EXPLORING THE FACTORS INFLUENCING THE CONTINUED USE OF MEDICATION EVENT REPORTING SYSTEMS IN COMMUNITY PHARMACIES

by

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Dalhousie University is located in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq. We are all Treaty people.

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ABSTRACT

Medication incidents, also known as medication errors, within community pharmacies (CPhs), persist as significant safety concerns despite the evolution of medication dispensing practices. Understanding and addressing these incidents are crucial for enhancing workflow practices, mitigating risks, and enhancing patient safety. Digital platforms and information systems have emerged to facilitate incident reporting and management, thereby fostering continuous quality improvements in safety protocols. However, despite the imperative and mandatory nature of reporting medication incidents and near misses, the continuous use of these systems to report incidents remain suboptimal. This study delves into the factors influencing the continued use of these systems within CPhs. Grounded in IS Continuance theory and some factors from the Techno-stress model, the proposed research model is designed to elucidate key determinants. Through a survey of 206 pharmacy practitioners, we identify several factors impacting the ongoing use of these reporting systems, including perceived usefulness, confirmation of system expectations, techno-overload, social pressure, and perceived threat. Our findings underscore the complexities surrounding the continuous use of healthcare technologies in community pharmacies. We discuss the implications of these factors for pharmacy practice and academic scholars interested in enhancing our understanding of medication incident reporting and continuous use of these systems.

Keywords: Medication incidents, Near misses, Medication Events Community Pharmacies, Information Systems Continuance Theory, Technostress.

LIST OF ABBREVIATIONS USED

CMB	Common Method Bias
CMERS	Continued Medication Event Reporting System Usage
CONF	Confirmation
CPhs	Community Pharmacies
IS	Information Systems
MERS	Medication Event Reporting Systems
PEU	Perceived Ease of Use
PLS	Partial Least Square
PT	Perceived threat
PU	Perceived Usefulness
SAT	Satisfaction
SEM	Structural Equation Modeling
SP	Social Pressure
TO	Techno-Overload

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CHAPTER 1: INTRODUCTION

Medication incidents are among the most common and detrimental patient safety events. In Canada, deaths resulting from patient safety incidents rank third behind cancer and heart disease (Ledlie et al., 2023). An estimated 12% of emergency department visits and 24% of all MEs that occur in hospitals in Canada are caused by incidents that reach a patient and cause harm (Boucher et al., 2018). Further, it has been reported that approximately one-quarter of all medication incidents occur in community pharmacies (Ledlie et al., 2023). These events not only endanger patient safety but also place a significant financial burden on the healthcare system, the financial impact of these incidents is substantial, with annual costs in Canada estimated at approximately $2.6 billion (Ledlie et al., 2023).

In the healthcare sector, Community Pharmacies (CPhs) serve as readily accessible and cost-effective primary health care providers, offering immediate counseling services to consumers (Etezad et al., 2023). In recent years, their significance has grown with the expansion of pharmaceutical care services, particularly in reviewing and ensuring the appropriate use of medications. CPhs play a crucial role in minimizing medication incidents elevating patient safety, and cutting down on healthcare expenses (Karout et al., 2022). While medication incidents are associated directly with risks, the reporting of medication near-misses (also known as “good catches”) is crucial for the continuous learning of these events, because those have the potential to cause harm to the patient (Haw et al., 2014). In this study, the term "Medication Events (MEs)" refers to all events involving medication incidents that cause harm or not harm to patients, such as the incorrect administration of medication, dosage, or amount, or to those events that are caught and corrected before the medication is administered, which are known as near misses (Boyle et al., 2014).

Pharmacies are ethically committed to minimizing the potential risks of harm to the public related to medication incidents (Boucher et al., 2018). The principle of non-maleficence (i.e., avoid causing harm) in the profession is a key bioethical consideration for pharmacy practitioners who strive to fulfill their duty of promoting and safeguarding the health, well-being, safety, and interests of the public (Boucher et al., 2018). To fulfill this ethical obligation, these practitioners are encouraged and often mandated to document and analyze

such incidents and implement suitable preventive measures (Boucher et al., 2018). The practice of reporting medication events is governmentally regulated and often mandatory in various countries around the world. In Canada, for example, reporting is regulated at the provincial level, with the majority of provinces, including Alberta, British Columbia, Manitoba, New Brunswick, Ontario, and Saskatchewan, requiring the report of medication event as a compulsory practice (British Colombia Pharmacy Association, 2021; College of Pharmacists of Manitoba, 2022; ISMP, 2020; ISMP, 2023; New Brunswick College of Pharmacists, 2018; Ontario College of Pharmacists, 2023)

Medication Event Reporting Systems (MERS) are intended to support pharmacies and healthcare stakeholders in the process of collecting MEs, identifying ME patterns and trends, and creating continuous improvement and learning towards patient safety (Boyle et al., 2013; Boucher et al., 2018). The learning is also expected to happen by fostering a community of sharing of events information across community pharmacies. This collaborative approach is intended to enhance learning and quality improvement activities. As participation grows, the collective pool of data becomes richer, leading to better learning from past events and taking proactive steps to prevent future events (Boyle et al., 2012). In the case of this research, it is important to mention that the Ontario College of Pharmacies, which collaborated in this study, mandates the use of a MERS for reporting medication events. However, despite these collective benefits and obligation of the profession, underreporting of these events remains a significant concern within community pharmacies (Haw et al., 2014; Karout et al., 2022; Rutledge et al., 2018; Vrbnjak et al., 2016).

Prior studies have identified factors that might contribute to the underreporting of medication events in community pharmacies (Barker, 2019; Boucher et al., 2018; Cheema et al., 2017; Khan, 2013; Haw et al., 2014; Karout et al., 2022; Odukoya et al., 2015). Some of these factors include time constraints, complicated reporting procedures, lack of feedback mechanisms and a culture of blame that discourages pharmacy professionals from reporting medication events (Boucher et al., 2018; Haw et al., 2014; Karout et al., 2022; Odukoya et al., 2015). Most of the existing research has employed qualitative methods, such as focus groups and interviews (Barker, 2019; Hohl et al., 2018; Odukoya et al., 2015), or questionnaires informed by exploratory interviews (Karout et al., 2022; Hughes &

Weiss, 2019; Cheema et al., 2017; Khan, 2013), focusing on the understanding of the adoption of the systems or platforms to enable the report of medication incidents. Nevertheless, initial adoption is crucial in exploring the successful introduction of new technologies and systems, the study of continued use of the systems aims at exploring the factors that ensure the systems are effectively used and provide long-term value to users (Bhattacherjee, 2001). This gap is particularly evident when comparing the body of research on initial system adoption (Prakash & Das, 2021; Yan et al., 2021; Kummer et al., 2013; Bhattacherjee & Hikmet, 2007) and continued use (Lu et al., 2023; Alhassan & Adam, 2022; Kaium et al., 2020; Imlawi & Gregg, 2019) in other healthcare sectors. Factors that influence the first adoption of information systems and technology might differ from those that influence the continued use of the systems (Bhattacherjee, 2001; Kaium et al., 2020). As such, the intention to continue using the systems is crucial as a step towards the comprehensive understanding of systems and successful adoption and use of these systems (Bhattacherjee, 2001; Kaium et al., 2020).

To address this gap this study sets out two primary objectives:

1. To identify the key factors affecting the continued use of MERS[1] in CPhs;
2. To propose a research model that could explain and predict the continued use of MERS[1] in CPhs.

The identified factors are grounded on a literature review conducted as part of this investigation and two theoretical frameworks that support the proposed research model, the IS Continuance theory (Bhattacherjee, 2001) and the Techno-stress model (Ragu-Nathan et al. 2008). The proposed research model explores the influence of users' degree of confirmation, perceived usefulness, techno-overload, and perceived ease of use on their satisfaction with MERS. It then delves into how satisfaction, perceived threats, and social pressure influence their intention to continue using MERS.

[1] The use of Medication Event Report Systems (MERS) is directly associated with the report of medication events. The systems were developed to enable, facilitate, and standardize the process of reporting medication events in community pharmacies. As such the outcome can also be interpreted as the "*continued reporting of medication events using MERS*"

The rest of this study proceeds as follows. Chapter 2 sets the context of the research by providing definitions of the main concepts and summarizing the literature on the barriers and facilitators to ME reporting. In Chapter 3, a theoretical model is proposed for examining the factors influencing pharmacy practitioners' intention to continue using MERS. Chapter 4 presents the research methodology and data analysis; followed by Chapter 5 where the findings, theoretical and empirical contributions are discussed. Then, chapter 6 concludes and summarizes the results of this study.

CHAPTER 2: LITERATURE REVIEW

2.1 Definitions

2.1.2 Medication Events

Medication events refer to medication incidents and near misses (also known as good catches) (Haw et al., 2014). Medication incidents are events that could potentially be prevented and may lead to the misuse of medication or harm to the patient when the medication is under the management of healthcare professionals, patients, or consumers (Aubert et al., 2023). These incidents encompass a range of factors including professional practices, drug products, procedures, and systems. They can occur at various stages of delivering the medication such as prescribing, communication of orders, labeling and packaging of medications, compounding, dispensing, distributing, and administering the medications (Aubert et al., 2023). For example, the prescription may have been processed with the incorrect drug or dosage or quantity and delivered to the wrong patient. Near misses are defined as events that could lead to inappropriate medication use or patient harm but were intercepted before reaching a patient (Haw et al., 2014). The reporting and analyses of these events are crucial steps towards the continued development of strategies and processes to help prevent future occurrences (Ledlie et al. 2023).

2.1.2 Medication Event Reporting Practice

The practice of reporting medication events is regulated in various countries around the world. In the United Kingdom, the "Yellow Card Scheme" (YCS) for spontaneous reporting of such events was launched over 50 years ago. Administered by the Medicines and Healthcare products Regulatory Agency (MHRA), the scheme initially invited only doctors and dentists to report. However, by 1999, it had expanded to include both hospital and community pharmacists as reporters of medication events (Cheema et al., 2017; Hughes & Weiss, 2019). In the United States, the National Coordinating Council for Medication Error Reporting and Prevention was established in 1995 by the United States Pharmacopeial Convention (USP). This council brings together leading national health care organizations to collaboratively address the causes of medication errors and promote

medication safety (NCC MERP, 2024). Another example is Saudi Arabia which initiated its pharmacovigilance program in 1998 through the Ministry of Health (Khan, 2013).

In Canada, the 2002 report of the National Steering Committee on Patient Safety recommended improvements in patient safety, including the adoption of non-punitive reporting policies and investment in infrastructures for standardized patient safety data reporting and tracking (ISMP, 2005). However, the mandate to report medication events in community pharmacies is regulated provincially in Canada. Several provinces have implemented or are in the process of adopting quality management systems that include mandatory event reporting to an independent third party (Aubert et al., 2023). Mandatory event reporting began in 2010 with Nova Scotia taking the lead and since then, this initiative has progressively gained traction across Canada (Barker et al., 2019). Following Nova Scotia, Saskatchewan implemented mandatory reporting in 2017, while Alberta, New Brunswick, and Ontario joined in 2018. Manitoba followed suit in 2021, and British Columbia in 2022. Newfoundland is expected to mandate event reporting by July 1, 2024 (British Colombia Pharmacy Association, 2021; College of Pharmacists of Manitoba, 2022; ISMP, 2020; ISMP, 2023; New Brunswick College of Pharmacists, 2018; Newfoundland & Labrador Pharmacy Board, 2023; Ontario College of Pharmacists, 2023).

Reporting medication events in community pharmacies is an important component of Pharmacies' Quality Management Program (QMP) (NBCP, 2018) aimed at ensuring patient safety. This process generally involves reporting, responding, and maintaining a culture of safety. A robust medication incident reporting system allows community pharmacies to identify and address potential risks and errors in the medication use process, thereby preventing harm to patients. However, the lack of reporting can have serious consequences, including compromised patient safety, missed opportunities for learning and improvement, diminished trust and reputation, legal and liability risks, and inefficient resource allocation. Studies have highlighted the importance of medication incident reporting in enhancing patient safety outcomes (Vincent et al., 2019) and have underscored the need for comprehensive reporting systems to facilitate organizational learning and quality improvement (Härkänen et al., 2019). Therefore, fostering a culture of transparency, accountability, and continuous improvement in medication safety practices is essential in

community pharmacy settings to ensure the timely identification and mitigation of medication-related risks (NBCP, 2018; Härkänen et al. 2019).

2.1.3 Medication Event Reporting Systems in Canada

Medication Event Reporting Systems (MERS) are software applications or digital platforms designed to collect, store, and analyze medication events (ISMP, 2021). These systems are usually managed by independent third parties that ensure the data to be securely shared with the Canadian Medication Incident Reporting and Prevention Systems (CMIRPS). The CMIRPS is a collaboration that spans across Canada, involving Health Canada, the Canadian Institute for Health Information (CIHI), the Institute for Safe Medication Practices Canada (ISMP Canada) and the Canadian Patient Safety Institute (CPSI) (NBCP, 2018).

Among the two most common MERS in Canadian Community pharmacies are the Canada Community Pharmacy Incident Reporting (CPhIR) and Pharmapod with the latter being implemented by approximately 65% of community pharmacies across Canada (ISMP, 2021). These systems standardize data collection by asking reporters to provide details on the nature of the event (such as incorrect drug, dose, patient, or quantity), its timing (the stage or step of the process, like prescribing or dispensing), contributing factors (such as potential variables present at the time of the incident, like interruptions or distractions), and the level of patient harm (indicating whether the incident reached the patient and the extent of harm caused) (Aubert et al., 2023).

2.2 Review on Barriers and Facilitators of Medication Event Reporting

An initial step in exploring the barriers and facilitators of ME reporting in CPhs was to conduct a literature review. I searched through Google Scholar, Scopus, and PubMed, using keywords like 'Medication error', 'report*', 'incident', 'community pharma*', and others related to barriers and facilitators. My focus was on English-language journal articles and empirical papers published between 2007 and 2023. The initial search of these articles yielded 55 papers. Upon a more focused review, I narrowed these down to only 21 papers that specifically focused on identifying barriers and facilitators to ME reporting. The remaining papers, if related to community pharmacies, explored topics like patient

outcomes, medication incident trends, stages and types, workplace stress, and fatigue (e.g., Boyle et al., 2012; Boyle et al., 2014; Boucher et al., 2018; Cheung et al., 2014; Cousins et al., 2012; Etezad et al., 2023; Huckels-Baumgart & Manser, 2014; Jacobs et al., 2013; Joseph et al., 2021; Knudsen et al., 2007; Ledlie et al., 2023). Of the 21 studies focusing on barriers and facilitators, 9 studies addressed these issues in community pharmacies (e.g., Barker, 2019; Boyle et al., 2011; Boyle et al., 2014; Boyle et al., 2016; Cheema et al., 2017; Hughes & Weiss, 2019; Karout et al., 2022; Khan, 2013; Odukoya et al., 2015). The other studies investigated reporting practices in varied healthcare settings, involving professionals like nurses, midwives, physicians, clinicians, and hospital pharmacists (e.g., Alblowi et al., 2021; Haw et al., 2014; Hohl et al., 2018; Karsh et al., 2006; Mirghafourvand et al., 2021; Mohammadbeigi et al., 2021; Rutledge et al., 2018; Samsiah et al., 2020; Soydemir et al., 2016; Vrbnjak et al., 2016; Williams et al., 2013). The geographical diversity of these studies, spanning countries like Lebanon, Turkey, Iran, the USA, the UK, Saudi Arabia, Malaysia, and Canada, offers a comprehensive global perspective on the challenges and facilitators of medication incident reporting.

We identified themes in the literature that shed light on the multifaceted nature of reporting behaviors and the need for comprehensive strategies to improve ME reporting practices in community pharmacy settings. A summary of the findings is presented in the next paragraphs and a table with more details of the studies can be found in the appendices (See Appendix A).

One of the most salient themes in the literature review is the lack of an efficient reporting system coupled with clear national policies to encourage the report of medication events. Research conducted within community pharmacies in Lebanon highlights the absence of an efficient reporting system significantly hinders the capacity to learn from errors and implement preventative measures. The lack of a valid and well-recognized reporting system, combined with a lack of mandatory obligation prevents pharmacy staff from reporting owing to system inefficiencies or restricted access to necessary reporting tools (Karout et al., 2022). Another study focusing on community pharmacists in Wales calls for the standardization of the reporting process through the adoption of structured reporting

systems. It underscores the need for more precise policies or guidelines that clearly outline the reporting procedure and set clear expectations for pharmacists (Hughes & Weiss, 2019).

Evidence indicates that the complexity of reporting forms significantly hinders the implementation of medication event reporting. Reporting forms are often perceived as cumbersome and involve navigating through multiple webpages, contributing to the underreporting of medication errors (Khan, 2013; Williams et al., 2013; Karsh et al., 2006). For example, hospital pharmacists in the United Kingdom state that the detailed reporting requirements required for each report discourage pharmacists from using existing reporting mechanisms (Williams et al., 2013). The perceived effort required to complete these forms significantly reduces reporting rates (Karsh et al., 2005).

Clarity of definitions for incident reporting and near-misses emerged as another theme in my review, pointing to the complexities in understanding the medication reporting process. This complexity and confusion are largely attributed to the lack of uniformity in the definitions of medication incidents and near-misses (Haw et al. 2014; Cheema et al. 2017). For example, a study investigating the barriers to reporting medication administration events found that underreporting is partly due to a lack of knowledge about what constitutes an incident or near-miss and the procedures for reporting these events (Haw et al., 2014). Similarly, research focused on community pharmacies in the United Kingdom identified that perceiving an incident as not serious enough acts as a significant barrier to reporting (Cheema et al., 2017). Both studies highlight a deficiency in knowledge that prevents the accurate categorization and reporting of medication events. This suggests that improving the reporting of medication incidents and near-misses requires addressing these barriers by enhancing clarity and understanding around what should be reported and how to report it (Cheema et al., 2017).

Feedback mechanisms play a pivotal role in enhancing the confidence of healthcare professionals in reporting systems. Williams et al. (2013) noted that when hospital pharmacists saw improvements and received constructive feedback post-reporting, their trust in the system increased. This sentiment is recognized across various healthcare settings. For example, Samsiah et al. (2020) highlighted how the presence of constructive feedback can encourage medication event reporting in Malaysian primary care clinics.

Vrbnjak et al. (2016) further highlighted the importance of a robust feedback mechanism, where reporters are updated on the outcomes or actions taken based on their reports. These feedback loops highlight the importance of the reporting process, emphasizing its perceived value.

A recurring theme across multiple studies is the prevailing culture of blame and the associated fear of reprisal. Without the assurance of confidentiality, healthcare professionals may hesitate to report incidents due to concerns about potential repercussions (e.g., Vrbnjak et al., 2016; Karout et al., 2022; Khan, 2013). For instance, pharmacists have voiced fears of blame from patients, colleagues, or employers, leading to a reluctance in reporting (Karout et al., 2022). This hesitancy is further exacerbated by the lack of a supportive professional environment that encourages open discussions about medication incidents (Khan, 2013). Williams et al. (2013) highlighted that hospital pharmacists' relationships with other healthcare professionals can influence their decision to report. To address these concerns, Mirghafourvand et al. (2021) suggested the implementation of anonymous reporting systems, the creation of a safe working environment, and fostering positive managerial relationships as potential solutions to promote consistent reporting. A similar finding was reported in a study from Malaysian primary care clinics, where apprehension was identified as a significant barrier to reporting (Samsiah et al., 2020).

Time constraints also emerged as a prominent theme. The demanding nature of pharmacists' roles, coupled with tight schedules, often leaves them with little time to engage in the reporting process (Cheema et al.,2017; Hughes & Weiss, 2019; Khan, 2013). The desire for a more streamlined reporting system was evident, with participants advocating for a swift and efficient process. They prefer a process that ideally takes no more than 5 minutes, with a strong preference for a 2-minute duration (Karsh et al., 2005). Community pharmacists often perceive the reporting process as time-consuming, which can deter them from reporting even when they identify a medication event (Khan, 2013). Some pharmacists suggested that remuneration might compensate for the time and effort expended in reporting (Hughes and Weiss, 2019).

Some of these concerns were addressed with the adoption of digital platforms that aimed at facilitating the report of medication incidents in terms of enabling a more efficient

process of reporting and providing regulatory bodies (e.g., college of pharmacies) with standardized data suitable for analytical processes (Boucher et al., 2018; ISMP, 2021). However, despite the adoption of digital platforms to address some of the prior concerns and often the dictated mandatory nature of the reporting, limited report of medication incidents as well as underutilization of digital platforms for reporting prevails as a challenge to develop reliable quality assurance programs to foster patient safety (Aubert et al., 2023; Ledlie et al., 2023). Thus, the interest of this research centers on exploring the factors that contribute to the continued use of digital platforms (also known as MERS in this thesis) after initial adoption has taken place in a mandatory context.

Given the importance of these issues, the next section will discuss a summary of similar studies conducted in healthcare settings and followed a theoretical and quantitative approach. Following this discussion, a research model and hypotheses are proposed.

CHAPTER 3: THEORETICAL BACKGROUND AND RESEARCH MODEL

This chapter presents the theoretical background that supports the proposed research model and an additional literature review of the factors influencing the continued use of medication event reporting systems.

3.1 Theoretical Review on Information Systems Continuance Use in Healthcare

This study is rooted on the IS Continuance Theory (ISCT), a theoretical extension of technology adoption and acceptance theories. This theory focuses on understanding why individuals persist or cease using a technology once it is adopted (Bhattacherjee, 2001). ISCT is derived from the Expectation-Confirmation Theory (ECT) in consumer behavior context integrated with prior IS usage research to theorize a model of IS continuance (Bhattacherjee, 2001). The IS continuance model assumes that after initial adoption, a user's satisfaction with the technology and perception of system usefulness may change, so that users may either repeat the use or discontinue use of the technology. The central difference between ISCT and the initial acceptance models is that the satisfaction with the technology is shaped by the alignment of their initial expectations with their actual experiences using the system (Bhattacherjee, 2001). That means that users' continuance intention is determined by their satisfaction with IS use and perceived usefulness of continued IS use. User satisfaction, in turn, is influenced by their confirmation of expectation from prior IS use and perceived usefulness. Post acceptance perceived usefulness is influenced by users' confirmation level (Bhattacherjee, 2001).

Research has applied ISCT in the healthcare contexts (Lu et al., 2023; Alhassan & Adam, 2022; Yan et al., 2021; Kaium et al., 2020; Imlawi & Gregg, 2019; Cho, 2016). For instance, Yan et al. (2021) investigated the factors influencing continuance intention for health app in China. They found that factors such as perceived usefulness, perceived ease of use, flow experience and behavioral change techniques are significant predictors of intentions to continue using the health applications. Another study by Lu et al. (2023) examined the user continuance intention to use telemedicine applications during the COVID-19 pandemic in Indonesia revealed that health stress as an emotion can positively

affect perceived usefulness and satisfaction in relation to the continuous intention to use mobile health apps.

The IS Continuance Theory specifically addresses factors influencing users' decisions to continue using information systems over time, rather than just their initial adoption. Since the digital platforms for reporting medication incidents (MERS) have already been implemented, understanding why they may be underutilized despite their availability and mandated use requires examining factors related to continued use. These factors are related to user satisfaction, perceived usefulness, system quality, and external influences and organizational context.

The theory posits that users' satisfaction and perceived usefulness of an information system are key determinants of continued use. If pharmacy practitioners perceive the digital reporting platforms as easy to use, valuable for their workflow, and effective in facilitating incident reporting, they are more likely to continue using them. Conversely, if the platforms are perceived as cumbersome or lacking in utility, pharmacists may discontinue their use.

In the context of this study, community pharmacies are mandated to utilize MERS as dictated by regulatory guidelines of several provinces in Canada (e.g., Ontario College of Pharmacies). The concept of continuance in the context of information systems, where usage is mandatory, might appear unnecessary at first glance because users often do not have the option to discontinue use. However, the implications of "continuance" or "discontinuance" take on different meanings in a mandatory setting. Bhattacherjee (2001) discusses continuance in voluntary settings as a matter of the user's will or lack of will to keep using a system. In mandatory environments, the absence of a will to continue does not typically result in ceasing to use the system. Instead, it may lead to dissatisfaction with the IS, which could then manifest as underutilization or inefficient use (Sørebø & Eikebrokk, 2008). It could result in underreporting or reporting of minimal information through medication event reporting systems in community pharmacies.

According to Ajzen (1991) when individuals lack the freedom to choose their engagement with a specific behavior—in this case, the use of MERS to reporting medication event—various internal or external factors may prevent them from engaging in the intended behaviour. The literature identifies numerous factors, often termed as barriers, that obstruct

the continued use of MERS. In the next section, I will discuss them from the perspective of theory.

3.2 Techno-stress Model in Healthcare Context

To address the challenges and barriers to continued reporting through MERS, I integrated concepts from the technostress model into the research model. Techno-stress model provides a theoretical lens that has recently been applied in understanding the inhibitors or resistance to use technology or information systems in healthcare settings. A study by Ragu-Nathan et al (2008) identifies five types of technostress, namely techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty, as creating stress. People experience techno-overload when they appraise stressful situations that require them to work longer and faster. Techno-invasion occurs when people are constantly connected outside the workplace. As a result of techno-complexity, users feel inadequate about their technology skills (Tarafdar et al. 2011). Techno-insecurity is when users fear that they may lose their jobs due to using technologies (Tarafdar et al. 2011, p. 119). A techno-uncertainty concerns the pace of technology change (Ragu-Nathan et al., 2008).

While little is known about the techno stressors that may hinder the use of medication reporting, prior research has identified several related stressors among other healthcare professionals such as nurses (Lauwers & Giangreco, 2016; Califf et al., 2020), physicians (Liu et al., 2017), and other healthcare workers (Gaube et al., 2021). For example, a study by Califf et al. (2020) aimed to provide a comprehensive understanding of technostress among hospital nurses by examining both the positive and negative aspects of technology use. They revealed that techno-overload and techno-insecurity were associated with low job satisfaction and high turnover rates among nurses. Another study by Gaube et al. (2021) found that participants who reported experiencing techno-overload felt strained and slightly less satisfied with their jobs. In Gaube et al. (2021) study, perceived usability affects healthcare workers only when it reduces the technostress. In this case, the respondents are better able to adapt to their system and their jobs.

In the context of underutilized digital reporting platforms, pharmacists may experience the similar stressors such as fear of negative consequences of incident reporting and their confidentiality, the complexity of reporting forms and processes, as well as increased

workload due to additional reporting requirements which could be related to the techno stressors. As such, techno-overload and techno-insecurity are particularly relevant factors explaining and predicting the continued use of digital platforms to report medication incidents in community pharmacies due to the unique characteristics of the pharmacy environment and the nature of medication incident reporting. Techno-overload is particularly pertinent as it addresses concerns related to the complex processes, multiple forms and many options to fill out inherent in reporting systems, which can lead to additional workload and time constraints. The introduction of digital platforms for reporting medication incidents may add to this workload, especially if the platforms require additional data entry or administrative tasks. Techno-overload occurs when individuals feel overwhelmed by the volume of information and tasks generated by technology, leading to stress and reduced effectiveness. In the context of medication incident reporting, pharmacists experiencing techno-overload may be less inclined to use the digital platforms due to concerns about increased workload and time pressure (Tarafdar et al., 2011).

Techno-insecurity refers to individuals' feelings of vulnerability or anxiety about their ability to effectively use technology. In the context of community pharmacies, pharmacy practitioners may experience techno-insecurity if they perceive the digital reporting platforms as essential tools for ensuring medication safety and regulatory compliance. Fear of not using these platforms effectively or breaching any confidentially in reporting medication incidents could lead to concerns about job security, especially if there are strict regulatory requirements or consequences for non-compliance. This dimension encompasses concerns about potential threats of replacement or loss of professional autonomy (Tarafdar et al. 2011; Prakash & Das, 2021), which could be important considerations in the pharmacy context.

The other dimensions of techno-stress, namely techno-invasion, techno-complexity, and techno-uncertainty, are considered less relevant to this study. Techno-invasion, which involves being constantly connected to technology outside the workplace (Tarafdar et al., 2011), is not typically applicable in the community pharmacy context. Techno-complexity, relating to users feeling inadequate about their technology skills, is addressed in this study through the construct of perceived ease of use, which overlaps with the concept of

complexity. Finally, techno-uncertainty, concerning the pace of technology change (Ragu-Nathan et al., 2008), is less of a concern in community pharmacies where the utilization of MERS, provided by third-party organizations, standardizes the reporting process. The pace of technology change in such systems is not typically rapid, as the Institute for Safe Medication Practices collects reports retrospectively from healthcare institutions across Canada, allowing for a more stable technological environment (Ledlie et al., 2023).

3.3 Development of Hypotheses

According to ISCT the 'Perceived Usefulness (PU)' has been defined as users' perception of the expected benefits of the particular system use. ISCT highlights the significance of perceived usefulness in shaping users' intentions to continue using a system (Bhattacherjee, 2001). In the case of MERS, users who find the reporting systems efficient and useful in their performance to enhance patient safety are more likely to report medication events using the system in the future.

Additionally, the PU tends to be positively associated with the user's satisfaction with a system for continued use (Bhacteurjee, 2001). Perceived usefulness influences the affective dimension of satisfaction through its contribution to facilitating task completion or performance improvement. As long as the user is satisfied with the system, i.e., has a positive experience with the system, the user is likely to continue to use the system (Battacherjee, 2001; Locke, 1976; Oliver, 1981). Prior research supported PU's direct influence on continued usage of system as well as on satisfaction in the case of healthcare (Yan et al., 2021; Cho, 2016). Our literature review also emphasizes the importance of efficient reporting systems that may increase the willingness to report via systems in various studies (Haw et al., 2014; Hughes & Weiss, 2019; Karout et al., 2022).

In mandatory contexts, users' perceived usefulness and satisfaction with the system still play a crucial role. Even if usage is mandatory, users are more likely to engage with the system if they perceive it as beneficial and valuable in fulfilling their job responsibilities. If the system provides functionalities that streamline tasks, improve efficiency, or contribute to better outcomes, users are more likely to view it as useful and be motivated to continue using. That is, better outcomes can be interpreted as users' perception of a

positive association between reporting medication incidents and different dimensions of improving patient safety (Hedrén, 2021; Backe, 2017).

Satisfaction reflects users' overall contentment and positive experiences with the system. Even in situations where system use is mandatory, users' satisfaction with the system's performance, usability, and user experience influences their willingness to engage with it effectively. Users who find the system intuitive, reliable, and user-friendly are more likely to feel satisfied and develop positive attitudes toward its use, leading to greater acceptance and continued engagement over time (Hedrén, 2021; Backe, 2017).

Based on these considerations, this study proposes the following hypotheses:

H1. Perceived Usefulness is positively associated with the intention to continue using MERS in Community Pharmacies.

H2. Perceived Usefulness of MERS is positively associated with the perceived satisfaction with MERS.

In the ISCT, the notion of 'Confirmation' plays a pivotal role. This concept is understood as a cognitive belief reflecting the degree to which a user's initial expectations regarding the IS are met during actual use (Bhattacherjee, 2001). This belief is not static; rather, it evolves based on the user's accumulated experiences with the system. The level of the confirmation influences future engagement with the system by affecting user satisfaction. This influence manifests as a dynamic feedback loop, where the user's beliefs, satisfaction, and intentions are in a state of continuous evolution, beginning from the initial adoption and extending to its long-term use or potential discontinuation. This evolving nature of user perceptions highlights the significance of the confirmation in shaping long-term use of a system (Bhattacherjee, 2001). The significance relationship of confirmation on satisfaction is consistent with prior studies on mobile health apps (Cho, 2016; Kaium et al., 2020). Accordingly, it is reasonable to speculate that when pharmacists confirm that their expectations from the reporting system are being met, and they see the tangible benefits of their reporting, their satisfaction with the system is likely to increase. Therefore, this study proposes the following hypothesis:

H3. Confirmation is positively associated with satisfaction with MERS.

The ISCT demonstrates that confirmation plays a significant and positive role in shaping PU (Bhattacherjee's, 2001). This relationship indicates that how well a system aligns with users' expectations directly influences their assessment of its usefulness. When a system either meets or exceeds these expectations, it is typically perceived as more useful by users. Hong et al. (2006) supports this notion, suggesting that users' initial perceptions of usefulness can be recalibrated based on their confirmation experiences, particularly when users are initially uncertain about what to expect from using a system or have benefit from the system usage. In the specific context of MERS, this theory can be applied to understand how pharmacists' perceptions evolve with the use of such systems. After a period of initial usage, pharmacists can gauge their level of confirmation – assessing whether the system has fulfilled their initial expectations in various aspects such as enabling an easier reporting and finding value from the reporting. This assessment is crucial as it influences their perception of the system's usefulness. Consequently, this study proposes the following hypothesis:

H4. Confirmation is positively associated with perceived usefulness of MERS.

Techno-overload is characterized by too much information and difficulties using digital platforms for daily work, according to the technostress model (Ragu-Nathan et al., 2008). As a result, users struggle with digital systems for accessing and entering information that are too much for them (Ragu-Nathan et al., 2008). As a result of feeling overwhelmed, employees are often forced to work more and faster to meet increased demands, resulting in increased stress and dissatisfaction (Ragu-Nathan et al. 2008). A study that explored the dual nature of factors influencing technology usage found that inhibitors of technology use are qualitatively distinct from facilitators. Technology usage decisions may be influenced more by these inhibitors, with unique antecedents and consequences (Cenfetelli, 2004). In this way, prior research has found that techno-overload significantly impacts end-user satisfaction and performance, potentially reducing their commitment to continue using the system (Tarafdar et al., 2010; Ragu-Nathan et al., 2008; Ayyagari, 2011).

In healthcare settings, the techno-overload has been mentioned in previous research. For instance, hospital health workers experiencing techno-overload reported feeling strained and less satisfied with their job, as the health information technology demanded them to

work faster and for longer periods (Gaube et al., 2021). Similarly, hospital nurses identified the extra time required for documentation as a barrier to reporting (Rutledge et al., 2018). When it comes to community pharmacies, pharmacists often find the process of reporting through MERS to be burdensome and overwhelming. The multiple and long reporting forms, with their numerous mandatory and voluntary fields, and extra information that they often fill in, add to their workload. This, combined with the workload pressure of their roles, means that medication events may not be reported as frequently as necessary (Boyle et al., 2016; Khan, 2013; Williams et al., 2013). The demanding nature of pharmacists' roles, along with their tight schedules, often results in them exerting extra effort and time to engage in the reporting process, which aligns with the concept of techno-overload (Khan, 2013; Samsiah et al., 2020; Hughes & Weiss, 2019; Cheema et al., 2017). As a result of these insights, techno-overload can be viewed as an inhibitor of system usage that explains the challenges associated with MERS continuance acceptance. Therefore, this study hypothesizes:

H5. Techno-overload is negatively associated with satisfaction with MERS.

Perceived Ease of Use (PEU), as defined by Davis (1989), refers to the extent to which an individual believes that using a particular system would require minimal effort. It primarily taps into the self-efficacy dimension, influencing users' decisions to accept and continue using systems (Hong et al., 2006). While Bhattacherjee (2001) initially posited a non-significant effect of PEU on satisfaction within the ISCT, subsequent research by Hong et al. (2006) has highlighted its notable impact on both user satisfaction and the intention to continue using Information Systems. Therefore, perceived ease of use is a part of our model. In the MERS setting, it is anticipated that pharmacists will show higher satisfaction and an increased intention to continue using MERS if they find the system straightforward and user-friendly. This is supported by studies which highlight that complex reporting forms and procedures can hinder effective MERS usage, leading to dissatisfaction among pharmacists (Khan, 2013; Williams et al., 2013). Based on these considerations, this study proposes two hypotheses:

H6. Perceived Ease of Use is positively associated with satisfaction with MERS.

H7. Perceived Ease of Use is positively associated with the intention to continue using MERS.

According to the technostress model, techno-insecurity refers to people who feel insecure about technology and fear losing their jobs (Ragu-Nathan et al., 2008). Moreover, insecurity is associated with coworkers' reluctance to share and discuss technology-related knowledge (Ragu-Nathan et al. 2008). In the context of healthcare, the notion of techno-insecurity, as originally defined in the technostress model, has been explored in several research (Califf et al., 2020; Liu et al., 2017). However, for this study, I have chosen to focus on the concept of perceived threat instead of techno-insecurity, as this term is more commonly used in healthcare studies. This shift in terminology is consistent with the broader understanding within healthcare research, where perceived threat refers to healthcare workers' concerns about the fear of repercussions associated with using health information technologies. For instance, medical practitioners have shown resistance to adopting diagnostic decision support systems, primarily due to the perceived threat of job loss, reduced income, or a loss of professional autonomy (Prakash & Das, 2021). Similarly, the reluctance of physicians to use computerized physician order entry systems has been linked to perceived threats, including fears of being replaced, losing power, or control over organizational resources (Bhattacherjee & Hikmet, 2007). In the nursing field, the perceived threat of blame, retribution, and professional humiliation has been identified as a significant barrier to error reporting (Alblowi et al., 2021).

Similarly, in community pharmacies, the perceived threat often arises from internal and external pressures, including an unsupportive corporate culture, fear of punishment for reported events, and concerns about the anonymity of reports (Boyle et al., 2014; Williams et al., 2013). These factors can deter pharmacists from using MERS due to potential negative consequences such as accountability, reputation damage, or punitive actions (Vrbnjak et al., 2016; Karout et al., 2022; Khan, 2013). The perceived threat, therefore, directly influences pharmacists' willingness to engage with the reporting system and can affect their intention to continue its use. Therefore, this study hypothesizes that:

H8. Perceived Threat will negatively affect the intention to continue using MERS.

Social influence shapes individuals' intentions toward technology use. This influence is defined as the extent to which users perceive the importance of using a particular technology based on the perceptions of their social circle, including peers and superiors. This concept emphasizes the role of external social factors in technology usage decisions (Venkatesh et al., 2012). While social influence might not be significant in voluntary scenarios, it gains importance in situations where technology use is mandatory (Venkatesh et al., 2003). The significant influence of social influence on the continuance usage intention of technology was supported by studies in the context of social networking (Al-Debei et al., 2013; Yoon and Rolland, 2015; Zhou and Li, 2014). For instance, Zhou and Li (2014) found that the continuance usage of mobile social network services in China was influenced by social influence. In the healthcare context, the endorsement and validation from professional peer groups are also important in influencing individuals' decisions to adopt new systems (Alhassan & Adam, 2022; Boyle et al., 2016; Prakash & Das, 2021; Vrbnjak et al., 2016). This form of social pressure is further supported by studies showing that social influence may impact individuals' psychological states and the continued use of health technologies (Kaium et al., 2020; Yan et al., 2021). For example, Kaium et al. (2020) demonstrated that social influence significantly impacts the rural elderly's continuance usage of mobile health services in Bangladesh. While Yan et al. (2021) found that this effect was not as strong in the continuance usage intention between health app users from China.

Given these insights, it is therefore possible that pharmacy practitioners' intention to continue using MERS may be influenced by the opinions of those in their social and professional circles (Boyle et al., 2016). As a direct determinant of intention, social influence has been referred to by different names (subjective norm, social factors, and image). However, given the mandatory nature of the using MERS in community pharmacies, I will choose the term social pressure in this study. Consequently, it is important to understand the dynamics of social pressure that influence the continued use of MERS in community pharmacies. Therefore, this study hypothesizes that:

H9. Social Pressure will positively affect the intention to continue using MERS.

In ISCT, satisfaction is a state of enjoyment or positive emotion resulting from one's interaction with a system or service (Bhattacherjee, 2001). An individual's intent to

continue using a technology is greatly enhanced by their positive initial experiences. Having such positive experiences at the adoption phase reinforces their attitudes towards the system, resulting in a cycle of continued use (Cho et al., 2009). In the context of MERS, user satisfaction could emerge as an important factor in determining the long-term use of these systems. For example, when pharmacies practitioners feel satisfied with the system - either because the system is easy to use and because they perceive a value with the process and outcomes of reporting medication- it is expected that these practitioners would remain engaged with the system on an ongoing basis. Thus, we propose the following hypothesis:

H10. Satisfaction with MERS will positively affect the intention to continue using MERS.

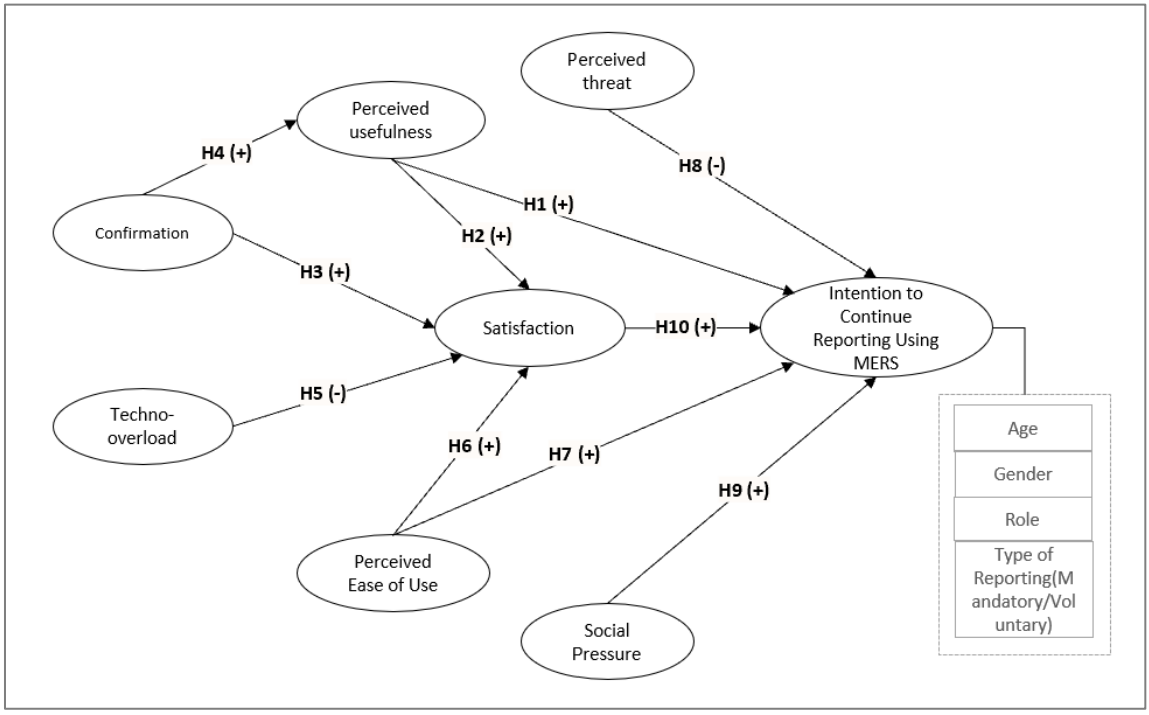

Figure 1. Research Model

CHAPTER 4: RESEARCH METHODOLOGY

This chapter presents the research methodology used to collect and analyze the data. The data was collected with an online survey and the Partial Least Squares (PLS), and thematic analytic techniques were used to analyze the data.

4.1 Samples and Data Collection

I collected the data in collaboration with the Ontario College of Pharmacists (OCP), the regulatory and registering body for pharmacy practitioners in Ontario, Canada's largest province. In 2018, the OCP initiated the Assurance and Improvement in Medication Safety (AIMS) Program, targeting the reduction of patient harm caused by medication events in the approximately 4,700 community pharmacies across Ontario. It mandated that all pharmacy practitioners in Ontario's community pharmacies follow specific protocols, including reporting, documenting, analyzing, and sharing insights from medication-related events (Ledlie et al., 2023). A critical part of the OCP's mandate is to facilitate the safe use of medications. This involves encouraging practitioners to learn from medication incidents and near misses to prevent future events. The OCP also endorses the reporting of medication incidents to authoritative bodies like the Institute for Safe Medication Practices Canada or the Canadian Medication Incident Reporting and Prevention System (Ontario College of Pharmacists (OCP), 2023).

After receiving Ethics clearance and going through a screening process internal at OCP, OCP shared the list of pharmacy practitioners registered with the college. Invitation emails were sent to these practitioners during December 2023 and January 2024. To ensure a common understanding among participants, the screening section of the survey provided brief information about key terms such as medication incidents, near misses, and the standardized digital platforms used for reporting these events. I used the term “standardized digital platforms” in the survey to refer to Medication Event Reporting Systems (MERS) because practitioners refer to these systems as platforms. Participants were then asked, “Do you use the standardized digital platforms to report medication events in your pharmacy practice?”, with only those responding affirmatively were invited to proceed with the survey. As a token of appreciation for participating, each participant had the option to enter a draw for a $50 gift card by providing their email address at the end of the survey.

Ten participants randomly selected to receive a gift card and these emails were not linked to their responses.

The minimum sample size for statistical analysis using Partial Least Squares (PLS) is calculated by multiplying the number of relationships between variables by ten (Hair et al., 2011). In this study, with 10 relationships identified and not accounting for control variables, the minimum sample size is determined to be 100 (10 relationships x 10). This mount consists of 140 points (14 x 10) when the links from four control variables are taken into account. However, to ensure sufficient statistical power, the study targets a minimum of 200 usable responses.

The data collected came from 285 participants. To enhance the reliability of the results and reduce respondent bias, any incomplete responses or responses completed in under 120 seconds were omitted. This led to a final count of 206 usable responses, which surpasses the minimum required sample size. Of the participants, 58.74% were male, 39.32% were female, and 1.94% chose not to disclose their gender. The most common age group among respondents was 30-39 years. Notably, over 85% of the respondents were designated managers, staff pharmacists, or pharmacy technicians. Additionally, 64% of the respondents had been working with MERS for a period ranging from 1 year to 5 years. Comprehensive demographic details are provided in Table 1.

Table 1. Descriptive Statistics of participant demographic (N=220)

Variable	Category	Frequency	Ratio (%)
Age group	18-29	17	8.25%
	30-39	71	34.47%
	40-49	50	24.27%
	50-59	45	21.84%
	>60	23	11.17%
Gender	Male	121	58.74%
	Female	81	39.32%
	Transgender	0	0.00%
	Non-binary	0	0.00%
	Genderqueer	0	0.00%
	Genderfluid	0	0.00%
	Two-Sprit	0	0.00%
	Prefer not to say	4	1.94%
Role	Designated Manager	54	26.21%
	Staff Pharmacist	86	41.75%
	Pharmacy Owner	17	8.25%
	Pharmacy Assistant	0	0.00%
	Pharmacy Technician	38	18.45%
	Consultant Pharmacist	7	3.40%
	Relief Pharmacist	0	0.00%
	Interns	3	1.46%
	Others	1	0.49%
How long	Less than 6 months	6	2.91%
	6 months to 1 year	14	6.80%
	1 – 5 years	132	64.08%
	5 – 10 years	11	5.34%
	More than 10 years	43	20.87%

4.2 Measurement

In this study, all variables, including control variables, were measured reflectively using multiple items. The definitions of these constructs are detailed in Table 2. The measurement items for each construct were adapted from existing literature and tailored to suit the specific context of MERS in community pharmacies. A comprehensive summary of these measurement items is provided in Appendix B. The survey employed a closed-end format, predominantly utilizing a seven-point Likert scale for responses. This scale ranged from "strongly disagree (1)" to "strongly agree (7)", with a midpoint of "Neither Agree nor Disagree (4)". However, for measuring the "Satisfaction" construct, the scales such as "very dissatisfied (1)" to "very satisfied (7)" were used. To enhance the validity of the responses, one reverse-coded item was included in the “Continued Usage Intention” construct. This was done to identify and exclude responses from participants with low attentiveness. Additionally, demographic information such as age, gender, role, and duration of MERS usage were collected and considered as control variables in this research.

In addition to these quantitative measures, the survey also included two optional open-ended questions aimed at eliciting qualitative insights into factors that could either encourage or discourage pharmacy practitioners from reporting medication events using the MERS. These qualitative responses were subjected to thematic analysis to identify common themes or categories, providing a deeper understanding of the factors influencing the use of the system.

Table 2. Conceptual definitions and measurement of constructs

Construct	Definition	Reference
Perceived usefulness	Users' belief that utilizing a MERS will enhance their performance in reporting events at the pharmacy.	(Bhattacherjee, 2001; Cho et al., 2009; Venkatesh et al, 2003)
Perceived ease of use	Users believes that using a MERS would require minimal effort.	(Venkatesh et al, 2003; Prakash & Das, 2021)
Confirmation	Users' cognitive belief based on the extent to which users' expectations of MERS are met during its actual usage.	(Bhattacherjee, 2001)
Social pressure	The perceived pressure from superiors and peers on individuals to use the MERS.	(Venkatesh et al, 2003; Cho et al., 2009)
Techno-overload	Users are overwhelmed with more information than they can manage efficiently and effectively while using the MERS.	(Tarafdar et al. 2010)
Perceived threat	Users' belief that the use of MERS for reporting events creates a sense of job insecurity, leading them to feel at risk of losing their jobs.	(Tarafdar et al. 2010)
Satisfaction	A feeling of pleasure or positive emotion experienced during users' interaction with a MERS.	(Bhattacherjee, 2001)
Continued MERS usage intention	Users' intention to continue reporting using MERS.	(Bhattacherjee & Hikmet, 2007; Hong et al., 2006)

4.3 Data Analysis

Partial Least Squares (PLS) Structural Equation Modeling (SEM) is a statistical analysis method that is particularly effective for exploratory research and theory development. PLS-SEM, a variance-based approach, is focused on maximizing the explained variance of dependent constructs, making it well-suited for predictive analysis and complex models involving multiple constructs (Hair, Hult, Ringle, & Sarstedt, 2017). This method is advantageous for its ability to handle both formative and reflective measurement models, which is essential in research involving technology acceptance and user behavior (Hair et al., 2017). The application of PLS-SEM is particularly appropriate for this study due to its compatibility with complex models that include multiple mediators and moderators. Additionally, PLS-SEM is known for its efficiency with smaller sample sizes, offering robust results even when the sample size is not extensive (Hair, Ringle, & Sarstedt, 2011). This characteristic is beneficial for this research, given the sample size and the nature of the data collected.

Another significant advantage of PLS-SEM is its flexibility with data distribution requirements. PLS-SEM can produce reliable results with non-normal data, a common feature in survey research (Henseler, Ringle, & Sinkovics, 2009). In terms of hypothesis testing, PLS-SEM enables the examination of direct, indirect, and total effects within the model, providing a comprehensive understanding of the relationships between constructs (Hair et al., 2017). Therefore, employing Smart PLS 4 for PLS-SEM analysis in this study is justified, as it aligns with the research objectives and the nature of the data, ensuring a thorough and insightful examination of the proposed model and hypotheses.

Internal reliability and convergent validity were conducted to ensure the consistency of the relationship between each item and the construct. Internal reliability is typically assessed using Cronbach's alpha. A Cronbach's alpha value exceeding the threshold of 0.70 signifies that the set of variables consistently measures what it is intended to measure, thus confirming their internal reliability (Gefen & Straub, 2005; Henseler et al., 2016). As indicated in Table 3, the Cronbach's alpha values for all variables in this study exceed 0.7, demonstrating that the variables possess adequate levels of internal reliability (Henseler et al., 2016).

To evaluate convergent validity in this study, three key metrics were examined: factor loadings, composite reliability (CR), and average variance extracted (AVE) for each variable. A brief explanation of these metrics and results are below.

Factor loadings exceeding the recommended threshold of 0.70 (Hair, Anderson, Babin & Black, 2010) indicates a strong correlation between the survey items and their respective constructs, suggesting that the items are appropriate indicators of the constructs they are intended to measure. Composite reliability greater than the accepted criterion of 0.70 (Aguirre-Urreta, Marakas & Ellis, 2013) demonstrates sufficient internal consistency within the constructs, ensuring that the items grouped under each construct reliably measure the same concept. AVE values for all constructs exceeded the threshold of 0.5 (Fornell & Larcker, 1981) indicating that a significant portion of the variance in the observed variables is accounted for by their respective constructs. The combination of high

CR, AVE, and factor loadings collectively indicates that the constructs in this study demonstrate acceptable convergent validity (Table 3).

Table 3. Internal reliability and convergent validity

Construct	Loadings	Cronbach's α	CR	AVE
Perceived Usefulness (PU)	PU1: 0.859 PU2: 0.873 PU3: 0.831 PU4: 0.816 PU5: 0.872 PU6: 0.893	0.928	0.943	0.736
Confirmation (CONF)	CONF1: 0.905 CONF2: 0.819 CONF3: 0.919	0.858	0.913	0.779
Perceived Ease of Use (PEU)	PEU1: 0.935 PEU2: 0.914 PEU3: 0.95	0.926	0.953	0.871
Techno-Overload (TO)	TO1: 0.919 TO2: 0.765 TO3: 0.861	0.812	0.887	0.724
Perceived Threat (PT)	PT1: 0.911 PT2: 0.933 PT3: 0.863	0.887	0.929	0.814
Social Pressure (SP)	SP1: 0.826 SP2: 0.883 SP3: 0.815 SP4: 0.875	0.872	0.912	0.723
Satisfaction (SAT)	SAT1: 0.934 SAT2: 0.956 SAT3: 0.928 SAT4: 0.909	0.95	0.964	0.869
Continued MERS Usage Intention (CMERS)	CMERS1: 0.91 CMERS2: 0.95 CMERS3: 0.939 CMERS4: 0.909	0.946	0.961	0.86

Discriminant validity was assessed using the Fornell-Larcker criterion via SmartPLS 4.0. This involves calculating the square roots of the Average Variance Extracted (AVE) values for each variable and ensuring that these values surpass the inter-correlations between the variable in question and other variables in the model. This validity ensures that each variable is distinctly measured by its own set of constructs, rather than being significantly influenced by other constructs in the model. The study results confirm this validity, please see Table 4. This finding supports the discriminant validity of the constructs, indicating that they are sufficiently distinct from each other.

In addition to the Fornell-Larcker criterion, the Heterotrait-Monotrait (HTMT) ratio of correlations was also employed to further assess discriminant validity. As indicated in Table 5, the HTMT values for all construct pairs are below the threshold of 0.85, *except for* the pair CONF and PEU, which is 0.865. Although this value slightly exceeds the more stringent threshold of 0.85, it remains below the commonly used threshold of 0.90 (Henseler et al., 2016). This suggests that while CONF *(confirmation)* and PEU *(perceived ease of use)* are closely related, they are still conceptually distinct enough to be considered separate constructs in our measurement model. The proximity of these constructs could be attributed to their theoretical underpinnings, as both are likely to be influenced by users' experiences and perceptions of system effectiveness and efficiency. However, the overall results of the HTMT test, in conjunction with the Fornell-Larcker criterion, suggest that our measurement model possesses adequate reliability and validity, with constructs that are sufficiently distinct from each other.

Furthermore, the goodness of fit for the model was evaluated using the Standardized Root Mean Square Residual (SRMR). In this research, the SRMR value was recorded at 0.06, which falls below the threshold of 0.08. (Henseler et al., 2016).

Table 4. Discriminant Validity: Fornell and Lacker Criteria, Inter-correlation matrix with Sqrt (AVE)

Construct	**CONF**	**CMERS**	**PEU**	**PU**	**PT**	**SAT**	**SP**	**TO**
CONF	**0.882**							
CMERS	0.592	**0.927**						
PEU	0.778	0.578	**0.933**					
PU	0.676	0.617	0.639	**0.858**				
PT	-0.12	-0.245	-0.14	-0.092	**0.902**			
SAT	0.667	0.53	0.56	0.501	-0.173	**0.932**		
SP	0.545	0.621	0.595	0.533	-0.191	0.382	**0.85**	
TO	-0.459	-0.309	-0.45	-0.261	0.231	-0.437	-0.319	**0.851**

Table 5. Discriminant Validity: Heterotrait Monotrait (HTMT)

Construct	CONF	CMERS	PEU	PU	PT	SAT	SP	TO
CONF	-							
CMERS	0.645	-						
PEU	0.865	0.618	-					
PU	0.747	0.655	0.687	-				
PT	0.134	0.264	0.151	0.103	-			
SAT	0.732	0.554	0.594	0.527	0.183	-		
SP	0.613	0.678	0.658	0.587	0.213	0.413	-	
TO	0.536	0.33	0.499	0.267	0.263	0.477	0.366	-

Given the self-reported and cross-sectional design of our survey, we also examined the potential for common method bias (CMB). CMB is a concern in research where the variation in responses might be more reflective of the data collection method itself rather than the actual constructs under study. This bias can lead to artificially inflated correlations between variables or skewed results. To mitigate this risk, I implemented a thorough CMB testing procedure based on the approach recommended by Liang et al. (2007). This involved utilizing a Latent Method Factor (LMF) within the Partial Least Squares (PLS) framework. In this process, each survey item (indicator) was treated as an individual construct. These were then conceptually grouped under their respective original constructs, now redefined as second-order theoretical constructs, and linked tothe LMF. This approach allowed for a detailed analysis of the variance attributable to the method of data collection versus the substantive constructs.

The results of the CMB test, detailed in Table 6, show that the average proportion of variance accounted for by the substantive constructs was 0.803, compared to a method variance mean proportion of 0.015. The ratio of substantive to method variance stood at approximately 54:1, suggesting that the influence of method variance on our results was minimal. In conclusion, these outcomes suggest that common method bias is not a significant issue in our dataset, lending credibility to the validity of our findings.

Table 6. Common Method Bias Test Using the modelling of the Latent Method Factor (LMF)

Construct	Indicator	Substantive Factor Loading (R1)	R1²	Method Factor Loading (R2)	R2²
Perceived Usefulness (PU)	PU1	0.949***	0.901	0.010^{+}	0.010
	PU2	0.98***	0.960	0.014^{+}	0.014
	PU3	0.91***	0.828	0.007	0.007
	PU4	0.682***	0.465	0.023^{+}	0.023
	PU5	0.86***	0.740	0.000	0.000
	PU6	0.77***	0.593	0.020*	0.020
Perceived Ease of Use (PEU)	PEU1	0.931***	0.867	0.000	0.000
	PEU2	0.927***	0.859	0.000	0.000
	PEU3	0.943***	0.889	0.000	0.000
Social Pressure (SP)	SP1	0.816***	0.666	0.000	0.000
	SP2	0.894***	0.799	0.000	0.000
	SP3	0.923***	0.852	0.023**	0.023
	SP4	0.763***	0.582	0.018*	0.018
Confirmation (CONF)	CONF1	0.743***	0.552	0.032**	0.032
	CONF2	1.16***	1.346	0.140***	0.140
	CONF3	0.77***	0.593	0.028**	0.028
Techno-Overload (TO)	TO1	0.815***	0.664	0.021***	0.021
	TO2	0.885***	0.783	0.020**	0.020
	TO4	0.857***	0.734	0.020	0.020
Perceived Treat (PT)	PT1	0.942***	0.887	0.001	0.001
	PT2	0.953***	0.908	0.000	0.000
	PT3	0.817***	0.667	0.003	0.003
Satisfaction (SAT)	SAT1	0.827***	0.684	0.018^{+}	0.018
	SAT2	0.989***	0.978	0.002	0.002
	SAT3	0.898***	0.806	0.001	0.001
	SAT4	1.009***	1.018	0.017**	0.017
Continued MERS Usage Intention (CMERS)	CMERS1	1.003***	1.006	0.012*	0.012
	CMERS2	0.947***	0.897	0.000	0.000
	CMERS3	0.916***	0.839	0.001	0.001
	CMERS4	0.843***	0.711	0.006	0.006
Average (by absolute value)			0.803		0.015

Note(s): + = $p < 0.1$, * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$

Having passed the reliability and validity tests, we proceeded to analyze the structural model. This analysis involved assessing the explained variance (R^2) of the dependent variable, the path coefficients (β), and their significance levels (t-values). These assessments were conducted using the Partial Least Squares (PLS) algorithm and the bootstrapping method, with a substantial resampling size of 5000, to evaluate the significance of the hypothesized relationships. The path coefficient (β) is a critical measure indicating the strength and direction of the relationship between independent and dependent variables. A higher path coefficient implies that changes in the independent variable significantly influence the dependent variable. T-values are employed to determine the statistical significance of each estimated parameter, such as beta coefficients.

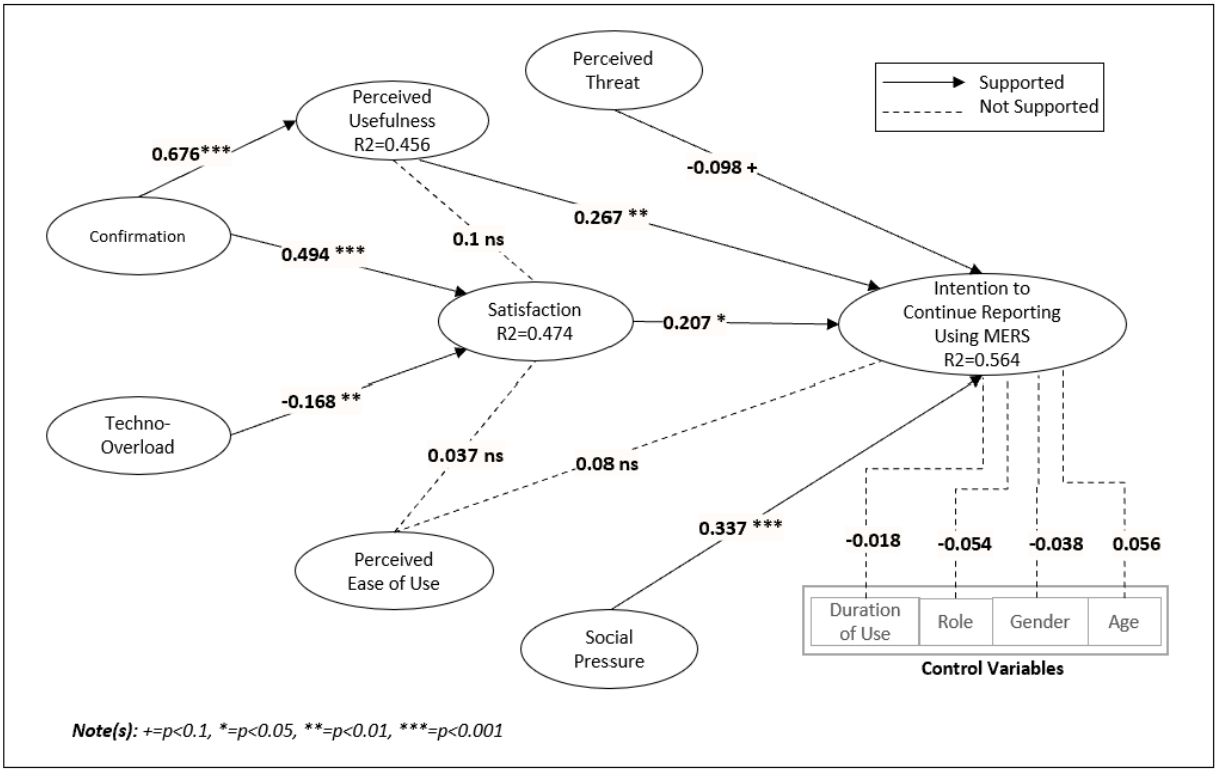

Figure 2. Structural test result (N=206)

Figure 2 illustrates the outcomes of the path analysis for our structural model, showcasing the explained variance (R^2), path-coefficient estimates (β), and significance levels (t) for each hypothesized relationship. The results support all hypotheses, with the exception of H2, H6, and H7. Regarding the control variables, none exhibited a significant impact on the dependent variable, Intention to Continue Using MERS.

The R^2 values serve as indicators of the model's predictive power, reflecting the proportion of variance in the endogenous variables explained by the exogenous variables (Chin, 1998; Gefen et al., 2000). As depicted in Figure 2, the model explains 45.6% of the variance in perceived usefulness, 47.4% in satisfaction, and 56.4% in continued MERS usage intention. Given that all R^2 values exceed the 10% threshold, these findings suggest that the model possesses substantial explanatory power and is satisfactory in its predictive capacity (Falk and Miller,1992).

In addition to the questions assessing the variables with Likert-scales, participants had the opportunity to add insights on their factors that could either encourage or discourage them from using MERS. Out of 206 respondents of this survey, 59 people answered this type of question. The responses were analyzed through thematic analysis to identify common themes or categories. The thematic analysis was conducted following a systematic approach. Initially, all responses were read thoroughly to gain an overall understanding. Subsequently, responses were coded, and similar codes were grouped to form themes. This process was iterative, involving revisiting the data multiple times to refine the themes and ensure they accurately represented the responses (Braun & Clarke, 2006). It's important to note that the categorization and subsequent frequency count of responses into these themes are approximate. Some responses may fit into multiple categories or be subject to different interpretations, reflecting the subjective nature of qualitative data.

Table 7 summarizes the identified themes along with their estimated frequencies. This information offers a snapshot of the most prominent issues and considerations raised by the respondents, highlighting areas that may require attention or improvement in the MERS platform.

The thematic analysis revealed six key categories that influence pharmacists' use of MERS. The most prominent category, 'workload management and time efficiency,' with 26 responses, highlights the challenges practitioners face in managing their workload and the time-consuming nature of the reporting process. The 'system usability and efficiency' category, with 14 responses, underscores the need for a more user-friendly and technically efficient system. The 'training, support, and system understanding' emerged as a significant theme, emphasizing the necessity for better training and support to enhance system

understanding and usage. The 'cultural and attitudinal barriers' category reflects concerns about workplace culture and attitudes towards events reporting, including fears of repercussions. The 'technical accessibility and reliability' was identified as another factor, pointing to technical issues and access difficulties that hinder efficient system use. Lastly, the 'feedback utilization and perceived value' category, with responses calling for more feedback and transparency, indicates a desire to understand the impact and value of the reporting system.

Table 7. Thematic analysis of qualitative responses on factors influencing the use of the MERS

Theme Name	**Description**	**Sample Responses**	**Estimated Frequency**
Workload Management and Time Efficiency	Concerns about the time-consuming nature of reporting and its impact on pharmacists' workload.	"Time consuming, in the busy pharmacy reporting becomes a burden", "It needs to be quicker. It is a long task to report a near miss or incident. The longer it takes, the less likely I am to report", "quicker reporting (too many questions)", "Just make it simple, …. and not time consuming"	26
Ease of Use and Process Efficiency	Technical aspects like ease of use, interface design, and performance of the reporting system.	"Easier to use", "Make the filling of the incident report easier."	14
Training, Support, and System Understanding	Need for effective training, ongoing support, and clear communication about system use.	"Training online", "Better awareness and more accessible training on the platform."	7
Technical Accessibility and Reliability	Issues related to accessing the system, technical glitches, and login problems.	"…. is very slow and takes a long time to fill in.", "Every time I have difficulty of signing in."	6
Cultural and Attitudinal Barriers	Workplace culture and individual attitudes towards events reporting, including fear of repercussions.	"The general culture of event reporting in pharmacy is abysmal.", "Feeling like the college may suspend your license."	5
Feedback Utilization and Perceived Value	Desires for feedback on reported data usage and skepticism about the system's impact on safety.	"Reports generated showing number of similar events.", "We do not receive any feedback on our submissions."	5

CHAPTER 5: DISCUSSION

5.1 Findings

This study investigated the factors influencing pharmacy practitioners' intention to continually use MERS in their community pharmacy practice. In this chapter, I discuss the research findings and the implications derived from this study.

The analysis reveals that perceived usefulness (PU) has a significant association with the intention to continue using MERS (β=0.267 at a significance level of 0.01), thereby supporting H1. This indicates that when users perceive the reporting system as efficient and useful in ways that would enhance their awareness of MEs and of the risks associated with these events, reducing recurrence of MEs, as well as improving safety culture in CPhs, they are more inclined to continually keep using these systems to report MEs. These findings aligned with prior studies that examined users' intention to adapt and continually use systems in healthcare settings (Cho, 2016; Prakash & Das, 2021; Bhattacherjee & Hikmet, 2007).

Interestingly, PU has unexpectedly emerged as an insignificant predictor of satisfaction (β=0.1 and p-value > 0.1), not supporting H2. Although, this is contrary to propositions in the original IS Continuance (Bhattacherjee, 2001), it corroborates the assertions of a prior research that perceived usefulness is an inconsistent determinant of satisfaction with continued use of m-health apps (Cho, 2016). This outcome suggests that perceived usefulness alone does not suffice or might not be a strong influential factor that influences pharmacists' satisfaction with the system. It implies that other contextual factors, such as streamlined procedures or reduced workload among others, might also play crucial roles in shaping users' satisfaction with the system. Nonetheless, the direct positive impact of perceived usefulness on continuance intention is noteworthy and has often been related to the perceived value (Barker et al., 2019). This finding implies that as long as MERS continues to deliver benefits and utility to its users, their likelihood of ongoing use of the system remains high. In summary, while perceived usefulness is a pivotal driver for the continued use of MERS, it does not automatically translate into user satisfaction. This distinction highlights the mandatory use context of MERS, which introduces an additional

layer to the user experience. In such contexts, the necessity to use the system may override personal preferences or satisfaction levels. When people are obligated to use a system, their personal beliefs or feelings towards it become less significant; they may not enjoy it, but they will continue to use it to comply with the requirement (Brown et al., 2002).

The findings reveal a significant and robust association between confirmation and satisfaction, as well as between confirmation and perceived usefulness (β=0.494 and 0.676 respectively at the significance level of 0.001). This supports H3 and H4, underscoring the pivotal role of confirmation in shaping users' attitudes towards MERS. The strong link between confirmation and satisfaction suggests that when users' expectations regarding MERS are met, their satisfaction with the system notably increases. As users (in our case pharmacy practitioners) experience positive benefits and effectiveness of their reporting practices (e.g., less cumbersome) within the system, their overall satisfaction might be enhanced. This finding aligns with the IS Continuance theory (Bhattacherjee, 2001), where the fulfillment of prior expectations leads to higher satisfaction levels. Also, this evidence is in line with past research in m-health apps continuance usage intention (Kaium et al., 2020; Cho, 2016). Similarly, the significant relationship between confirmation and perceived usefulness indicates that the extent to which MERS meets or surpasses users' expectations directly influences their perceptions of its usefulness. When users experience that MERS effectively addresses their needs and expectations, they are more likely to view the system as beneficial and valuable in their professional practice. This result aligns with the original IS continuance and Cho (2016) research that examined users' post-adoption beliefs on the continued use of health apps.

The study's findings indicate that techno-overload significantly and negatively affects satisfaction with the MERS, (β= -0.168 at a significance level of 0.01), thus supporting H5. This result indicates that participants who experienced techno-overload – experiencing pressure to work faster or for longer hours – tended to report lower levels of satisfaction with the system. This negative correlation underscores the importance of balancing technological advancements with workloads and stress levels in pharmacy settings. It is critical for such systems to ensure that they positively contribute to user satisfaction rather than complicating professional practices. This result aligns with the prior research that

examined the impact of technology overload on job satisfaction (Jena, 2015; Tarafdar et al., 2010; Ragu-Nathan et al. 2008).

The perceived ease of use not significantly influence satisfaction or continued MERS usage intention (β=0.037 and 0.08 respectively at the significance level of > 0.1). Thus, Hypotheses H6 and H7 are not supported. This suggests that the simplicity or user-friendliness of MERS does not necessarily translate into higher satisfaction or a greater likelihood of continued use among pharmacy practitioners. This outcome may imply that factors other than ease of use are more influential in determining satisfaction with and continued use of MERS. This result aligns with the IS continuance theory, which suggests that as users become more experienced with a system, ease of use concerns diminish and are replaced by more instrumental considerations such as the system's efficiency in enhancing job performance (i.e., perceived usefulness). Furthermore, this observation could imply that MERS users have developed a level of proficiency with the system, reaching a point where ease of use is no longer a key factor influencing their satisfaction or decision to continue using the system.

The exploration of the relationship between perceived threat and the intention to continue using MERS reveals a marginally negative association (β=-0.098 at the significance level of 0.1), offering marginal support for H8. This finding implies that an increase in perceived threat – the apprehension about potential negative consequences of reporting medication events – is marginally associated with a decrease in the intention to continue using MERS. This marginal negative association suggests that while the influence of perceived threat on continued usage intention is present, it is not overwhelmingly strong among the sample surveyed in this study. It indicates that pharmacists who are concerned about the repercussions of reporting events through MERS might be slightly less inclined to use the system regularly.

The highly significant and positive association between social pressure and the intention to continue using MERS (β = 0.337 at a significance level of 0.001) supports H9. This result implies that the pressure or influence exerted by superiors and peers significantly encourages pharmacy practitioners to continue using MERS. The strong positive correlation suggests that when pharmacy practitioners perceive those important individuals

in their workplace, such as their superiors and peers, endorse the use of MERS, they are more likely to continue their engagement with the system. This finding highlights the critical role of workplace social dynamics in influencing technology adoption and continued usage. It indicates that the support and positive reinforcement from colleagues and leadership might be more influential in shaping an individual's decision to persist with a technology than their personal evaluation of the technology itself. This finding is also in line with the prior studies, which argued for the inclusion of "social influence" as an antecedent of healthcare systems adaption and continuance use (Prakash & Das, 2021; Alhassan & Adam, 2022).

The significant positive association between satisfaction and the intention to continue using MERS (β=0.207 at a significance level of 0.05) supports H10. This finding implies that the level of satisfaction pharmacy practitioners derives from using MERS plays an important role in their decision to continue using the system. In the original IS Continuance model, satisfaction with IS use is the strongest predictor of users' continuance intention, however given that MERS usage is mandated by Ontario regulatory bodies, pharmacists may feel compelled to continue using the system, leading to varying levels of commitment to its continued use. In such mandatory contexts, it's typical for employees to use systems in a basic and standard manner as outlined by management, which often leads to superficial utilization, hindering the system's full potential. Despite these constraints, employees maintain a certain level of autonomy in deciding how and to what extent they utilize the system to aid their tasks (Wang and Hsieh, 2006). This scenario reveals a nuanced interplay between regulatory mandates and user satisfaction. While reporting medication events through MERS is mandatory, instances of non-reporting might remain undetected, resulting in underreporting. This focus on meeting regulatory requirements may inadvertently minimize the importance of user satisfaction. This underscores the critical importance of user satisfaction in the long-term success of healthcare technologies like MERS. It suggests that for such systems to be effectively and continuously used, they must not only meet regulatory standards but also ensure that they meet the needs and expectations of the pharmacists. This result is in line with previous studies in the healthcare context (Lu et al., 2023; Yan et al., 2021; Imlawi & Gregg, 2019)

In this study, control variables such as age, gender, duration of use, and role showed no significant impact on the continued intention to use MERS. This finding could be attributed to the mandatory nature of MERS usage, as dictated by Ontario regulatory bodies, which likely supersedes individual differences and leads to a uniform intention to use the system across various demographics. This uniformity in usage intention might also suggest that MERS is broadly effective and accessible to a diverse user base. Additionally, the consistent intention to use MERS across different groups could indicate the presence of effective training and support for all users, as well as an inherent motivation among pharmacy practitioners to improve medication safety and reduce events.

Table 8. Hypotheses testing

	Path	**Path Coefficient (β)**	**t -value**	**Supported**
H1	PU -> CMERS	0.267	3.209	Yes**
H2	PU -> SAT	0.1	1.208	No
H3	CONF -> SAT	0.494	4.705	Yes***
H4	CONF -> PU	0.676	12.443	Yes***
H5	TO -> SAT	-0.168	-0.168	Yes**
H6	PEU -> SAT	0.037	0.366	No
H7	PEU -> CMERS	0.08	0.988	No
H8	Pt-> CMERS	-0.098	1.754	Yes+
H9	SP -> CMERS	0.337	4.98	Yes***
H10	SAT -> CMERS	0.207	2.31	Yes*
Control Variables				
CV1	Age -> CMERS	0.056	1.117	No
CV2	Gender -> CMERS	-0.038	1.137	No
CV3	Duration of use -> CMERS	-0.018	0.331	No
CV4	Role -> CMERS	-0.054	1.219	No

5.1.1 Additional Insights from Qualitative Findings

The thematic analysis of the qualitative responses from the survey revealed several key themes that provide deeper insights into the factors influencing pharmacy practitioners' use of MERS.

A significant theme was the concern over ‘workload management and time efficiency’. For instance, one respondent mentioned, *"Having enough time during one’s shift to do so - as*

it is we are overwhelmed with volume and understaffed which discourages taking the time to report things properly." Another noted, *"It needs to be quicker. It is a long task to report a near miss or incident. The longer it takes, the less likely I am to report."* These responses highlight the practical challenges faced by pharmacy practitioners in managing their workload while using MERS. This theme is further supported by the PLS analysis of the study, where techno-overload emerged as one of the predominant determinants of satisfaction. The significant impact of techno-overload on satisfaction underscores the importance of considering time efficiency and workload management in the design and implementation of MERS. This finding aligns with existing studies that emphasize the need for clarity in the MERS process and a more streamlined reporting system (Haw et al., 2014; Cheema et al., 2017) that can manage time constraints effectively (Khan, 2013; Hughes & Weiss, 2019; Cheema et al., 2017).

The theme of 'ease of use and process efficiency' emerged distinctly in the qualitative responses, often intertwined with the desire for a simpler and quicker reporting process. For example, one respondent stated, *"Just make it simple, easy to use, and not time-consuming,"* while another mentioned, *"easier to use, click boxes to be easy and quick to use."* These responses indicate that when participants referred to the system being 'easy to use,' they often simultaneously emphasized the need for a more straightforward and less time-consuming process. Interestingly, only a small number of responses (N=6) focused solely on ease of use without mentioning process efficiency. This connection between ease of use and time efficiency suggests that participants primarily view the system efficiency in terms of how it impacts their process and time efficiency. However, due to the lack of in-depth interviews or further qualitative exploration, I could not delve deeper into participants' perspectives to fully understand this relationship. In the quantitative analysis of the study, the relationship between perceived ease of use and both satisfaction and continued use of MERS was not supported. This finding aligns with the qualitative insights, where only a small proportion of respondents emphasized ease of use as a standalone concern. This suggests that ease of use, while important, may not be the primary concern for the majority of pharmacists. However, the emphasis on ease of use in healthcare technology aligns with findings from previous research (Khan, 2013; Williams et al., 2013; Karsh et al., 2006).

The theme of 'training, support, and system understanding' was highlighted in the qualitative responses. For instance, one respondent emphasized the need for *"Training online,"* while another pointed out the importance of *"Better awareness and more accessible training on the platform."* These examples reflect a need among pharmacy practitioners for more comprehensive training and support to effectively use MERS. Importantly, such training can help practitioners understand how the system contributes to improving patient safety, reinforcing the value and purpose of MERS. This aspect of training is crucial, as it aligns with the broader goal of enhancing patient safety in healthcare settings. This aligns with research that emphasizes the importance of training and support in the adoption and continue use of healthcare technologies (Mohammadbeigi et al., 2021; Odukoya et al., 2015; Cheema et al., 2017; Vrbnjak et al., 2016).

The theme of 'cultural and attitudinal barriers' is another factor that emerged in the responses. This theme is further supported by the model analysis of the study, where perceived threat emerged as one of the barriers of the continued use of MERS. One respondent highlighted, *"The general culture of error reporting in pharmacy is abysmal,"* while another expressed concern about potential repercussions: *"Feeling like the college may suspend your license."* These examples underscore the prevailing culture of blame and the associated fear of reprisal, which can significantly hinder the willingness of pharmacy practitioners to report medication events using MERS. Also, the influence of workplace culture and individual attitudes on event reporting in healthcare settings is well-documented in the literature (Vrbnjak et al., 2016; Karout et al., 2022; Khan, 2013). These studies emphasize the need to address the prevailing culture of blame and create a more supportive environment that encourages open and honest reporting without fear of negative repercussions.

The ‘Technical accessibility and reliability' was another theme in the responses, emphasizing the importance of these aspects for the effective use of MERS. This theme also could be related to perceived ease of use in the structural model that was not supported in association with both satisfaction and continued use of MERS. A respondent pointed out integration issues, stating, *"Another password to a platform that is not linked to the primary software in pharmacy,"* which highlights the challenges with system compatibility and ease

of access. Additionally, another respondent expressed difficulties with system functionality: *"Every time I have difficulty of signing in and I have to change my password."* These examples illustrate the technical challenges faced by users, such as system integration, access issues, and login difficulties, which can hinder the efficient and effective use of MERS. Addressing these technical concerns is crucial, as they directly affect the user experience and the overall functionality of the system. The significance of this theme in healthcare systems is supported by prior research emphasizing the need for consistent availability (Karsh et al., 2006; Odukoya et al., 2015; Khan, 2013; Rutledge et al., 2018).

The 'feedback utilization and perceived value' emerged as another aspect in the qualitative responses, highlighting the importance of feedback in MERS. This theme aligns with the perceived usefulness construct in the research model and its strong association with continued use of MERS. However, the relationship between perceived usefulness and satisfaction was not supported. One respondent expressed their concern: *"We do not receive any feedback on our submissions. I feel like our work on reporting is not fruitful."* Another respondent echoed this need for transparency: *"More feedback and data shared from OCP about overall trends - where is the data?"* These responses underscore the desire among pharmacy practitioners for a feedback mechanism that not only acknowledges their reporting efforts but also provides meaningful insights. The lack of feedback can lead to a perception that the effort put into reporting is not valued or impactful, which can diminish the motivation to engage with the system. Feedback mechanisms are crucial in enhancing healthcare professionals' confidence in reporting systems. Therefore, integrating effective feedback mechanisms into MERS could greatly improve its perceived usefulness. This is supported by studies indicating the positive impact of feedback on user engagement and trust in healthcare systems (Samsiah et al., 2020; Williams et al., 2013; Vrbnjak et al., 2016).

5.2 Theoretical Contributions

This study aims at contributing to the existing literature by applying the IS Continuance theory, along with other psychological factors, to explore the continued use of MERS in community pharmacies (CPhs). This approach not only fills a gap concerning the continued use of such systems but also broadens the scope of established theoretical frameworks to

the specific challenges of medication event reporting in community pharmacies. Practically, the research offers guidance for CPhs leaders, administrators, and regulatory bodies by identifying important factors that highly influence the ongoing interaction with MERS.

First, this study contributes to the IS Continuance model (Bhattacherjee, 2001) by adapting it to the specific context of MERS in community pharmacies. Three critical variables – techno-overload, social pressure, and perceived threat – have been integrated into the model to enhance its applicability to the context of community pharmacies and the process of medication event reporting. The study pays particular attention to techno-overload as a key obstacle affecting user satisfaction with MERS (Ragu-Nathan et al., 2008) as also mentioned in a handful of qualitative and practitioner-oriented studies. Similarly, perceived threat, adapted from the notion of techno-insecurity in the same techno-stress model, is identified as another important barrier influencing the continued intention to use MERS. By exploring how these stress-related factors influence long-term engagement with MERS, the research contributes to a deeper understanding of the psychological barriers and facilitators of digital systems adopted and use in high demanding and stressful environments such as healthcare settings.

Second, this study enhances the theoretical understanding of social pressure within the IS Continuance model. Social pressure was incorporated as a crucial determinant of post-use behavior, aligning with its established role in the technology acceptance models as a form of social influence. This addition to the model underscores the importance of social dynamics in professional settings and how they can either facilitate or hinder the long-term adoption of technology. It highlights that beyond individual perceptions and usability factors; the collective environment and normative pressures play a crucial role in shaping technology usage behaviors. This insight contributes to a more holistic understanding of the continued use of digital systems in such contexts.

Overall, these enhancements provide a more comprehensive understanding of the factors influencing the long-term use of MERS in community pharmacies, confirming the explanatory and predictive power of the IS continuance model and offering deeper insights

into the complexities of technology adoption and continued usage in healthcare environments.

5.3 Practical Contributions

The significant influence of perceived usefulness on continued MERS usage intention in our study underscores the importance of focusing on MERS' tangible benefits for community pharmacies. To maximize the impact of perceived usefulness on continued MERS usage, community pharmacies are encouraged to conduct awareness programs that clearly communicate how MERS contributes to medication safety and reduces the recurrence of events. Sharing success stories and testimonials from peers that demonstrate MERS's effectiveness in practical scenarios can be particularly impactful. Additionally, the qualitative themes of 'training, support, and system understanding' and 'feedback utilization and perceived value' from our study underscore the importance of effective training, ongoing support, and providing meaningful feedback. These themes highlight the need for clear communication about system use and the value of feedback in reinforcing the benefits of reporting medication events. Organizing workshops or seminars to educate practitioners on the importance of standardization of the forms embedded in MERS and their role in enhancing the process of reporting can further enhance user engagement with the systems. The perceived usefulness or value of the system could be enhanced by providing real-time feedback upon filling up a report. For example, implementing interactive dashboards and analytics on medication events within the pharmacy and other pharmacies might help practitioners to see immediate feedback upon their reports, thereby enhancing their perceived value of the system. Additionally, introducing alert systems or 'red flags' for potential high-risk events can draw practitioners' attention to critical issues.

Second, the strong association between social pressure and the intention to continue using MERS highlights the importance of a supportive workplace culture in encouraging the use of MERS. To enhance this positive social influence, community pharmacies can implement peer advocacy programs, where experienced MERS users mentor their colleagues, sharing insights and best practices. This approach aligns with the qualitative themes of "training, support, and system understanding," and also “cultural and attitudinal barriers" emphasizing the role of peer support in fostering a deeper understanding and more

confident use of MERS. Creating forums or discussion groups can also foster a collaborative atmosphere, where pharmacy practitioners feel collectively involved in improving medication safety through MERS. These strategies, while complementing the need for effective training and clear communication, add an extra layer of social support and recognition, crucial for sustaining long-term engagement with MERS.

Third, addressing techno-overload is crucial for managing user satisfaction with MERS. To mitigate this, community pharmacies should consider practical strategies that ease the workload associated with MERS reporting. One effective approach could be to allocate specific hours for reporting tasks and to add “reporting of medication event” as an important practice within the workload of practitioners. This not only acknowledges the time and effort required for accurate reporting but also could demonstrate organizational commitment to medication safety. Another strategy could be to increase staffing levels during peak reporting periods or to designate specific roles for managing MERS-related tasks. This would help distribute the workload more evenly and prevent individual practitioners from feeling overwhelmed with the reporting process. Additionally, simplifying the MERS interface and streamlining the reporting process can further reduce the perceived workload. For example, MERS could enable users to set reminders to complete their reports later in case they were interrupted or could not complete the report in one sitting. These strategies are supported by the qualitative theme of "workload management and time efficiency" which highlights the need for a more user-friendly and efficient system to manage the time constraints.

Fourth, enhancing user satisfaction with MERS is vital, especially considering its significant mediation role in the relationship between various factors and the intention to continue using MERS and the context of its mandatory usage by regulatory bodies. However, reporting medication events is mandated, but they are anonymous and can be ignored and go unnoticed. That is, an intrinsic motivation to report medication events is often required in this process. This means that if pharmacists choose not to report, these events may remain unnoticed, underscoring the importance of their commitment to using MERS. To foster this commitment and motivation, healthcare organizations could focus on developing persuasive strategies that could influence the intrinsic motivation to report

medication events and to constantly gather users' expectations with the system and benefits of reporting. Another strategy is to provide provincial rewards in the form of recognition for ensuring and developing safety programs upon reporting.

Fifth, the latter suggestion of introducing awards and promoting a culture of safety upon reporting might diminish the influence of perceived threat and the intention to continue using MERS. Although the influence of perceived threat was only marginally significant in our sample, it encompasses the comments and opinions of practitioners across different professional workshops and media, the act of reporting a medication incident or error still is perceived as a punitive act which has also been discussed in prior studies (Mohammadbeigi et al., 2021; Mirghafourvand et al., 2021; Boyle et al., 2016) as a barrier to event reporting. Creating a more supportive, blame-free culture where pharmacists feel secure in reporting events without fear of negative repercussions could mitigate this marginal negative impact and promote a more proactive approach to event reporting and patient safety. This approach aligns with the qualitative theme of "Cultural and Attitudinal Barriers". As an example, one of the quotations stated that "My colleagues believe the data is not fully anonymous and can be used in court." which emphasizes the need to shift from a culture of blame to one of learning and improvement. Community pharmacies should communicate clearly that the purpose of reporting is for systemic improvement, not for punitive actions. Reassuring pharmacists that their professional integrity is respected and that reporting events is vital for patient safety is crucial. Training programs can be enhanced to include modules on managing fear associated with event reporting and to emphasize the importance of transparency. By mitigating the perceived threat associated with using MERS and fostering a culture that values open and honest reporting, community pharmacies can encourage more effective long-term use of MERS and thereby promote a culture of patient safety.

5.4 Limitations and Future Research

Despite its contributions, this study has several limitations that should be considered.

First, in this model, the factors and variables under study may have been confounded by the interplay of two behaviors: the reporting of medication events and the use of the system.

Some of the theoretical factors proposed in the model may exert differential influences on each behavior. Throughout this study, we operated under the assumption that system usage is intricately linked to reporting; practitioners are likely to engage with the system primarily for the purpose of reporting a medication event. Similarly, our focus centered on medication events, encompassing both incidents and near-misses. Consequently, our findings were unable to delve into the potential distinctions between these event types. We encourage future research endeavors to dissect the factors influencing the reporting of each event category independently.

Second, the overall response rate presents a limitation. The survey was distributed among 6,727 participants in community pharmacies in Ontario. The response rate was approximately 4.2%, which raises questions about the sample's representativeness. Although the final number of usable responses (N=206), after data cleansing, surpasses the minimum required sample size, the low response rate might limit the generalizability of the findings to the broader population of pharmacy practitioners. Despite employing follow-up reminders and incentives in this research, December and early January might have not been the appropriate time to promote the study. Future studies could explore additional strategies to further enhance response rates in this population.

Third, another limitation concerns the potential bias in survey responses, which could contribute to the observed low response rate. It's possible that the pharmacists who chose to participate in the survey are those more compliant with and satisfied by the MERS process, who therefore perceive its usefulness more positively. This bias suggests that the views of pharmacists who are less satisfied or less compliant—perhaps those who do not report or see less value in the system—might not be adequately represented. This underrepresentation could skew the results towards a more favorable evaluation of MERS, highlighting the need for future studies to engage a wider and more varied pool of respondents to capture a full spectrum of experiences and perceptions regarding MERS in community pharmacies.

Fourth, the study utilized a simple qualitative method within the survey, but reliance on survey data may not capture the depth of insights that other qualitative methods, like interviews or focus groups, could offer. Future research could benefit from integrating in-

depth interviews or focus groups. Such approaches could provide richer, more nuanced understandings of the factors influencing MERS usage.

Fifth, the survey data was collected directly from Ontario community pharmacies. While this approach ensures a degree of relevance and specificity to the context, it may also limit the generalizability of the findings. The responses are reflective of the perceptions and experiences of pharmacy practitioners within a specific geographic and regulatory context, which might differ from those in other regions or countries. The mandatory nature of MERS usage in Ontario might have influenced the responses, potentially leading to skewed results. Investigating MERS usage in regions with different regulatory requirements and considering the mandatory nature of MERS usage as a control variable could provide insights into how regulatory environments impact system continued use.

Finally, the study may not have accounted for all variables that could influence outcomes, such as individual resistance to technology or trust in the MERS system. Future studies should consider exploring additional variables like individual resistance, trust, and personal attitudes towards technology to better understand their impact on the continued use of MERS in community pharmacies.

CHAPTER 6: CONCLUSION

The main goal of this study was to explore the factors influencing pharmacists continued use of Medication Event Reporting Systems (MERS) within Canadian community pharmacies (CPhs). By integrating the IS Continuance theory with elements from the Technostress model and UTAUT, this research proposed a research model to identify influential factors that could explain and predict the intention to continue using MERS in CPhs. The findings reveal that confirmation (users' cognitive beliefs based on how well MERS meets their expectations) and techno-overload (too much information to manage efficiently and effectively with the system) are significant determinants of pharmacy practitioners' satisfaction with the use of MERS. Specifically, techno-overload negatively affects satisfaction with MERS. Furthermore, social pressure (the perceived pressure from superiors and peers to use MERS) and satisfaction emerge as key motivators for pharmacy practitioners to continually keep using MERS, even in the face of challenges like perceived threats (insecurity about their jobs caused by using MERS for reporting events). Thus, both technological and psychological factors, alongside social dynamics, play pivotal roles in shaping the intention for continued use of these systems in community pharmacies. This study contributes to academic literature by applying well-established theories in an understudied context such as community pharmacies and offering insights into the continuous use of reporting systems. The study also offers recommendations to healthcare administrators, regulatory bodies, and technology developers to enhance the effectiveness of MERS.

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APPENDIX A Table of literature review toward medication event reporting

Authors (Country, Title)	Context	Methodology	Key Findings
(Karout et al., 2022) Lebanon A nationwide assessment of community pharmacists' attitudes towards dispensing errors: A cross-sectional study	Community pharmacy	Quantitative Survey	**Barriers:** Workload, lack of obligation to report, lack of reporting systems. **Facilitators:** Collaboration with physicians, Benefits of reporting (improving handwriting, double-checking), patient counseling, encouraging reporting, issuance of guidelines.
(Gaube et al., 2021) Germany The relationship between health IT characteristics and organizational variables among German healthcare workers	Healthcare workers of hospitals	Survey	**Barriers:** Techno-overload, It-related strain **Facilitators:** Perceived usability, error management culture
(Mirghafourvand et al., 2021) Iran Barriers to and facilitators of medication error reporting from the viewpoints of nurses and midwives working in gynecology wards of Tabriz Hospitals	Nurses and midwives working in hospital	Questionnaire descriptive-analytical cross-sectional study	**Barriers:** Blame, Fear of reprisal and reprimand, The anonymity of the reporting system. **Facilitators:** Benefits of reporting (preventing future errors, correcting practice, increasing accountability).
(Mohammadbeigi et al., 2021) Iran Barriers and facilities in Reporting Medical Errors: A systematic review study	Clinical staff	Systematic review	**Barriers:** Fear, Lack of attention to the importance of medical errors, a sense of distrust, blame, lack of staff support, forget the error, lack of feedback from error report. **Facilities:** Having error reporting system. Staff training, Correct behaviour of managers, avoid blame staff.
(Alblowi et al., 2021) Saudi Arabia Nurses' Perspectives on Causes and Barriers to Reporting Medication Administration Errors in Saudi Arabia	Nurses	Questionnaire descriptive-analytical	**Barriers:** Blame, lack of positive feedback, excessive emphasis on medication errors as a measure of quality. fear of adverse consequences. lack of clear medication error definition, perceived unimportance, failure to recognize errors.

Authors (Country, Title)	Context	Methodology	Key Findings
(Samsiah et al., 2020) Malaysia Knowledge, perceived barriers and facilitators of medication error reporting: A quantitative survey in Malaysian Primary Care Clinics	Primary care clinics	Quantitative Survey	**Barriers:** Heavy workload, time constraints, unawareness of medication errors **Facilitators:** Patient safety concern, desire for improvement, anonymity, sufficient time for reporting
(Barker, 2019) Canada Barriers to the use of patient safety information sources by community pharmacies	Community pharmacy managers	Semi-structured interviews	**Barriers:** lack of time, too much information, complexity, and lack of community pharmacy involvement in source Design.
(Hughes & Weiss, 2019) United Kingdom Adverse drug reaction reporting by community pharmacists—the barriers and facilitators	Community pharmacy	Questionnaire based on the literature and exploratory interviews	**Barriers:** Lack of awareness of incident, difficulty identifying causative drug, uncertainty about what to report, time constraints, lack of confidence. **Facilitators**: Reporting through dispensary software. Clearer reporting guidelines. Feedback on reports. Record keeping. Remuneration.
(Rutledge et al., 2018) United States, california. Barriers to medication error reporting among hospital nurses	Nurses in hospital	Quantitative Survey	**Barriers:** Long and time-consuming reporting process, fear, lack of readily available forms, lack of information on how to report or on responsibility, belief that system does not contribute to improved quality of care.
(Hohl et al., 2018) Canada why clinicians don't report adverse drug events, qualitative study	Clinicians: general practitioners, hospitalists, emergency physicians, and hospital and community pharmacists.	Qualitative Observation and focus group	**Barriers:** Complexity of observed events, multiple providers involved, not reporting documented adverse drug events to external agencies, time constraints, duplication of documentation.
(Cheema et al., 2017) United Kingdom Barriers to reporting of Adverse Drugs Reactions: A cross sectional study among	Community Pharmacy	Quastionnaire based on the previous studies	**Barriers:** Lack of time, perception of incident severity **Facilitators**: Training and Information, Access to IT resources, including internet connectivity

Authors (Country, Title)	Context	Methodology	Key Findings
community pharmacists in United Kingdom			
(Boyle et al., 2016) Canada Pharmacist work stress and learning from quality related events	Community Pharmacy	Quantitative: Survey	**Barriers:** Work stress, blame culture, high workload **Facilitators:** Rewards such as potential for career advancement, respect, and encouragement
(Vrbnjak et al., 2016) Barriers to reporting medication errors and near misses among nurses A systematic review	Nurses in hospital	Systematic Review between January 1981 and April 2015	**Barriers:** Blaming, punitive, and fearful cultures, fear of Accountability, lack of awareness of the need to report, undefined medication errors. **Facilitators:** Trust in superiors, effective reporting systems (uncomplicated, and non-time-consuming anonymous reporting systems), non-Punitive culture, feedback, definitions of a medication error, education and training supportive management.
(Soydemir et al., 2016) Turkey Barriers to medical error reporting for physicians and nurses	Physician and nurses in hospital	Qualitative	**Barriers:** Fear, no support from administrators, inadequacies in improving the system, thinking that errors are personalized, lack of a developed reporting culture, lack of a reporting system, difficulty in system usage, having to affix an identifying name to the report, not enough knowledge about the use of the system, lack of belief in the need for such a system, ack of knowledge about medical errors, seriousness of error.
(Odukoya et al., 2015) USA, Wisconsin	Community pharmacy	Qualitative observations, interviews, and focus groups	**Barriers:** interruptions and time pressure when performing tasks, noise in the physical environment. **Facilitators**: Communication, training, teamwork, and staffing levels, level of experience, knowledge of the pharmacy personnel, availability or usability of tools and technology.
(Boyle et al., 2014) Canada reflections on the role of the pharmacy regulatory authority in enhancing quality related Event	Community pharmacy	Focus group	**Facilitators**: Defining event reporting and compliance, navigating role conflict, educating for enhanced event reporting and learning, promoting the positive/removing the fear of reporting, tailoring event reporting and learning consistency

Authors (Country, Title)	Context	Methodology	Key Findings
reporting in community pharmacies			
(Haw et al., 2014) United Kingdom Barriers to the reporting of medication administration errors and near misses: An interview study of nurses at a psychiatric hospital	Psychiatric nurses	Qualitative-Interview	**Barriers:** Excusing, fear, lack of knowledge and information, **h**eavy workload.
(Boyle et al., 2011) Canada determinants of error reporting, recovery, and learning in Canadian retail pharmacies: a conceptual model	Community Pharmacy	Literature review	**Facilitators:** Individual perceived self-efficacy, process capability, process support, organizational culture, management support, and regulatory authority.
(Khan, 2013) Saudi Arabia Community pharmacists' knowledge and perceptions about adverse drug reactions and barriers towards their reporting	Community Pharmacy	Quantitative, Survey	**Barriers:** Lack of a professional environment., unavailability of reporting form, not knowing how to report, complexity of reporting forms, time-Consuming reporting process.
Williams et al. (2013) England Understanding the attitudes of hospital pharmacists to reporting medication incidents.	Hospital Pharmacists	Qualitative	**Barriers:** Uncertainty about what and when to report, time-consuming, personal fear with comparison with pear, perceived complexity of the reporting forms **Facilitators:** Positive change following an error report.
(Karsh et al., 2006)	Physicians and clinical assistants	Focus group	**Barriers:** Time Constraint, resource allocation. **Facilitators:** Integration with their current work structure, benefits of reporting, consistent availability, pluralistic system, financial incentives.

APPENDIX B Measurement Items

Name of variable	Measurement Items	Source
Perceived Usefulness	Please indicate if you agree with the following statement with a scale from Strongly disagree (1) to Strongly agree (7) • Using the digital platform increases my awareness and understanding of medication events occurrences. • Using the digital platform increases my effectiveness in managing risks associated with medication events in my practice. • Using the digital platform helps me reduce the probability that medication events recur in my practice. • Using the digital platform improves the quality of medication events reporting. • Using the digital platform enhances the effectiveness in medication events reporting. • Overall, the digital platform is useful in improving a culture of safety in community pharmacy	*(Bhattacherjee, 2001; Cho et al., 2009; Venkatesh et al, 2003)*
Perceived Ease of Use	• The digital platform to report medication events is clear and understandable. • It would be easy for me to become skilled at reporting medication events using the digital platform. • I find the digital platform to report medication events easy to use.	*(Venkatesh et al, 2003; Prakash & Das, 2021)*
Social Pressure	• To the best of my knowledge, my colleagues report medication events using the digital platform. • My colleagues in the pharmacy encourage me to report medication events using the digital platform. • The senior management of my pharmacy encourages me to report medication events using the digital platform. • In general, my community pharmacy supports the use of the digital platform. •	*(Venkatesh et al, 2003; Cho et al., 2009)*

Name of variable	Measurement Items	Source
Confirmation	• My experience with using digital platform was better than what I expected. • The service level (technical support) provided by the digital platform was better than what I expected. • Overall, most of my expectations from using the digital platform were confirmed.	*(Bhattacherjee, 2001)*
Open-ended question	**(Optional)**Can you think of any other factors that could encourage you to report medication incidents using the digital platform? (If so, please enter your answer below) • Text entry.	
Techno-overload	• Using the digital platform to report medication events creates more work than I can handle. • I work with very tight time schedules when using the digital platform to report medication events. • I changed my work habits to adapt to the to report medication events. To report medication events. • I have a higher workload because of the use of the To report medication events.	*(Tarafdar et al. 2010)*
Perceived Threat	• I feel my job security could be threatened if I use the digital platform to report medication events. • I feel there is a possibility of job loss due to report medication events in our pharmacy. • I feel that using the digital platform could compromise the confidentiality or personal information.	*(Tarafdar et al. 2010)*
Open-ended question	**(Optional)** Can you think of any other factors that could discourage you from reporting medication incidents using the MIRS? (If so, please enter your answer below) • Text entry.	
Satisfaction	How do you feel about your overall experience with the use of the MIRs: • Very dissatisfied/very satisfied	*(Bhattacherjee, 2001)*

Name of variable	Measurement Items	Source
	• Very displeased/very pleased • Very frustrated/very contented • Absolutely terrible/Absolutely delighted.	
Continued MERS Usage Intention	• I will continue using the digital platform to its full potential when needed to report a medication event. • I will continue to maximize the use of the digital platform in the future. • I will continue leveraging the digital platform to foster a safety culture in my pharmacy. • I will continue using the digital platform to enhance shared learning within the community pharmacy. • I sometimes wish I could minimize my reliance on the digital platform (reverse coded)	*(Bhattacherjee & Hikmet, 2007; Hong et al., 2006)*
Gender	What is your gender identity? • Male • Female • Transgender • Non-binary • Genderqueer • Genderfluid • Two-Spirit • Prefer not to say! • Other (please specify)	
Age group	What is your age range? • 18-29 • 30-39 • 40-49 • 50-59 • > 60	
Role	• Designated Manager • Staff Pharmacist • Pharmacy Owner • Pharmacy Assistant • Pharmacy Technician • Consultant Pharmacist • Relief Pharmacist • Others	

Name of variable	Measurement Items	Source
Duration of use	For how long you have been using MIRS: [check some time frequencies to see if these times make sense] • Less than 6 months • 6 months to 1 year • 1 – 5 years • 5 – 10 years • More than 10 years	