researcher:

Name: Ardra Vattamkandathil Tomy

Affiliation: Griffith College Dublin

Email: ardratomy165@gmail.com

Additionally, you may contact the supervisor of this study:

Supervisor:

Name: Paul Blunnie

Affiliation: Griffith College Dublin

Email: paul.blunnie@gmail.com

These individuals will be happy to address any questions or concerns you may have about participating in the study or about the research itself.

[THANK YOU]

SURVEY QUESTIONNAIRE

By clicking "I Agree," you consent to participate in this study, understanding that your responses will be confidential and used solely for academic research purposes.

I Agree □

Section 1: Demographics

1. What is your role?

□ Pharmacist

□ Pharmacy Technician

□ Support Staff

2. How many years of experience do you have in your current role?

□Less than 1 year

□ 1-3 years

□ 4-6 years

□More than 6 years

3. How long have you been using Electronic Prescription Services (EPS)?

□Less than 6 months

□6 months to 1 year

□1-2 years

□More than 2 years

Section 2: Prescription Accuracy

4. How has EPS impacted the accuracy of prescriptions?

□Significantly improved

□Somewhat improved

□No change

□Somewhat decreased

□Significantly decreased

5. Please rate the frequency of prescription errors since implementing EPS.

□Much less frequent

□Less frequent

□No change

□More frequent

□Much more frequent

6. Do you find EPS improves communication with prescribers about prescription errors?

□ Strongly agree

□ Agree

□ Neutral

□ Disagree

□ Strongly disagree

Section 3: Pharmacist Satisfaction

7. Overall, how satisfied are you with using EPS?

□Very satisfied

□Satisfied

□Neutral

□Dissatisfied

□Very dissatisfied

8. How would you rate the ease of use of EPS?

□Very easy

□Easy

□Neutral

□Difficult

□Very difficult

9. Does EPS improve your ability to manage medication inventory?

□ Strongly agree

□ Agree

□ Neutral

□ Disagree

□ Strongly disagree

Section 4: Barriers and Challenges

10. How much training did you receive to use EPS effectively?

□ None

□ Minimal

□ Adequate

□ Extensive

11. What are the main challenges you have encountered with EPS? (Select all that apply)

□Technical issues

□Training and support

□Resistance to change

□Cost

□Integration with existing systems

□Other (please specify): ____

12. How often do you experience technical issues with EPS?

□Never

□Rarely

□Sometimes

□Often

□Always

13. What are the most common technical issues you face with EPS? (Select all that apply)

□ System crashes

□ Slow processing

□ Data entry errors

□ Connectivity issues

□ Other (please specify): ____

Section 5: Workflow Efficiency

14. How has EPS impacted the overall workflow efficiency in your pharmacy?

□Significantly improved

□Somewhat improved

□No change

□Somewhat decreased

□Significantly decreased

15. How has the time required to process prescriptions changed since using EPS?

□Much faster

□Faster

□No change

□Slower

□Much slower

16. What is your daily prescription volume since implementing EPS?

□Significantly increased

□Somewhat increased

□No change

□Somewhat decreased

□Significantly decreased

17. How has EPS affected patient waiting times?

□ Significantly reduced

□ Somewhat reduced

□ No change

□ Somewhat increased

□ Significantly increased

18. How has EPS influenced your ability to provide patient counselling?

□ Significantly improved

□ Somewhat improved

□ No change

□ Somewhat decreased

□ Significantly decreased

Section 6: Additional Comments

19. Do you believe EPS contributes to better patient outcomes?

□ Strongly agree

□ Agree

□ Neutral

□ Disagree

□ Strongly disagree

20. How likely are you to recommend EPS to other pharmacies?

□ Very likely

□ Likely

□ Neutral

□ Unlikely

□ Very unlikely

21. How would you rate the user interface of the EPS system?

□ Excellent

□ Good

□ Average

□ Poor

□ Very poor

22. Do you feel EPS helps in identifying potential medication interactions more effectively?

□ Strongly agree

□ Agree

□ Neutral

□ Disagree

□ Strongly disagree

23. How has EPS impacted your workload distribution?

□ Significantly improved

□ Somewhat improved

□ No change

□ Somewhat worsened

□ Significantly worsened

24. Do you receive sufficient updates and information about EPS improvements and changes?

- ☐ Always
- ☐ Often
- ☐ Sometimes
- ☐ Rarely
- ☐ Never

25. Do you have any additional comments or suggestions regarding EPS in your pharmacy?

- [Open-ended text box]

Thank you for participating in this survey. Your responses are valuable and will contribute to improving the effectiveness of Electronic Prescription Services in community pharmacies.