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Physicians' Perceptions of Electronic Prescribing of Controlled Medications in The West Bank of Palestine: A Pre-implementation Assessment

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This Thesis was submitted in Partial Fulfillment of the Requirements for the Master's Degree in Health Informatics.

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Declaration

This thesis was submitted in partial fulfillment of the requirements for the Master's degree in Health Informatics.

I declare that the content of this thesis (or any part of the same) has not been submitted for a higher degree to any other university or institution.

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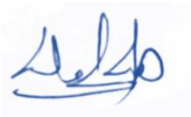
Signature 

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Dedication

I dedicate this work to Allah, my family, my friends and to my homeland, Palestine

Acknowledgments

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Abstract

Introduction:

Background: In Palestine, the prescription of controlled drugs is still done on paper. Despite valuable attempts to regulate them, there is a high risk of undetected abuse and doctor shopping. These problems can be addressed with the introduction of electronic prescribing of controlled medications (EPCM). User acceptance is an important prerequisite for the successful adoption of any technology. Therefore, it is crucial to determine the attitude of prescribing physicians towards the introduction of EPCM at an early stage. This issue has never been addressed in Palestine. Without it, an implementation project carries a significant risk of failure.

Methods:

This was a cross-sectional study conducted among Palestinian physicians in the West Bank who currently or previously prescribed controlled medications. Data were collected using a self-administered questionnaire based on the Unified Theory of User Acceptance and Use of Technology (UTAUT) from a convenience sample of 300 physicians. Data were analyzed using SPSS version 26. Bivariate analysis and binary and multivariate logistic regression were performed to identify factors associated with physicians' perceptions of ECPM.

Results:

The majority of physicians indicated that they were willing to use EPCM, with an acceptance rate of 85%. This perception was found to be significantly affected by performance expectancy, effort expectancy and trust. None was moderated by age, gender, or experience with electronic prescribing. Age and level of specialization were also found to be independent factors significantly influencing the intention to use EPCM. The level of current prescribing difficulty did not correlate with the intention to use EPCM.

Conclusion:

EPCM seems to be well accepted by Palestinian physicians. Based on the results of this study, it is recommended that the following be considered: ensuring maximum efficiency of the system, selecting user interfaces that are straightforward and easy to use, and the best protection mechanisms to prevent system breaches. All of these aspects are critical to improving physicians' perceptions of EPCM.

***Keywords**:* e-prescribing, controlled medications, Palestine, perception.

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List of abbreviations

EPCM: Electronic Prescribing of Controlled Medications

HIT: Health Information Technology

HIS: Health Information System

EHR: Electronic Health Record

E-prescribing: Electronic Prescribing

PDMP: Prescription Drug Monitoring Programs

NHI: National Institute of Health

TRA: Theory of Reasoned Action

TPB: The Theory of Planned Behaviors

TAM: The Technology Acceptance Model

MPCU: Model of Personal Computer Utilization

MM: Motivational Model

SCT: Social Cognitive Theory

IDT: Innovation Diffusion Theory

UTAUT: Unified Theory of Acceptance and Use of Technology

UNODC: the United Nations Office on Drugs and Crime

AAU: Arab American University

MOH: Ministry of Health

HIPPA: The Health Insurance Portability and Accountability Act

Chapter 1: Introduction

1.1 Background

With the increasing complexity of the medical field, improving patient safety has become one of the most important goals of healthcare institutions. Medication safety is an excellent source of such concerns. Many efforts have been made to optimize therapy through the implementation of technology-based interventions among which is electronic prescribing (e-prescribing) (Kelly & Rucker, 2006). E-prescribing involves direct computer-to-computer communication for ordering, revising, reviewing, and transmitting prescriptions between participants in a given prescribing cycle via specialized software in either hospital or public settings (Clyne et al., 2012).

E-prescribing systems can be either stand-alone or integrated with an established electronic health record (EHR). While integrated systems appear to be better in scope and depth of use, standalone systems, on the other hand, are cheaper, easier to implement, less likely to disrupt workflow, and have little to no impact on productivity during the implementation phase. Therefore, a stand-alone system is a viable option in regions with poor health information technology infrastructure (HIT) and a lack of EHR. It is considered a stepping stone to full EHR adoption (Bell et al., 2011; Desroches et al., 2010).

E-prescribing, whether integrated or stand-alone, is thought to enhance the quality of health care services. Among the advantages, e-prescribing can eliminate problems with the illegibility of handwritten prescriptions, which should reduce medication errors (Tully, 2012). Kaushal et al. (2010) stated that e-prescribing reduced medication errors by up to 42 per 100 prescriptions. E-prescribing can also be used to monitor compliance and suspected overuse or abuse by displaying previous prescriptions based on patient data and to streamline clinical practice workflows by

providing a single view of prescriptions for multiple providers. E-prescribing can result in fewer duplicate prescriptions and reduced calls to pharmacies. Accordingly, a decrease of more than 50% in phone calls between pharmacists and physicians has been reported, resulting in corresponding time and cost savings (Thomas et al., 2012). In addition, e-prescribing, when supported by practice guidelines and relevant medical information (such as correct dosing, frequency, and drug-drug interactions), has been found to improve adherence to treatment guidelines and increase health professionals' confidence in decision making. (Keyworth et al., 2018; Porterfield et al., 2014).

Many of these features combined can reduce inconsistencies, eliminate the need for communication and coordination between prescribers, payers, and pharmacists, improve patient safety and efficiency and achieve higher patient and provider satisfaction (Bell et al., 2011; Hoyt et al., 2009; Porterfield et al., 2014).

Considering the aforementioned features and benefits of e-prescribing in general, e-prescribing of controlled drugs, in specific, appears to be a promising transition. Controlled substances for medicine are drugs with addictive potential. Governments strictly regulate the use of these drugs because they are highly addictive and can be easily abused (Preuss et al., 2018). In an attempt to better control the use of these medications, laws have been enforced in several regions around the world, and electronic-based prescribing has been implemented in limited areas such as the Prescription Drug Monitoring Programs (PDMPs) in USA (CDC, 2022). Not surprisingly, the centralized prescription network that electronic prescribing provides has actually proven beneficial in improving the prescription of controlled medications. (Doctor Shopping Laws | Prevention Solutions@EDC, n.d.; Dormuth et al., 2012; Thomas et al., 2013)

In Palestine, controlled medications are prescribed using a special prescription pad with a concept similar to a checkbook that a physician can only obtain from the physician's union. Each prescription has a unique serial number and must be filled with several mandatory pieces of information to be valid. However, because of the lack of inter-provider connections and the lack of a central monitoring agency, it is believed that doctor shopping exists. Therefore, the current system is incapable of tightly regulating controlled medication prescribing. With the aforementioned e-prescribing benefits, and taking into consideration the lack of a national electronic health record (HER), a stand-alone electronic prescribing for controlled medication (EPCM) appears to be a promising intervention.

Regardless of the rationale for implementing e-prescribing for controlled medications locally, and before taking any step further, one should reflect on the possible context-specific factors that might affect adoption success. These might be related to users (healthcare providers), the proposed technology, or even the organizational context. This understanding is essential because the vast majority of health information technologies (HIT), including e-prescribing, fail in some way despite the significant investment and widespread availability of these technologies (Bell et al., 2011; Gagnon et al., 2014). At large, many barriers that could affect the adoption of e-prescribing were identified, and they include cost, lack of adequate training and clinical support, workflow changes, connectivity issues, hardware and software issues, interoperability issues, and the frequent need for guideline updates (Hahn & Lovett, 2014; Oktarlina, 2020). Physician resistance has also been repeatedly identified as an important and common barrier (Cusack, 2008; Dansky et al., 1999; Wager et al., 2017). In some cases, it has even been reported that provider acceptance of these technologies is the main barrier to adoption (Crisan & Mihaila, 2021)

In the U.S., for example, it was reported that 50% of healthcare providers would be slow to accept these technologies (Hoyt et al., 2009). This negative view of e-prescribing, being a common and important observation, could be due to users' lack of understanding of its benefits, which could diminish end users' desire to use it (Oktarlina, 2020). Besides, a positive user attitude was found to be associated with higher adoption of these technologies (Keyworth et al., 2018). Therefore, it is essential to understand end-user culture and perceptions of barriers and facilitators. This can decide which implementation method is most likely to be successful and to predict actual usage (Wager et al., 2017). Physicians, as the primary users of e-prescribing technology, are in an excellent position to point out the factors and their magnitude that they believe would influence their perception of this technology. This critical topic has never been addressed in the Palestinian context. It must be studied before any actual e-prescribing project is undertaken.

1.2 Problem Statement

In Palestine, the prescription of controlled drugs is still done on paper. Despite valuable attempts to regulate them, there is a high risk of undetected abuse and doctor shopping. These problems can be addressed with the introduction of electronic prescribing of controlled medicines (EPCM). User acceptance is the essential prerequisite for successfully adopting any technology. Therefore, assessing prescribers' perceptions of EPCM adoption in the early stages is critical. This issue has never been addressed in Palestine, without which an implementation project may carry a significant risk of failure.

1.3 Research Significance

Despite religious, legal, and cultural constraints that condemn illicit drug use in Palestine, Thabet & Dajani. (2012) revealed that drug addiction exists among Palestinians in the West Bank and Gaza Strip. The abused substances include substances for non-medical use such as heroin and hashish, as well as controlled medications such as sedatives and hypnotics. Later, in 2017, several months after the launching of the new unified prescription for controlled medications, the United Nations Office on Drugs and Crime (UNODC), in collaboration with the Palestinian National Institute of Public Health, revealed that the percentage of illicit benzodiazepine users in the West Bank among high-risk drug users reached up to 70%, with relatively high rates of use of other controlled medicines such as tramadol, barbiturates, and opioids.

This was associated with significant social and health consequences for most users.(Palestinian National Institute of Public Health, 2017) Knowing that majority of users are young men in their most productive time of their lives, more efforts should be invested in reducing these numbers. Given the complexity of the Palestinian context, we should at least ensure that these consumers couldn’t manipulate controlled medications prescribing. This is difficult to achieve with paper prescriptions, especially with the lack of centrality and shared providers view of the patient's medical history. EPCM, however, can significantly reduce misuse and overuse of controlled medications. (CDC, 2022; Dormuth et al., 2012)

Still, given the limited resources locally, and despite this initiative's proposed and confirmed benefits, it would be risky to assume that healthcare workers would want to adopt it. This is especially important for physicians because, as initiators of the prescribing cascade, they have the power to oppose and abort EPCM. Therefore, the first step should be to understand how physicians perceive this technology, a topic that has not been addressed before. Therefore, this study would

be the first in Palestine and the Middle East to examine perceptions of e-prescribing, particularly EPCM. This assessment would help policymakers design and implement EPCM based on scientific and locally relevant factors. This, in turn, is likely to increase the acceptance of EPCM, which is expected to improve control over controlled medicines by providing a dynamic and centralized monitoring system that can easily prevent and track abuse across the country.

1.4 Aim of the Study

To assess Palestinian physicians' perception toward adopting a stand-alone electronic prescribing system for controlled medication (EPCM).

1.5 Objectives of the Study:

The main objectives of our study are to:

- Assess the impact of current prescribing difficulty, performance expectancy, effort expectancy, and trust on intention to use EPCM,
- Assess the effect of age, gender, specialty, experience with e-prescribing, and number of controlled medication prescriptions per month on the magnitude and direction of the impact of these factors on intention to use EPCM.
- Assess the level of satisfaction with the current method of controlled medications prescribing.
- Evaluate physicians’ technical readiness.

1.6 Research Question

Our main research questions are:

How do Palestinian physicians perceive EPCM?

What factors influence their perception the most?

1.7 Research Hypothesis

In this study, we hypothesize that providers' perception and acceptance of EPCM are affected by current workflow/prescribing difficulties, performance expectancy, effort expectancy, and trust. Below is a description of each hypothesis:

1. Current prescribing difficulty and acceptance of EPCM
    - H1: Current prescribing difficulties has a positive impact on intention to use EPCM. This effect is moderated by the number of prescriptions per month and age.
2. Performance expectancy and acceptance of EPCM
    - H2: Performance expectancy has a positive impact on intention to use EPCM. The effect of performance expectancy on intention to use is moderated by age and gender so that this effect will be more substantial among younger providers and men.
3. Effort expectancy and acceptance of EPCM
    - H3: Effort expectancy has a positive impact on intention to use EPCM. This effect is moderated is moderated by age, gender, and experience.
4. Trust and acceptance of EPCM
    - H4: trust has a positive impact on intention to use EPCM. This effect is moderated by experience with E-prescribing and age.

1.8 Research Expected Outcome

Our study would provide a reflective assessment of physicians' perception toward the adopting EPCM. This perception can be used by policymakers as a tool to tailor the implementation process and the final system to fit users' needs and to increase the adoption success rate.

1.9 Description of Thesis Chapters

This thesis is structured as follows:

- Chapter two: includes a literature review about controlled substances, controlled substances prescribing in the Palestinian context, physicians' perception as an important barrier, and what we know about physician perception toward EPCM. The researcher describes the most relevant and significant information regarding this topic and highlights the main gaps in this research field.
- Chapter Three contains a description of the conceptual framework of this research where both variables and operational definitions are listed.
- Chapter Four: it contains the research methodology including study design, setting, population and sample size, data collection instrument, instrument validation, data collection and analysis and ethical considerations and study limitations.
- Chapter Five: it includes a descriptive presentation of participants characteristics, model validation, correlational analysis and hypotheses testing.
- Chapter six: it includes discussion, conclusion, recommendations and future research along with the strength and limitations of this study.

Chapter 2: Literature Review

2.1 Introduction

This chapter aims to explain the concept of controlled substances, their prescription worldwide, and specifically in Palestine. It will also explain the potential for EPCM in Palestine, followed by a discussion of some of the significant obstacles to this initiative, focusing on physicians' perception as an essential barrier to HIT. It will also explain how this obstacle has been explored in previous research, the main pivots, the extent to which they have been explored globally and in the Arab and Palestinian contexts, and what knowledge gaps currently exist on this topic.

2.2 Controlled Substances

According to the national institute of health (NIH), a controlled substance is "a drug or other substance that is tightly controlled by the government because it may be abused or cause addiction. The control applies to the way the substance is made, used, handled, stored, and distributed. Controlled substances include opioids, stimulants, depressants, hallucinogens, and anabolic steroids…]"(Preuss et al., 2018).

The prescribing and dispensing of these drugs are usually controlled through secure procedures and firm regulations. Up to the present time, the prescribing of these medications is paper-based in most regions of the world, which increases the possibility of misuse and abuse. Prescription fraud and counterfeiting, for example, being a serious problem with paper prescriptions, contributes to a significant proportion of medications diverted for abuse in the United States (Thomas et al., 2012).

Providers also reported frequent (more than six times in six months) patient complaints of prescription loss that required a new prescription to be written (26% of respondents), an incident which they had no fast and official means to confirm or reject (Thomas et al., 2012). Another important concern is the phenomenon of "doctor shopping" (individuals obtaining prescriptions for controlled medications from many physicians for the purpose of misuse or diversion), which is common among substance abusers (CDC, 2015).

Medication errors were also not uncommon, with 35.1% of prescribers reporting prescribing the wrong medication and 20% reporting pharmacy errors (Thomas et al., 2012). These problems are significant as the overall use of controlled medications is increasing globally and misuse and overdose deaths have risen in many countries despite regulatory efforts (AHRQ, 2017; Mattson et al., 2021; UNODC, 2019).

2.3 Controlled Substances Prescribing in the Palestinian Context

In Palestine, controlled medication prescribing is still paper-based. It utilizes a special prescription pad that only authorized doctors can have. It has a concept similar to checkbooks, and every prescription has a unique serial number and several patient-specific and drug-specific information entry fields. A physician has to fill out several mandatory pieces of information that also need to be medically and legally correct. This information includes the patient’s name and identification number, age, diagnosis, date, trade name of drugs with dose and frequency written both in words and number, and the total amount to be dispensed with the doctor’s signature and stamp (Figure 2.1).

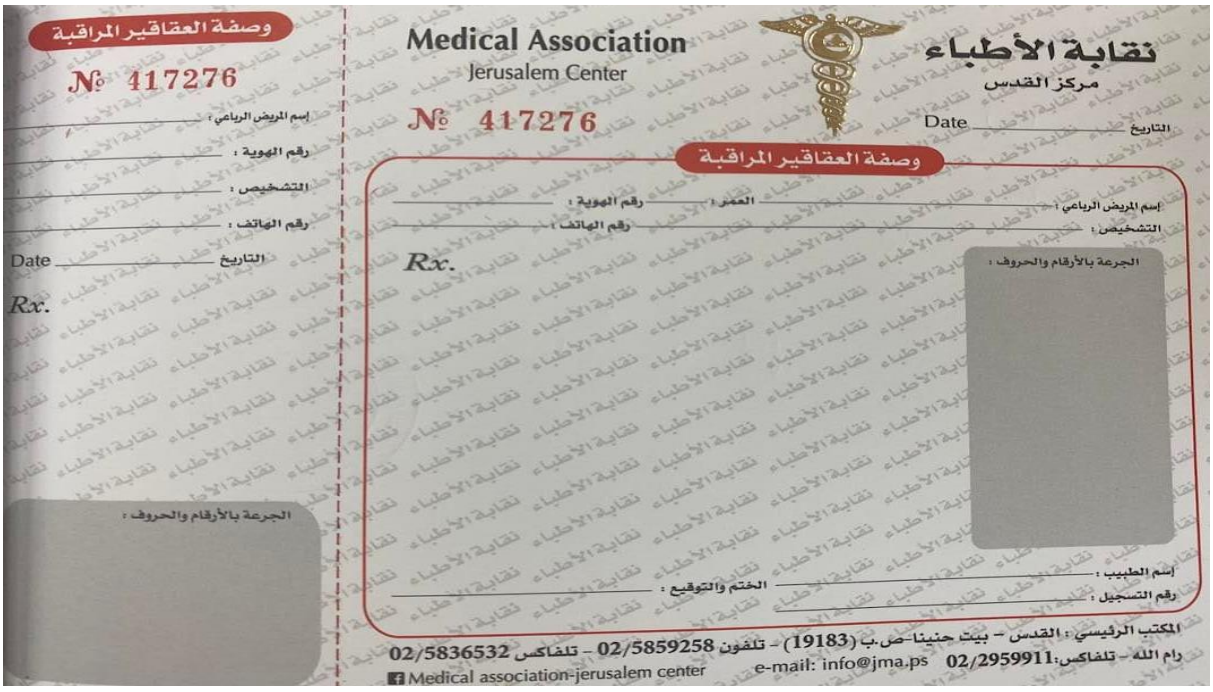

Figure 2.1. The Unified Palestinian Controlled Medications Prescriptions Pad.

Source: Captured in a physician's clinic.

However, if the patient has previously received the monthly dose of that drug, the prescription should be denied by the pharmacist, even if it was filled correctly. There are several other regulations and rules regarding the prescribing process provided by the Palestinian Ministry of Health (the Dangerous Drugs Department, Drug Control Department and other parties) that doctors and pharmacists have to adhere to, or else, they will be subjected to penalties (MOH, 2012; W. M. Sweileh et al., 2016). Both sides should strictly document controlled prescription transactions, and they both need to make sure the prescription is legal and correct in terms of dose, frequency, indication, and others. Then, inspectors need to go in person to pharmacies and match inputs and outputs of controlled medications to check for any possible fraud.

One inspector per governorate does random inspection visits to pharmacies with a frequency that rarely exceeds one stop per year. Hence, it is difficult to monitor these processes at a national level due to the lack of a central database for these many geographically distant transactions. The lack of problem reporting is actually due to a lack of sufficient research in this field which is ascertained by the little available research on this topic. Sweileh & Jaradat. (2004), for example, showed that there are some irrational benzodiazepines prescribing practices among Palestinian neurologists and physiatrists where prescriptions were not filled properly and a clear and rational indication was missing. This is a problem that is thought to have lessened with the adoption of the new unified prescription, but no guarantee on this since such evidence is lacking. In fact, several months after the introduction of the new unified prescription for controlled drugs, the percentage of illicit benzodiazepine users in the West Bank was still very high among high-risk drug users, with relatively high rates of use of other controlled medicines such as tramadol, barbiturates, and opioids (Palestinian National Institute of Public Health, 2017). Therefore, malpractice, violations, and doctor shopping may occur in the current prescription system and sometimes go undetected.

In light of what was mentioned above, and although the tightly regulated paper-based prescribing system can reduce misuse to some extent, it is not enough, especially since drug addicts soon become familiar with the design and get to know how to manipulate it. Hence, there is a need for a central database where all transactions are documented dynamically, allowing for easier detection and prevention of misuse. This takes us to the potential value of adopting e-prescribing controlled medications in Palestine. To further highlight the potential power of EPCM in alleviating misuse and overuse, Preuss et al. showed that among the different ways that someone can get a controlled medication prescription, more than 20% of the time, it is from a prescriber, multiple doctors, or pharmacies with a further 5% stolen from a friend or a relative (Preuss et al.,

2018). This information is of high value because all these problems can be tackled with an electronic prescribing system where a prescription can be easily prevented if medically or legally wrong, it can be tracked until it gets prescribed by a specific pharmacy, and also it can be quickly canceled if reported as lost or whatever other reason that demands are canceling it before dispensing.

2.4 Physicians' Perception as an Important Barrier

As expectations for health information technology rise and significant financial investments are made in their development and implementation, it's no surprise that academics and practitioners are looking to learn more about the factors that influence users' perception and acceptance of these systems. In a systematic review that aimed to identify the most common barriers and facilitators to implementing E-prescribing from the perceptive of health care practitioners, the following factors were found to play a significant role in how physicians perceive e-prescribing. They include system function-related concerns such as structure (design, technical, system reliability and quality standards concerns), process (interoperability, insufficient infrastructure and insufficient clinically relevant information, alerts medications renewal and others), and privacy and security concerns. Other factors that are related to human perspective were identified such as resistance to change, familiarity with IT, perceived ease of use, perceived usefulness and efficiency, risk-benefit equation, patients/clinician interaction, time concerns and observability. Organizational factors also affected physicians' perception, including resources (IT support, training, etc.), incentives, professional interaction, and team spirit, among others (Gagnon et al., 2014).

Physician perception deserve close attention because, if sufficiently researched, it can help reduce practitioner resistance, which in itself is a tool to increase the success rate of adoption (Centers for Disease Control and Prevention (US), 2017; Dansky et al., 1999; Gagnon et al., 2014; Oktarlina, 2020; Wager et al., 2017). Hence, researchers have grown more interest in investigating user's perceptions in validated and systematic approaches. In fact, the most successful interventions are those that are based on behavior change theories. The theory is used for explaining and defining target beliefs in therapeutic practice, as well as providing a framework for designing and implementing interventions (Keyworth et al., 2018). In this context, several behavioral and social cognitive models of technology acceptance have been proposed with the shared concept that individuals' intentions to use and actual use of health information systems (HIS) are affected by their perception toward these technologies (Venkatesh et al., 2003).

These models include: The Theory of Reasoned Action (TRA), The Theory of Planned Behaviors (TPB), The Technology Acceptance Model (TAM), the Combined-TAMTPB, Model of PC Utilization (MPCU), Motivational Model (MM), Social Cognitive Theory (SCT), Innovation Diffusion Theory (IDT), IS Successful Model, Technology Fit Model, and the unified theory of acceptance and use of technology (UTAUT. Each one of these models is based on certain but similar constructs (independent variables) and moderators. The UTAUT is a universal model for assessing technology acceptance among medical doctors that was developed by Venkatesh et al. in 2003. It is comprehensive, and has a strong theoretical foundation and very good explanatory power since it combines 8 other theories; TRA, TPB, MM, TAM, SCT, MPCU, CTAM-TPB and IDT (Venkatesh et al., 2003). According to its originator, UTAUT is expected to explain 70% of the variations in the level of acceptance of use of IT among users. It is the most used model based on citations (Owolbi et al., 2016). The use of UTUAT in health research has been supported by

several studies (El-gayar et al., 2008; Hennington & Janz, 2007; Li et al., 2013). This model includes four constructs: performance expectancy, social influence, effort expectancy, and facilitating condition, along with four other moderators: acceptance of technology, age, gender, voluntariness of use, and experience (Owolbi et al., 2016)

Later, it was further extended to include other important variables such as cost and trust (Cody-Allen & Kishore, 2006; Venkatesh et al., 2012). It is also suggested that rather than replicating the model, UTAUT attributes be adjusted and customized to meet the unique research interests (Venkatesh et al., 2003). However, the main endogenous constructs of the UTAUT model are as follows:

Performance expectancy is the degree to which a person thinks IT will help him/her to achieve better job performance. It is about the benefits an individual is expecting to get when using the new technology compared to the system in current use. It was found to be the strongest predictor of intention to use in all models. In addition, age and gender were found to be strong moderators, especially for younger providers and men. (Venkatesh et al., 2003)

Effort expectancy is the degree of ease associated with the use of the system. It was found to significantly impact on intention to use in the early phase of technology adoption. This effect becomes less significant as users become more familiar with it. In addition, this effect was found to be moderated by gender, age, and experience, as women, older users, and those with limited experience with the technology were most affected by this element. (Venkatesh et al., 2003)

Social influence is the extents to which a person decision to use the new system is influenced by others options. The impact of this construct on technology adoption has been examined in previous research and was proved to be significantly associated with intention to use and actual use of technology (Venkatesh et al., 2003). However, there are several issues related to social influence that pose challenges to information technology adoption research and raise questions regarding the explanatory power of this construct. These include differences in interpretation of the concept across different technology adoption models, examining the effect of social influence through only one distinct social influence process (compliance, internalization or identification) and the inconsistency in primary research findings on this construct (e.g. context related such as the impact of voluntary vs. mandatory context) (Graf-Vlachy & Buhtz, 2017; Venkatesh et al., 2003).In the UTAUT model, social influence is defined as "the extent to which a person perceives that significant others believe he or she should use the new system(Venkatesh et al., 2003). However, for such influence to be socially derived, there must be an actual prevalence and users of a certain intervention in a person's network (social referents) (Graf-Vlachy & Buhtz, 2017).

Facilitating conditions defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system."(Venkatesh et al., 2003). However, the effect of facilitating conditions on intention to use is thought to be mediated by effort expectancy and performance expectancy. Therefore, when these two constructs are taken into account, the prediction of intention to use through facilitating conditions becomes nonsignificant. Moreover, facilitating conditions were found to affect actual use but not intention to use.(Venkatesh et al., 2003).

2.5 What Do We Know About Physician Perception of EPCM?

A true challenge in the existing literature about this topic is the lack of pre-implementation perception assessment which is an important issue now that we know that a pre-implementation perception can prevail valuable information about the actual implementation. Also relying on post implementation assessment can be misleading as the perception was found to be a changing behavior that varies from one stage of implementation to another. For example, some elements that influence perception might be seen as barriers in the pre-implementation stage and change to facilitators during and post implementation (e.g. the time-saving factor) (Gagnon et al., 2014).

To elaborate more on this point, several studies, for example, found that physicians perceived e-prescribing after implantation as very efficient and easy to use despite a differing view pre-implementation (Hahn & Lovett, 2014). These findings also include controlled medications, as physicians found e-prescribing in this context to be easier and more efficient than expected (Thomas et al., 2013). In addition, some factors were found to have a significant impact on user perceptions only under certain circumstances (social influence in a voluntary or mandatory setting), while other factors become less important over time as users become more familiar with the new technology (Venkatesh et al., 2003). Additionally, the perception evaluation literature on perception assessment is limited to e-prescribing in general and scarce on e-prescribing of controlled medications. The existing researches, although of a great value, being a context specific topic, cannot be safely extrapolated to other regions. Studies were conducted on physician perception toward e-prescribing, and their results, although they have some similarities, varied from one region to another (Cohen et al., 2013; Khan et al., 2018; Smith, 2006; Wrzosek et al., 2020).

For e-prescribing of controlled medication, literature that addresses pre-implementation perception assessment is scarce and most of the literature is limited to the USA. Among these, Thomas et al 2012, using the TAM model, found that the majority of prescribers had a positive view of it and predicted e-prescribing of controlled drugs to result in fewer calls from pharmacists, more accurate prescriptions, improved detection of controlled substance usage and diversion, and productivity benefits. It is worth noting that current e-prescribing users were more optimistic about the e-prescribing of controlled medications possibilities. They were more inclined to expect it to increase practice efficiency and workflow (Thomas et al., 2012).

In Palestine and the Middle East at large, the literature on this topic is inadequate, with no studies directly addressing physicians' perception of the adoption of e-prescribing. This might be attributed to the fact that most Arab countries are still behind in using HIT due to cost and competencies (Alsadan et al., 2015). Therefore, there is a real gap in knowledge about the possible factors and their type and extent of impact on physicians' intention to adopt HIT, specifically EPCM.

In light of what was mentioned above, the gap in knowledge about the possible factors and their type and extent of impact on physicians' intention to adopt electronic prescribing, specifically for electronic prescribing of controlled medications, demands more efforts in this field. Therefore, in this research, we will build the knowledge base that is needed for the actual implementation step, since we will end up having a good understanding of the current workflow and possible needs and goals. Therefore, by the time of actual implementation, they can customize such systems based on a reflective, up-to-date, and country-specific perception assessment.

2.6 Summary

Controlled substances are prone to misuse and overuse, and their illicit use is on the rise globally and in Palestine. In Palestine, they are still prescribed using paper prescriptions, which is associated with a high risk of fraud and manipulation. EPCM is a reasonable solution. However, before considering implementation, physicians' perception should be first assessed since it is an important possible barrier. Among the models that have been widely used in assessing users' perceptions toward the adoption of HIT, UTAUT is a comprehensive and powerful theory that is capable of explaining the variations in the level of acceptance of the use of IT among users. This takes us to the next chapter, conceptual framework, where the UTAUT-derived hypothesis for this research is explained.

Chapter 3: Conceptual Framework

3.1 Introduction

This chapter explains the conceptual framework of this study. It clarifies the main constructs that are believed to influence physicians' intentions to use EPCM and the moderating factors that are hypothesized to have a significant impact on the direction and magnitude of the main constructs' effect on intention to use EPCM.

3.2. Conceptual Framework

The conceptual framework of this research is derived from UTAUT. However, the UTAUT model has a limited ability to explain and predict every technology use. Therefore, it is recommended to adjust and customize UTAUT attributes to meet the unique research interest rather than replicating the model (Venkatesh et al., 2003). In our research, we modified the original UTAUT model ~~t~~o better suit the situation of controlled medications prescribing in Palestine. The modifications were as follows: Two new constructs (endogenous mechanism extension), were added: current workflow difficulties and trust. For the trust construct, controlled medications pose a high risk for addiction and misuse. Therefore, prescribing these medications is usually associated with some extent of fear of system breaches and fraud, with subsequent legal accountability. Knowing that security issues are a well-established concern for many technology users, it is important to take this factor into consideration when assessing physicians' perception toward the adoption of EPCM (Clark et al., 2012). For current workflow difficulties, we assume that the more dissatisfied a physician is with the current prescribing practices, the more willing he or she is to undertake new improvement initiatives, including EPCM.

Two constructs of the original UTAUT were deleted: social influence and facilitating conditions. Regarding social influence: for such influence to be socially derived, there must be an actual prevalence and users of a certain intervention in a person's network (social referents) (Graf-Vlachy & Buhtz, 2017). Here, we propose an entirely new intervention (EPCM) that has never been used in Palestine. For this reason, this construct was omitted from this study. For facilitating conditions, it is assumed that the effect of facilitating conditions on intention to use is mediated by effort expectancy and performance expectancy. Therefore, when these two constructs are taken into account, the prediction of intention to use by facilitating conditions does not become significant. In addition, facilitating conditions were found to influence actual use but not intention to use, which was not examined in this study (Venkatesh et al., 2003). For this reason, this construct was omitted from this study. Also, the number of controlled medications prescriptions per month was added as a new moderator, to see if physicians' who prescribe controlled medications frequently are more open to improvement or not.

3.3 Dependent and Independent Variables

The conceptual framework of our study (Figure 3.1) was designed to describe the relationships between the study variables:

- **Dependent variables:** intention to use EPCM
- **Independent variables:** current prescribing difficulties, performance expectancy, effort expectancy, trust, age, gender, number of controlled medications prescriptions per month and experience with e-prescribing.

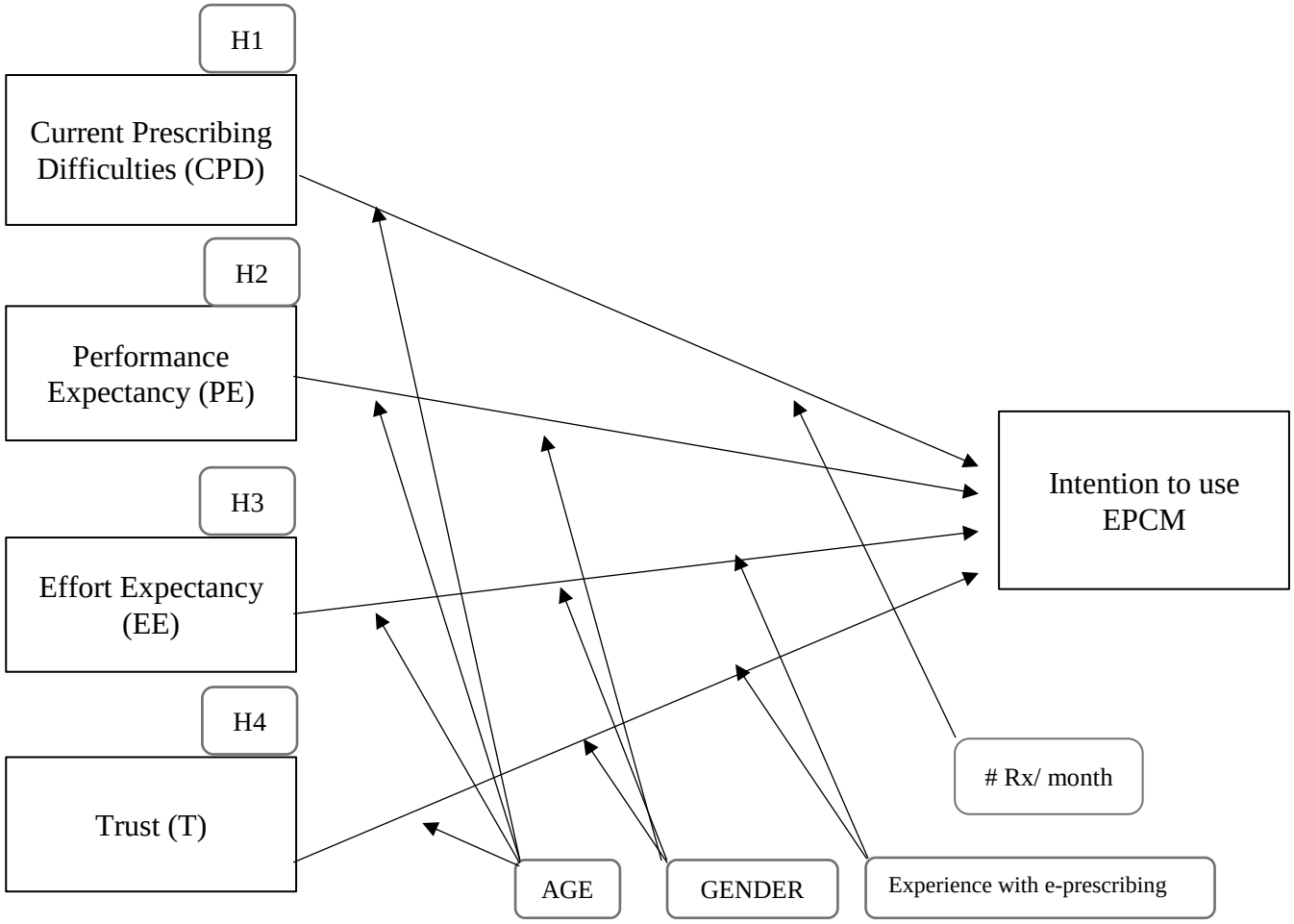

Figure 3.1. The Conceptual Framework of the Study

3.4 Operational Definitions

- Specialty: the current specialty of a participant (e.g., internal medicine, general surgery, etc), no options are provided, open question.
- Experience: it measures the level of experience a physician has with e-prescribing. It was measured by using two questions, one related to the general knowledge of e-prescribing (C1) and the other one related to the actual use experience of e-prescribing(C2). Answers range (yes: coded as 1, no: coded as 0)

- Governorate: an open question with the following possible answers: Nablus, Tulkarim, Qalqilya, Jenin, Tobas, Salfit, Ramallah, Jericho, Jerusalem suburbs Hebron and Bethlehem.
- Workplace: the current workplace that the physician practice medicine at. Six options were provided: addiction rehabilitation center, mental/psychiatric clinic, oncology center, private hospital, private clinic, others.
- Number of controlled medications prescribed per month: 5 options were provided: stopped prescribing controlled medications, less than 5 per month, more than 5 and less than 50 per month, from 50-100 per month and more than 100 per month. Answers were coded form 1-5, respectively.
- Controlled medications that the physician commonly prescribes. The listed options are composed of the list of commonly prescribed controlled medications in the Palestinian ministry of health and include Tramadol, Pregabalin, Phenobarbital, Diazepam, Codeine, Clonazepam, Alprazolam, Phentermine, and Lorazepam. Each of these was answered as yes if prescribed and no if not. Answers range (yes: coded as 1, no: coded as 0) for each medication.
- Current prescribing difficulties (CPD): this construct assesses the difficulty level with the current practices of controlled medications prescribing. It contains 9 items (CPD1-CPD9). Answers range (yes: coded as 1, no: coded as 0)
- Technical readiness: It is intended to evaluate familiarity with technology, availability of smart devices and a stable internet connection. Assessed using questions B1-B3. Answer range: (Yes: coded as 1, no: coded as 0)

- Section C: it measures experience with e-prescribing. It consists of two items C1-C2. Answers range:(Yes: coded as 1, no: coded as 0)
- Performance Expectancy (PE): it assesses how efficient physician believe EPCM will be. It contains 5 items PE1-PE5. Answers range: 1-5 (1: strongly disagree, 2: disagree, 3: neutral, 4 agree, 5 strongly agree).
- Effort expectancy: it assesses whether physicians believe EPCM will be easy or hard to use. It contains 5 items EE1-EE5. Answers range: 1-5 (1: strongly disagree, 2: disagree, 3: neutral, 4 agree, 5 strongly agree).
- Trust: it assesses the level of perceived trust of EPCM. It contains 5 items T1-T5. Answers range: 1-5 (1: strongly disagree, 2: disagree, 3: neutral, 4 agree, 5 strongly agree). Refer to appendix A. to see the full list of questions.

3.5 Summary

In summary, this chapter provided an understanding of the theoretical ground of this research which is based on the hypothesis that physicians' intention to use EPCM is affected by performance expectancy, effort expectancy and trust of EPCM, and the level of difficulty with the current practice. The next chapter provides a description of methodology.

Chapter 4: Materials and Methods

4.1 Introduction

This chapter provides details regarding the methodology of this research including study design, setting, population and sample, instrument, data collection and data analysis.

4.2. Study Design

A quantitative cross-sectional study was conducted using a self-administrated questionnaire. More details on the study instrument and data collection are provided later in this chapter.

4.3 Study Setting

The study was conducted in the West Bank of Palestine in 2022. Data collectors visited physicians in their workplaces (clinics, hospitals, medical centers, etc.). All regions of the West Bank were covered; southern (Nablus, Tulkarem, Qalqilya, Jenin, Tobas, Salfit), middle (Ramallah, Jericho, Jerusalem suburbs), and northern (Hebron and Bethlehem).

4.4 Population and Sample Size

Target population: Palestinian physicians residing in the West Bank who practice controlled medication prescribing, identified as those registered by the Palestinian ministry of health as current or previous holders of the unified controlled medication prescription pad. According to the ministry of health, 1260 physicians fulfilled the above criteria in 2021 (target population). Using http://www.raosoft.com/samplesize.html with a margin of error of 5%, a confidence interval of 95%, and a 50% response distribution, the needed sample size was 295 physicians.

4.4.1 Sampling Technique

A convenient sample was randomly selected where data collectors randomly visited physicians in their workplaces and made sure they fulfill the inclusion criteria before enrolling them in the study.

4.4.2 Inclusion and Exclusion Criteria

- Inclusion criteria: Palestinian physicians residing in West Bank who practice controlled medication prescribing identified as those registered by the Palestinian ministry of health as current or previous holders of a personal controlled medications prescriptions pad.
- Exclusion criteria: None.

4.5 Data Collection Instrument

Our instrument was build based on previous studies (Cohen et al., 2013; Palappallil & Pinheiro, 2018; Thomas et al., 2012) and Palestinian specialties observations (Table 4.1). It consists of three-parts:

- Part 1: Demographics and background information: specialty, age, gender, years of work experience, governorate, workplace, number of controlled prescription per month and the controlled medications prescribed the most by him/her.
- Part 2: measures current prescribing difficulties of controlled medications (nine questions,) computer use–personal experience (three questions) and experience with E-prescribing (two questions). Each item has two options: Yes or No.
- Part 3: These questions were adapted from the UTAUT. It is made up of 3 constructs; performance expectancy (5 items), effort expectancy (5 items) and trust (5 items). Some of the items within each construct were derived from the validated survey of Cohen et al.,

(2013) which was originally based on UTAUT theory. Other items were derived from (Thomas et al., 2012) Other items that are specific to controlled medication prescribing were developed based on Palestinian specialties observations (table 4.1). Each item is measured using a 5-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (5)". The full questionnaire is available as appendix A

Table *4.1: The Sources of The Questionnaire Items*

	Current Prescribing Difficulties (CPD)	Source
CPD1	أجد صعوبة في الحصول على دفتر وصفات مراقبة جديد I find it difficult to get a new controlled drugs prescriptions pad	New/ specific to the Palestinian context
CPD2	تنفذ وصفات الأدوية المراقبة المتوفرة لدي أحياناً I sometimes run out of controlled medications prescriptions	New/ specific to the Palestinian context
CPD3	اشعر بالقلق بشأن قوانين وصف الأدوية المراقبة وما يليها من تبعات I am concerned about the prescribing laws of controlled drugs and the consequences thereof	New/ added by researcher based on feedback form several physicians during validation
CPD4	أتلقى مكالمات من الصيدليات لتأكيد او توضيح وصفات الادوية المراقبة I receive calls from pharmacies to confirm or clarify prescriptions of controlled medicines	(Thomas et al., 2012) Palappallil & Pinheiro,) (2018
CPD5	استخدم وصفة جديدة في حال وجود خطأ ما في الوصفة I use a new prescription in case there is something wrong with the written one	New/ added by researcher based on feedback form several physicians during validation
CPD6	تعرضت لسرقة دفتر الوصفات المراقبة، أو جزء منه، من قبل Prescription pads, or part of them, were stolen	(Thomas et al., 2012) Palappallil & Pinheiro,) (2018
CPD7	تم كتابة وصفة طبية جديدة لفقدان المريض الوصفة المكتوبة سابقاً Patients reported loss of a prescription requiring a replacement prescription	(Thomas et al., 2012) Palappallil & Pinheiro,) (2018
CPD8	أفكر احياناً في التخلي عن وصف الادوية المراقبة (أو توقفت عن وصفها) لتجنب المشاكل المحتملة Sometimes I think about dropping (or stopped) prescribing controlled medications to avoid potential problems	New/ added by researcher based on feedback form several physicians during validation
CPD9	تم صرف علاج خاطئ او جرعة خاطئة من قبل الصيدلية The wrong medication, or dose, was dispensed by the pharmacy	(Thomas et al., 2012) Palappallil & Pinheiro,) (2018
	Technical readiness	
B1	امتلك حاسوب شخصي أو هاتف ذكي I have a smart phone or personal computer	Palappallil & Pinheiro,) (2018
B2	استخدم الحاسوب أو الأجهزة الذكية بشكل مرضي I am comfortable with computer use Computer	Palappallil & Pinheiro,) (2018
B3	تتوفر شبكة انترنت مناسبة معظم الوقت I have a stable internet connection most of the time	New/ added by researcher
	Experience	

C1	عندي معرفة بالمفهوم العام للوصف الالكتروني للأدوية I am aware of the concept of electronic prescribing	(Cohen et al., 2013)
C2	لدي تجربة في استخدام الوصف الالكتروني للأدوية في عملي الحالي او السابق I have experience using e-prescribing in my current or previous job	(Cohen et al., 2013)
	Performance expectancy	
PE1	الوصف الالكتروني للأدوية المراقبة سيساعدني في القيام بأعمالي بشكل أسرع Electronic prescription for controlled medications will help me do my work faster	(Cohen et al., 2013)
PE2	الوصف الالكتروني سيساعدني على كتابة وصفات أكثر التزاماً بالتشريعات والتوصيات الطبية Electronic prescribing will help me write prescriptions that are more compliant with medical legislation and recommendations	(Thomas et al., 2012)
PE3	الوصف الالكتروني سيحد من انتشار الإدمان وإساءة استخدام الادوية المراقبة Electronic prescribing will reduce the spread of addiction and abuse of controlled drugs	(Thomas et al., 2012)
PE4	الوصف الالكتروني للأدوية المراقبة سيقلل من الأخطاء الطبية Electronic prescribing of controlled drugs will reduce medical errors	(Thomas et al., 2012)
PE5	الوصف الالكتروني للأدوية المراقبة سيحسن من رضى المرضى Electronic Prescribing of Controlled Drugs Will Improve Patient Satisfaction	(Thomas et al., 2012)
	Effort expectancy	
EE1	استخدام الوصف الالكتروني للأدوية المراقبة سيكون سهلا The use of electronic prescribing of controlled medications will be easy	(Cohen et al., 2013) (Thomas et al., 2012)
EE2	استخدام الوصف الالكتروني للأدوية المراقبة لن يؤثر على روتين عملي The use of electronic prescribing of controlled medications will not affect my work routine	Palappallil & Pinheiro,) (2018
EE3	تجديد الوصفات باستخدام الوصف الالكتروني للأدوية المراقبة سيكون أسهل Renewing prescriptions using electronic prescribing for controlled medications will be easier	Palappallil & Pinheiro,) (2018
EE4	تعديل الوصفات من خلال الوصف الالكتروني للأدوية المراقبة سيكون أسهل Editing prescriptions through electronic prescribing of controlled medications will be easier	Palappallil & Pinheiro,) (2018
EE5	الغاء الوصفات من خلال الوصف الالكتروني للأدوية المراقبة سيكون أسهل Cancellation of prescriptions through electronic prescribing of controlled medications will be easier	New/ added by researcher
	Trust	
T1	الوصف الالكتروني للأدوية المراقبة سيحد من فرصة اختراق النظام وانتحال شخصية طبيب وصرف وصفات مزورة Electronic prescribing of controlled medications will reduce the opportunity to hack the system, impersonate a doctor, and dispense false prescriptions	Palappallil & Pinheiro,) (2018
T2	الوصف الالكتروني للأدوية المراقبة سيسهل تتبع الاختراق اذا حدث حيث سيكون من الممكن ابطال الوصفات بسهولة عكس الوصفات الورقية Electronic prescribing of controlled medications will facilitate tracking of the breach if it occurs as it will be possible to invalidate the prescriptions easily unlike paper prescriptions	(Thomas et al., 2012) Palappallil & Pinheiro,) (2018
T3	الوصف الالكتروني للأدوية المراقبة سيكون أكثر حماية لبيانات المريض Electronic prescribing of controlled medications will be more protective of patient data	(Thomas et al., 2012) Palappallil & Pinheiro,) (2018
T4	الوصف الالكتروني للأدوية المراقبة سيقوم بالتوثيق الدقيق لكافة الوصفات المصروفة Electronic prescription of controlled medications will accurately document all prescriptions dispensed	New but with a concept similar to ()Palappallil & Pinheiro, 2018(/ fear that work would be controlled
T5	الوصف الالكتروني للأدوية المراقبة يتتبع الأخطاء الطبية بشكل أسهل Electronic prescribing of controlled medications tracks medical errors more easily	New but with a concept similar to)Palappallil & Pinheiro, 2018(/ fear that work would be controlled

	Intention to use EPCM	
G1	الية صرف الادوية المراقبة المتبعة حالياً بحاجة الي تطوير The currently used controlled medications dispensing mechanism needs development	(Thomas et al., 2012)
G2	سأقوم باستخدام الوصف الالكتروني للأدوية المراقبة إذا تم توفيره I will use the electronic prescribing for controlled medications if it is available	(Cohen et al., 2013)

4.6 Questionnaire Validation and Reliability

Three quarters of this questionnaire is derived from validated questionnaires (Cohen et al., 2013; Palappallil & Pinheiro, 2018; Thomas et al., 2012). However, the final version of the questionnaire, with the eight new questions, was re-validated by eight experts: three academic pharmacists; a pharmacist in a managerial position in the Palestinian ministry of health; two professors in health informatics; a professor in statistics; and a professor in health information technology. More details on the validation expert panel can be found in appendix B. The questionnaire was also pilot-tested before being used on 10 physicians who fulfilled the criteria of the target population. They were asked to mark questions that were unclear or repetitive, as well as the amount of time it took them to complete the survey. Revisions were made where needed based on their feedback.

4.7 Data Collection

This task was assigned to four data collectors as follows: one in Hebron and Bethlehem to cover the southern region, one in Ramallah, Jerusalem suburbs and Jericho to cover the middle region; and two in Qalqilya, Jenin and Tulkarim, Nablus and its surroundings to cover the northern region. All data collectors were trained and educated about the concept of E-prescribing and how each question should be filled in. Since we were not provided with a list of names of controlled medications prescribers, data collectors randomly visited doctors in their workplaces from various

specialties and asked them if they prescribe these medications. If the answer was yes, the targeted physician was then asked to fill out the questionnaire. Then each participant was briefly educated about the concept of e-prescribing before filling out the questionnaire. Three main interfaces of EPCM that were primarily designed for this research were used to make sure physicians were well aware of the concept of EPCM before filling in the questionnaire, see (Appendix C). Still, physicians were informed that this is not necessarily the final and official interface of the system. A total of 300 responses were collected and each questionnaire was given a serial number from 1 to 300. Data collection was completed over one month, from June 1st to the end of June.

4.8 Statistical Analysis

Data were entered to Statistical Package for the Social Sciences (*IBM SPSS) version 26.0.0.0,* cleared, coded and categorized as study needed. Principle Component Analysis (PCA) with varimax rotation was performed to extract factors using the loading criteria of 0.40. Twenty-four items were examined, the items of the subscale related to e-prescribing difficulty (9 items) and e-prescribing expectancy (15 items) were examined separately. Validity of measurement was performed using the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's tests of the sample. Then, the reliability coefficient for each scale was calculated using, 1) Cronbach alpha for each subscale, and 2) no increase of more than 0.1 for Cronbach α when an item was deleted from the scale.

Descriptive statistics were performed to present data. Recoding for the dependent variable, intention to use EPCM, it was reduced into two categories including disagree, agree. Neutral responses were coded as missing values. Pearson Correlation test was performed to assess the relation between the five constructs. Univariate logistic regressions were performed to measure

the association between continuous variables (age, UTAUT constructs), and intention to use EPCM. Pearson's Chi- square test was conducted to assess the association between the expected categorical moderators (gender, number of prescriptions per month, and previous experience in e-prescribing), with intention to use EPCM. Then, a multivariate model using enter method was conducted between each construct and the expected significant moderators as the model gets built. The multivariate logistic regression models, adjusted for moderating variables, was performed to identify the interaction effects between UTAUT construct and intention to use EPCM.

4.9 Ethical Considerations

The researcher obtained permission to conduct this research from the American Arab University, the institutional review board, the Palestinian Ministry of Health, and the Palestinian physicians' union. A consent form was attached to each questionnaire in which participants were informed that participation was optional, they had the right to not answer any question, and that the collected data would be used with high confidentiality and only for the stated research purposes. See Appendix A

4.10 Summary

This chapter presented the methodology of this study. It included the study design, study setting, population, and sample size. It also presented the data collection instrument, data collection methods, and analysis, as well as important ethical considerations. The next chapter provides a presentation of the results obtained.

Chapter 5: Results

5.1 Introduction

This chapter provides an overview of the results of this study. First, the sociodemographic characteristics of the participants are presented, followed by the general acceptance of EPCM and an assessment of technical readiness and experience with e-prescribing. This is followed by an assessment of current prescribing difficulty, performance expectancy, effort expectancy, and trust, followed by an assessment of construct validity. Finally, hypothesis testing results are presented.

5.2 Construct Validity

The PCA with varimax rotation manifested that the variable's KMO value was 0.662 for the difficulties construct and 0.936 for the expectancy construct, indicating that the validity of each variable in the sample data is good. The significance level of Bartlett's test was <0.001 for each.

A total of 24 items related to UTAUT model loaded significantly on 5 factors. Table 5.1 shows the range of factor loadings for the items retained for each factor as well as the eigenvalues and variance explained for each factor. Four of the five factors had eigenvalues above 1, while one factor had an eigenvalue close to 1, with a total explained variance of 48.264% for 2 difficulties factors and 72.323% for three expectation factors. Two items were cross-loaded across two factors (EE1, PE3) for expectation factor and one item cross-loaded across two factors (CPD3) for difficulties factor. However, these three items showed significant correlation with the rest of the internal subscale homogeneity with the rest of the items. The item, ‘‘CPD9’’ did not meet the loading criterion, so it was deleted from the construct.

Table *5.1: Rotated Factor Analysis of the UTAUT model*

Subscale	No. of items	Factor loading	Eigenvalue	%Variance Explained
CPD (1,2,3,8)	4	0.484-0.794	2.218	27.723
CPD (4,5,6,7)	4	0.517-0.713	1.643	20.541
PE	5	0.553-0.766	1.262	8.411
EE	5	0.688-0.614	0.996	6.373
T	5	0.725-0.849	8.631	57.539

CPD: current prescribing difficulties, PE: performance expectancy, EE: effort expectancy, T: Trust
Eigenvalue: a factor if >1, % variance: the proportion of explained variance in the original data by each factor

5.3 Construct Reliability

Table 5.2 shows that the α coefficients for the five subscales retained for the final version of the questionnaire. The internal consistency (Cronbach α) for the factors ranged from excellent (Cronbach α=0.917) for Trust and poor (Cronbach α= 0.544) for CPD (5,6,7,8).

Table *5.2: The Internal Consistency (Cronbach α) of the Constructs*

Subscales	No. of items	Cronbach α
CPD (1,2,3,8)	4	0.65
CPD (4,5,6,7)	4	0.544
PE	5	0.869
EE	5	0.875
T	5	0.917

CPD: current prescribing difficulties, PE: performance expectancy, EE: effort expectancy, T: Trust
Cronbach a: Excellent: a ≥ 0.9, good: 0.7 ≤ a <0.9, acceptable: 0.6 ≤ a <0.7, poor: 0.5 ≤ a <0.6, unacceptable: a <0.5)

5.4 Sociodemographic Characteristics of Participants.

A total of 300 responses were collected. The majority (90.3%, n=271) of the responders were males (Table 5.3). Responders' mean age was 40.89 years and the highest proportion was in the age range 30-39 (39%). The majority of responders were specialists (69.6%, n=209) with the remainder being general practitioners and subspecialists, and 27% (n=81) of the participants had work experience of 5 to 9 years. The surveyed prescribers represented a variety of medical specialties, with general medicine and family medicine being the most encountered specialties (26.4%, n=79), followed by internal medicine and orthopedics (60, 20% and 58, 19.3%,

respectively. The majority of responders 50.3%(n=151), reported issuing less than 5 prescriptions per month and 14.3%(n=43) stopped prescribing them. Moreover, 69.7% (n=209) reported that their private clinic is the main place where they prescribe controlled medications.

Table *5.3: Participants' Sociodemographic Characteristics*

Individual-level variable	**n**	**Percent %**	**Mean ± SD**
Age	300		40.89 ± 10.4
Less than 30	38	12.7	
30-39	117	39.0	
40-49	89	29.7	
More than or equal 50	56	18.7	
Gender			
Male	271	90.3	
Female	29	9.7	
Region			
North (Nablus, Salfit, Qalqelieh, Jenin, Tulkarem)	125	41.6	
Middle (Ramallah/ Bireh, Jerusalem, Jericho)	112	37.4	
South (Hebron, Beithlahim)	63	21	
Specialty			
General practitioner/ Family medicine doctor	79	26.4	
Internal medicine doctor	58	19.3	
Cardiologist	5	1.7	
Orthopedics	60	20	
General surgeon	25	8.3	
Emergency Room Doctor	8	2.7	
Neurologist	9	3	
Psychologist	2	0.7	
Dentist	13	4.3	
Gynecologist	12	4	
Oncologist	5	1.7	
Pediatrician	6	2	
ENT	7	2.3	
Others (Anesthesiologist, Dermatologist, Ophthalmologists, urologist)	11	3.6	
Level of specialization			
Medical doctor	77	25.6	
Specialist	209	69.7	
Sub-specialist	14	4.7	
Experience in medicine (years)			12.25 ± 9.6
Less than 5	64	21.3	
5-9	81	27.0	
10-14	63	21.0	
15-19	27	9	
More than or equal 20	65	21.7	
Workplace			
Private clinic	209	69.7	
Private hospital	76	25.3	
Oncology center	10	3.3	
Mental/ Psychiatric/ Rehabilitation clinic	5	1.6	

Number of prescriptions per month		
Less than 5	151	50.3
5-50	85	28.3
50-100	16	5.3
More than 100	5	1.7
Stopped	43	14.3

*n is the number of participants occurrence in the defined category, % is the percentage of cases in defined category, SD standard deviation

Regarding the most commonly prescribed controlled medication, it was tramadol (81% (n=243)), followed by pregabalin 55.7% (n= 167) (as shown in Figure 5.1).

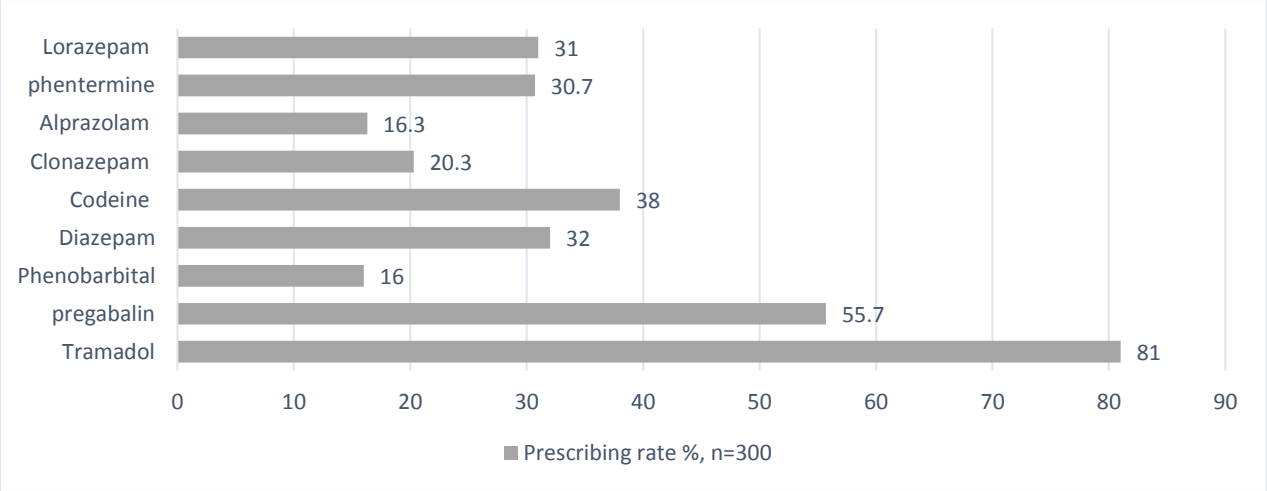

Figure 5.1. Prescribing Rates of Controlled Medications as Reported by Participants

5.5 Overall Perception of EPCM

The majority of responders had a positive perception toward the adoption of EPCM with an intention to adopt rat of 85% (agree n=93, strongly agree n=162). Furthermore, the existing prescribing system has to be improved concurrently, according to 80% (n=240) of respondents.

5.6 Technical Readiness and Experience with E-Prescribing

The majority of participants, 91.6% (n=275), reported they are comfortable with computer use, 296 (98.7%) have a personal smart phone or computer and 283 (94.3%) have a stable internet connection most of the time. (Table 5.4).

Table 1.*4: Responses of Participants on Technical Readiness*

Question	**Responses**	
	Yes	No
I have a smart phone or personal computer	296 (98.7%)	4 (1.3%)
I am comfortable with computer use	284 (94.7%)	16 (5.3%)
I have a stable internet connection most of the time	283 (94.3%)	17 (5.7%)

A total of 80%(n=240) of participants are familiar with the concept of e-prescribing with 72% (n=216) that had used e-prescribing before (Table 5.5).

Table *5.5: Participants' Knowledge About E-prescribing*

Question	**Responses**	
	Yes	No
I am aware of the concept of electronic prescribing of medicines	240 (80.0%)	60(20.0%)
I have experience using e-prescribing of medicines in my current or previous job	216 (72%)	84 (28%)

5.7 Current Prescribing Difficulties

Prescribers reported having a variety of problems regarding the prescribing of controlled medications. Out of all participants, 60.3% (n=181) of them find it difficult to renew their prescriptions pad, and 50.7% (n=152) reported that they frequently run out of prescriptions (Figure 5.2). Fifteen percent (n=45) of participants reported that their prescription pad, or part of it, was stolen. 34% prescribers were asked to issue a replacement prescription for a lost one. A total of 196 (65.3%) considering stopping prescribing-controlled medications, or already did.

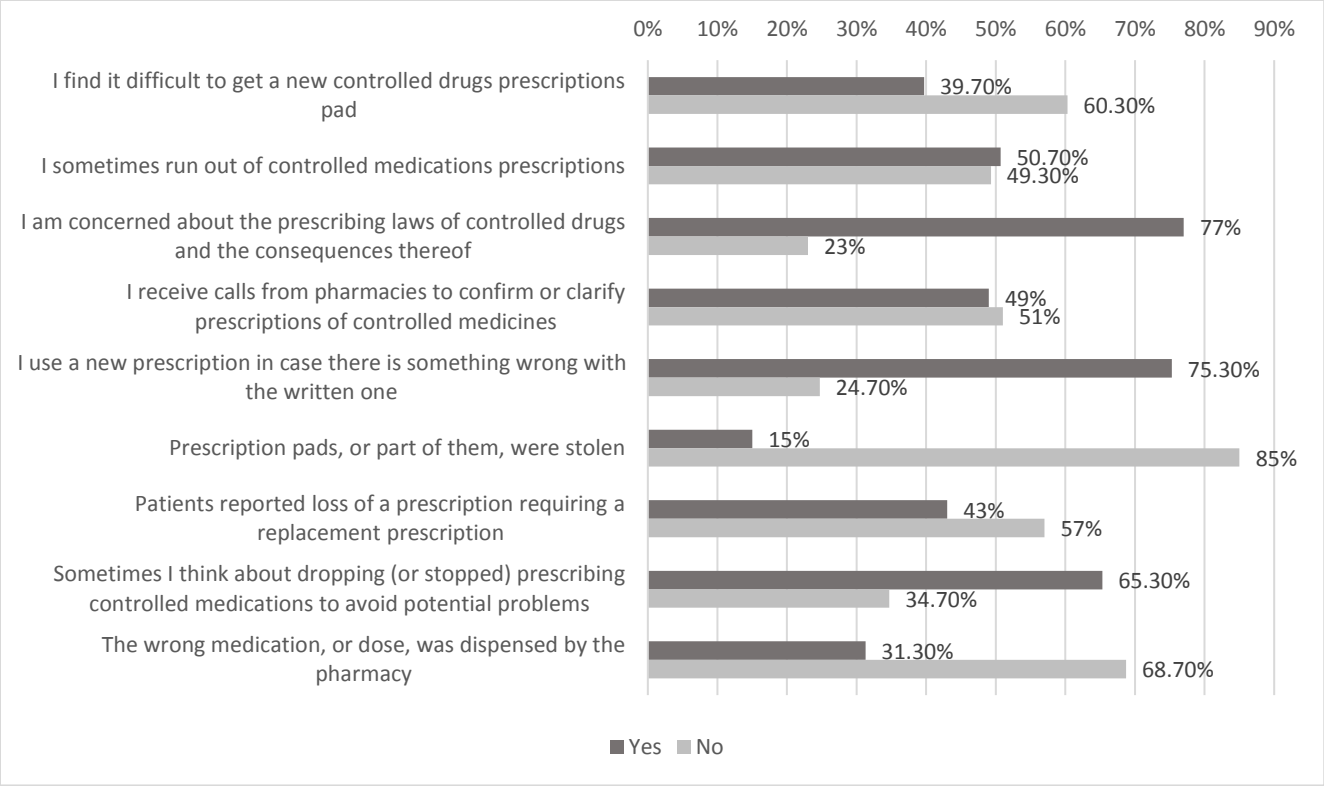

Figure 5.2: Current Prescribing Difficulties

5.8 Perceived Usefulness, Effort Expectancy and Trust

The variation in perceived usefulness, effort expectancy, and trust of EPCM was described in Table 5.6. The majority of responders (79.3%, n=238) believe that EPCM will help them write prescriptions that are more compliant with medical legislation and recommendations, and 78% (n=234) believe that EPCM will reduce the spread of addiction and abuse of controlled drugs. For effort expectancy, 73.3%(n=220) of the participants believe that EPCM will be easy to use. Moreover, 80%(n=240), 75%(n=225), and 63.3%(n=190) believe that renewing, modifying, and canceling prescriptions, respectively, will be easier through EPCM. Lastly, 75.6%(n=227) of participants believe that EPCM will reduce the risk of manipulation and dispensing fake prescriptions, and 77%(n=231) believe that detecting and canceling such breaches will be easier with EPCM as compared to paper prescriptions.

Table *5.6: Distribution of Performance Expectancy, Effort Expectancy and Trust*

	% of participants, n=300				
	SD	D	N	A	SA
Performance Expectancy					
Electronic prescription for controlled medications will help me do my work faster	3.7	4.7	14	37.7	40
Electronic prescribing will help me write prescriptions that are more compliant with medical legislation and recommendations	2.3	5.3	13	40	39.3
Electronic prescribing will reduce the spread of addiction and abuse of controlled drugs	2.7	5.3	14	31.3	46.7
Electronic prescribing of controlled medications will reduce medical errors	2.7	6	16.3	36	39
Electronic Prescribing of Controlled medications Will Improve patient satisfaction	6.3	10.7	19.7	30.3	33
Effort Expectancy					
The use of electronic prescribing of controlled medications will be easy	2	7.7	17	37	36.3
The use of electronic prescribing of controlled medications will not affect my work routine	3.3	7.3	17.3	38.3	33.7
Renewing prescriptions using electronic prescribing for controlled medications will be easier	1.7	3.7	14.7	42.7	37.3
Editing prescriptions through electronic prescribing of controlled medications will be easier	0.7	5	12.3	45.3	36.7
Cancellation of prescriptions through electronic prescribing of controlled medications will be easier	0.7	5.3	14.3	42.3	37.3
Trust					
Electronic prescribing of controlled medications will reduce the opportunity to hack the system, impersonate a doctor, and dispense false prescriptions	3.7	6.7	14	34.3	41.3
Electronic prescribing of controlled medications will facilitate tracking of the breach if it occurs as it will be possible to invalidate the prescriptions easily unlike paper prescriptions	3	6	14	34	43
Electronic prescribing of controlled medications will be more protective of patient data	2	6	14	34.3	43.7
electronic prescription of controlled medications will accurately document all prescriptions dispensed	0.7	4	12	34.7	48.7
Electronic prescribing of controlled medications tracks medical errors more easily	3.3	3	11.3	40.3	42

SD: Strongly Disagree, D: Disagree, N: neutral, A: agree, SA: Strongly agree

5.9 Testing Hypothesis

Pearson Correlation test was performed to assess how close the linear relationship was between subscales. Table 5.7 presented Pearson's Correlation between all possible pairs of constructs. The UTAUT correlation coefficients ranged from little positive correlation between CPD (5,6,7,8) & EE, and a high positive correlation between PE&EE. No multi-collinearity existed between the variables tested in this study.

Table *5.7: Person's Correlation of UTAUT Construct*

	CPD (1,2,4,9)	**CPD (5,6,7,8)**	**PE**	**EE**	**T**
CPD (1,2,3,8)	1				
CPD (4,5,6,7)	0.206	1			
PE	0.144	0.074	1		
EE	0.156	0.038	0.702	1	
T	0.131	0.06	0.636	0.669	1

CPD: current prescribing difficulties, PE: performance expectancy, EE: effort expectancy, T: Trust

Bivariate Analysis

In the univariate logistic regression; PE, EE and T were significantly associated with intention to use EPCM. Multivariate logistic regression showed that the three factors (PE, EE, and T) did not impact each other. In addition, these three factors, performance expectancy, effort expectancy, and trust, have a positive association with the intention to use EPCM, the unadjusted OR= (7.033, 7.021 and 4.824) respectively, and P-value <0.001 for each, and they are good predictors of physicians' willingness to use EPCM. (As mentioned in table 5.8)

Table *5.8: Association Between UTAUT- Subscales and Intention to Use EPCM.*

Subscale	**P-value**	**OR_u (95% CI)**	**P- Value**	**OR_a (95% CI)**
CPD (1,2,3,8)	0.056	1.636 (0.988- 2.711)	NA	NA
CPD (4,5,6,7)	0.223	1.392 (0.818- 2.368)	NA	NA
PE	<0.001	3.028 (1.855- 4.941)	<0.001	7.033 (2.637- 18.757)
EE	<0.001	4.405 (2.514- 7.721)	<0.001	7. 021 (2.9- 16.998)
T	<0.001	3.99 (2.413- 6.6)	<0.001	4.824 (2.343- 9.929)

CPD: current prescribing difficulties, PE: performance expectancy, EE: effort expectancy, T: Trust
CI= confidence interval, P-value <0.05, OR= odds ratio

Pearson's Chi-square test was performed to assess the presence of association between the expected moderators and intention to use EPCM. The results in Table 5.9 revealed that only level of specialization was found to be significantly associated with intention to use EPCM as general practitioners and sub-specialist were more willing to use EPCM when compared to specialties (p-value <0.05). Meanwhile, the results showed that there was no significant association between gender, number of drugs prescribed per month, experience in e-prescribing and the intention to use EPCM (P>0.05). The region, level of specialization, and workplace were also assessed for possible impact on intention to use EPCM. Work experience in years was also assessed for possible association with EPCM using univariate logistic regressions and no significant association was found (p-value: 0.12, ORu (95%CI): 0.967 (0.926-1.009))

Table *5.9: Association Between the Expected Moderators and the Intention to Use EPCM.*

Category	**Subcategory**	**Intention to use EPCM**		**P- value**
		Disagree n (%)	Agree n (%)	
Gender	Male	17 (7)	227 (93)	0.703
	Female	1 (3.4)	28 (96.6)	
Region	North	7 (6.1)	107 (93.9)	0.858
	Middle	8 (7.8)	94 (92.2)	
	South	3 (5.3)	54 (94.7)	
Number of prescriptions per month	Stopped	2 (5.6)	34 (94.4)	0.169
	<5	7 (4.8)	138 (95.2)	
	5-50	9 (12)	66 (88)	
	>50	0 (0)	17 (100)	
Having experience with e-prescription	Yes	13 (5.8)	213 (94.2)	0.208
	No	5 (10.6)	42 (89.4)	
Level of specialization	Medical doctor	0 (0)	74 (100)	0.012
	Specialist	18 (9.6)	169 (90.4)	
	Sub-specialist	0 (0)	12 (100)	
Work place	Private clinic	14 (7.3)	178 (92.7)	1
	Private hospital	4 (6)	63 (94)	
	Oncology center	0 (0)	10 (100)	
	Mental/ Psychiatric/ Rehabilitation clinic	0 (0)	4 (100)	

Chi- square test, P-value <0.05, n is the number of participants occurrence in the defined category , % is the percentage of cases in defined category

Since their effect on intention to use EPCM was not significant in the bivariate analysis, they were not included in the multivariate analysis model. Hence, these three variables did not impact the relation between UTAUT subscales and the intention to use EPCM, and were not classified as moderators. Regarding age, it showed a positive association with the intention to use EPCM (P= 0.032), Pearson correlation test was conducted to differentiate age impact on the UTAUT model constructs (Table 5.10). The initial results revealed that age was significantly associated with PE scale.

Table *5.10: Relation Between Age and Individual UTAUT factors*

Subscale	Correlation	P- value
CPD (1,2,3,8)	0.001	0.982
CPD (4,5,6,7)	0.102	0.078
PE	-0.114	0.048
EE	-0.054	0.349
T	-0.05	0.385

CPD: current prescribing difficulties, PE: performance expectancy, EE: effort expectancy, T: Trust

Binary logistic regression adjusted for age and interaction effects was then performed. Table 5.11 shows a significant association between age, PE and the intention to use EPCM (P-value=0.019, P-value <0.001) respectively. The absence of significant association between age and PE interaction revealed that the age of respondents did not affect the relation between PE and the intention to use EPCM. Whilst it was not a moderator, it could be classified as an independent variable that negatively affect the respondents' desires to go toward e-prescribing.

Table *5.11: Association Between Age and the Intention to Use EPCM*

Variable	P-value	ORu (95%CI)	P- value	ORa (95%CI)
Age	0.032	0.956 (0.917- 0.996)	0.019	0.967 (0.904- 0.991)
PE	<0.001	12.806 (5.263- 31.16)	<0.001	12.189 (5.002- 29.703)
Age*PE			0.08	1.048 (0.994- 1.104)

PE: performance expectancy, P-value: <0.05, OR: odds ratio, CI: confidence interval

Characteristics of Participants with a Neutral Opinion Regarding Their Intention to Use EPCM

Twenty-seven participants answered the question of their intention to use EPCM as neutral, they were recoded as missing data as they neither encourage nor discourage the intention toward e-prescribing. A descriptive analysis was performed to determine their characteristics. (Table 5.12) All of them were male, with mean age equal 42.59±8.842. Majority of them completed specialist 81.5%. Around all of them worked among Private sectors (96.3%).

Table 5.12*: Sociodemographic Characteristics of Participants that had a Neutral perception of EPCM*

Category	Subcategory	n (%)
Gender	Male	27 (100)
Age (mean± SD)	42.59 ± 8.842	
Level of specialization	Medical doctor	3 (11.1)
	Specialist	22 (81.5)
	Sub-specialist	2 (7.4)
Experience	Less than 5	2 (7.4)
	5-9	5 (18.5)
	10-14	10 (37)
	15-19	3 (11.1)
	20 or more	7 (25.9)
Work place	Private clinic	17 (63)
	Private hospital	9 (33.3)
	Oncology center	0 (0)
	Mental, psycho, rehabilitation clinic	1 (3.7)

5.10 Important Comments from Physicians

The following comments were collected from physicians who completed the questionnaire:

Several physicians reported that they borrow prescriptions from their colleagues when they run out of prescriptions, while other doctors don't use their pads, said one: "I do not have my pad, but when I need one, I borrow a signed and stamped prescription from my cousin, he is a general practitioner." For those who frequently prescribe such medications, reaching the maximum limit of the allowed pads is a concern, but as one said: "If I exceed the allowed number of pads per

month, I ask my resident doctors to get me one or two under their name." Another issue that was raised in the fact that this prescription can be misused by practitioners. Several physicians said that patients are being taken advantage of by some physicians who use these prescription pads as a source of revenue because they charge a certain amount of money to prescribe controlled drugs, i.e., they sell these prescriptions even if it is just a refill prescription for chronic disease. For this reason, one of the doctors said that sometimes he gets a new pad, stamps and signs it, and gives it to a local pharmacy so that when a patient comes who needs a controlled drug, the pharmacist can issue it for free - an act based on human motives. It was somehow surprising how often a personal pad gets shared or used by other prescribers and some said that a physician in charge at a clinic or hospital sometimes stamps several prescriptions or even gives his stamp to doctors working under his supervision to ensure a prescription is smoothly issued if he is busy or unavailable.

5.11 Summary

This chapter provided a presentation of the validity and reliability of the constructs and the sociodemographic characteristics of the participants. It also presented the results of hypothesis testing where H2, H3 and H4 were confirmed and H1 was rejected. These results will be interpreted and discussed in the coming chapter.

Chapter 6: Discussion & Conclusion

6.1 Introduction

The following chapter provides a reflection on the results, what they mean, why it matters and what practical actions should be taken. Also, this chapter presents strengths, limitations and future studies.

6.2 A Reflection on the Highlights of the Descriptive Findings of the Study

This study was conducted to assess the perception of Palestinian physicians toward the implementation of a stand-alone electronic prescribing system for controlled medications in the West Bank context. Palestinian physicians who currently prescribe or have prescribed controlled medications in the past and are familiar with the aspects of the current prescribing process were included in the study. This study revealed that the vast majority of the included providers had a positive perception toward the adoption of EPCM with an intention to adopt rate of 85%, which is consistent with a study that assessed the perception toward the adoption of e-prescribing in Jordan. (El-Dahiyat et al., 2014). Similar results were also observed in India in 2022 (Teferi et al., 2022).

The vast majority of participants were male and under 50 years of age. This finding is consistent with the distribution of the healthcare workforce in Palestine, which is considered young, with more than 80% of the population being male physicians. When it comes to physicians in practice, this percentage increases in favor of men, as women generally tend to work part-time or even drop out of practice altogether, more than men (Paturel, 2019; WHO EMRO, 2021; World Health Organization (WHO), 2020).

The results of this study revealed that tramadol was the most commonly cited, with nearly 8 in 10 physicians prescribing it. Tramadol is an opioid that is used for moderate to moderate-to-severe pain management. In Palestine, tramadol is the easiest opioid to prescribe and dispense because it is readily available in pharmacies. Other opioids, on the other hand, are only available in a very limited number of community pharmacies and are usually dispensed under strict medical supervision in hospitals and medical centers. Therefore, the high prevalence of tramadol prescribing was an expected result. However, knowing that tramadol can lead to physical dependence, one would become worried about the potential presence of non-medical use of this substance. In fact, in 2018, the UNODC reported that the non-medical use of tramadol is becoming a fast-emerging public health threat in the Near and Middle East, including Palestine. (United Nations Office of Dugs and Crimes (UNODC), 2019)

This concern is further reenforced with the fact that, in 2017, tramadol was reported to be frequently detected among high-risk drug users with varying rates in Palestinian governorates. (Palestinian National Institute of Public Health, 2017). This information demands putting more efforts into better controlling the prescribing of tramadol, along other addictive medications, to alleviate the trafficking and illicit use of these substances. Healthcare decision-makers should consider carefully ways to make any improvements to the controlled drug prescribing system while still preserving the independence of medical judgment of physicians. This is due to the possibility that a doctor might become less likely to prescribe any of them at the risk of not fulfilling the medical requirements of actual patients if the regulations are very strict and the prescription system is rigid, particularly when the legal repercussions are unpleasant.

In this study, a large group of the surveyed prescribers indicated that they are concerned about the legal issues and consequences of incorrect prescribing of controlled medications and that they have no way to identify drug abusers. This may make providers feel less comfortable prescribing these medications, an issue that has already surfaced in the United States, for example. On this matter, the Pain Advocacy Center stated that "honest providers fear being mistaken for bad actors" and that they view patients as liabilities.(Andrew Joseph, 2022). One expected action by prescribers is to stop providing this service altogether to avoid the headache.(Gatchel, 2010) Here, 65.3% of respondents said they were considering giving up prescribing controlled medications, with 14.3% of them having already stopped. This would be disturbing news for those in need of such medications, as this could make it difficult for them to get these medications. This is important because there are real and widespread debilitating diseases that require the use of controlled medications. Pain, for example, which is a common indication for some of these medications, has been identified as a leading cause of disability. Back pain, in particular, is the leading cause of disability in 126 of 195 countries, with an increasing number of all-age years of healthy life lived with disability (YLD) over the last three decades along with physical, psychological, and economic consequences. (Andrew Joseph, 2022) The inadequate suitable painkillers for such cases could leave them disabled or could drive them to seek illicit supplies.

An alarming observation was the number of physicians who reported a lost (or stolen) prescription pad (or a prescription/s). Normally, this needs to be reported to the MOH, but legal proceedings will follow, which could be a source of legal trouble for a physician. Therefore, some of them might choose not to report at all at the cost of not being able to get a new pad as they have to submit the stubs of the old pad to get a new one. On the patient side, this could mean that a

considerable number of illegal prescriptions have been dispensed over the past years. One would argue that a prescription needs to be stamped to get dispensed, and a stolen one should be easily detectable. However, based on the comments that were collected from participants, even stamps are prone to misuse and theft as they are frequently shared or left in others' custody.

Finally, when it comes to technical readiness, a positive finding was observed as the vast majority of participants had necessary tools to operate EPCM when it is launched. The proposed technology requires that physicians have stable internet access, a smart phone or personal computer, and comfort with computer use. This means that equipping physicians, which could have been a source of great expenditure, is not a concern as this prerequisite is fulfilled for the majority of the sample.

6.3 Factors that Affect Physicians' Perception of EPCM

According to the proposed hypothesis, current prescribing difficulties, performance expectancy, effort expectancy, and trust were all postulated to affect the intention to use EPCM. However, the effect of current prescribing difficulties on intention to adopt EPCM was found to be statistically non-significant. Taking into consideration that the internal consistency of its two sub-constructs ranged from acceptable to poor, the construct in its current composition needs enhancement and does not seem to add significant value to the proposed model.

On the other hand, performance expectancy was found to have a significant correlation with intention to use EPCM. This means that those who believe that EPCM will improve their work are more willing to use it. This result is consistent with the findings of other studies. (Cohen et al., 2013; Gagnon et al., 2014; Khan et al., 2018; Teferi et al., 2022). This is an important finding

because those who believe that EPCM will not improve their work and who dislike using it may change their perceptions when they learn the full benefits of the proposed measure. For example, those who do not believe that EPCM can reduce medication errors can be educated about the potentials of electronic prescribing with the integrated alerts, guides, clinical decision support systems (CDSS), and even denial of some transactions if they are legally or medically incorrect. In addition, EPCM will likely be able to prevent the phenomenon of "doctor shopping" by collecting all prescriptions for a particular patient from all physicians into one screen, based on which a physician can decide whether this is the right time to re-prescribe a particular drug. Thus, it is very likely that some physicians will view EMPC differently after sufficient training and education. Since there is a significant correlation with intent to use, this could lead to greater

Effort expectancy was also significantly associated with physicians' perception of EPCM. This means that the more a physician believes EPCM will be easy to handle and practical to use, the more positive his perception of EPCM will be. This finding was also observed in several studies (Cohen et al., 2013; Khan et al., 2018). This result can be used as a tool by stakeholders to alleviate the resistance of those who expect EPCM to be complicated. For example, they might consider simplifying the interfaces of the system and making navigation easy and clear. In fact, a poor design and technical concern were actually the most commonly reported barrier to the adoption of e-prescribing according to (Gagnon et al., 2014). Therefore, it is better to involve practitioners in the designing process of the system to make sure it meets their expectations. This way opposers will likely become more welcoming to the intervention.

Regarding trust, in this study this construct was found to be significantly associated with intention to adopt EPCM. This means that those who believe that EPCM will be more secure and trustworthy

as compared to paper prescribing are more willing to use it. This finding was repeatedly seen in studies that assessed the perception toward the adoption of technologies that have some sort of threat to users' private information, money, or related to practices where legal consequences are a real concern (Cody-Allen & Kishore, 2006; Cohen et al., 2013; Dash & Sahoo, 2022; Gupta et al., 2016). Security concerns were reported to be a significant barrier when it comes to e-prescribing, but surprisingly, this concern lessened post implementation as reported in several studies that were addressed in Gagnon et al. (2014) review. If this result is to be best used in making physicians more willing to use EPCM, it should be equipped with robust security and data breach prevention measures. For example, it would be better if ECPM be designed in compliance with the Health Insurance Portability and Accountability Act (HIPPA) security and privacy rules where administrative, physical, and technical safeguards are implemented (Rights (OCR), 2015). Ultimately, and after excluding current prescribing difficulties due to lack of association with intention to use EPCM, together, performance expectancy, effort expectancy and trust provided a good total explained variance of 72.323% of which trust contributed to 57.5%.

Finally, in alignment with previous work in the field of health information technology acceptance, gender and experience did not mediate the effect of the main constructs on intention to use EPCM, nor did they have a direct effect on intention to use EPCM.(Wills et al., 2008) However, age was found to have a direct statistically significant relationship with intention to use EPCM, where older physicians were less willing to use EPCM, which is consistent with previous work (Chimento-Díaz et al., 2022; Magdi, 2013; Talukder et al., 2020). This could be due to technology anxiety "technostress" and resistance to change (Ha & Park, 2020).

6.4 Conclusion

According to our results, Palestinian physicians seem to be open to the recommended technology. The most important factors that were found to affect their perception of EPCM were performance expectancy, effort expectancy, and trust. Age was also found to have a direct correlation with intent to use EPCM.

6.5 Recommendations

Based on these findings, we recommend:

- Involving Palestinian physicians in the design of the EPCM to ensure that they perceive it as efficient, simple, clear, and secure, as this will help increase physicians' willingness to use the EPCM.
- Proceeding with the assessment of Palestinian pharmacists' perceptions of EPCM. Since physicians' perceptions are usually the most difficult to change, and here they seem to have a positive attitude toward EPCM.
- Starting with the design of the user interface and testing how well it meets user expectations and needs. A user experience assessment should then be conducted to ensure that the EPCM is also easy to navigate.

6.6 Practical Implications

Based on this project, the following actions should be taken:

- Stakeholders in MOH, the Palestine Doctors' Association, and the Palestine pharmacists' Union should all be encouraged to proceed with the implementation of EPCM. The problems with the current system are real, and the perception of EPCM is encouraging. Therefore, the result of this project will soon be disseminated to all interested parties, and a mutual meeting will be scheduled to address future steps. These parties should decide on the main features that will be present in the final software to ensure that it is efficient and easy to use for doctors, pharmacists, and inspectors.
- Design an electronic prescribing system of controlled medications (EPCM) where the following should be considered:
    - How to ensure the best efficiency of the system, to choose interfaces that are simple and easy to navigate, and
    - It is important to consider the most protective mechanisms to protect patients' information and prevent system breaches, as all of these factors play a significant role in enhancing physicians' perception of EPCM.
- All of this should be done while keeping in mind that EPCM needs to be expandable, with the hope that EPCM will be a seed from which a national electronic prescribing system for all types of medications will stem one day.

6.7 Future Research

- Palestinian pharmacists' perception toward the adoption of EPCM, to make sure that all parties are willing to use EPCM and to understand and solve the potential barriers.
- Qualitative interviews with Palestinian health inspectors responsible for overseeing controlled drugs prescribing to better understand the operations of the current prescribing system and to spot opportunities for improvement.
- EPCM user interface/user experience assessment.

6.8 Strengths

This is the first study to address perceptions of electronic prescribing of controlled medications in Palestine and the Middle East and one of the few studies to address this issue worldwide. The results of this study are reflective of the entire target population in the West Bank, as the sample size was adequate and participants from different regions of the West Bank were included.

6.9 Limitations

The Gaza Strip was not included. The sample was a convenient sample because we were not provided with a complete list of physicians prescribing controlled medications, only the total number. Therefore, the data collectors had to visit a large number of physicians to find 300 physicians who met the inclusion criteria, and randomization was not possible. This could affect the generalizability of the results because physicians did not have an equal chance of being included in the study.

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Appendices

Appendix A: Questionnaire

نموذج الموافقة

عزيزي الطبيب:

أنت مدعو للمشاركة في هذا الاستبيان لقياس تصور الأطباء في فلسطين حول اعتماد الوصفات الإلكترونية للأدوية الخاضعة للرقابة كبديل للوصفات الذهبية الورقية

الوصف الالكتروني للأدوية المراقبة يعني استخدام برنامج موحد عبر الحاسوب او الأجهزة الذكية لنقل الوصفة من الطبيب للصيدليات (كل طرف مخّول يحصل على اسم مستخدم وكلمة مرور) دون الحاجة للوصفات الورقية، النظام المقترح سيجمع حركات المريض في شاشة موحدة لكافة أطراف الفريق الطبي المعنين بعملية الصرف

الهدف من الدراسة:

تقييم مدى تقبل وجاهزية الأطباء في الضفة الغربية للوصف الإلكتروني للأدوية المراقبة

طريقة اجراء الدراسة:

الدراسة تشمل إجراء الاستبيان التالي والذي يستهدف الأطباء المستخدمين لدفتر الوصفات الذهبية للأدوية المراقبة.

تجري هذا البحث د. هبة فلنة، طالبة في الجامعة العربية الأمريكية في فلسطين تخصص معلوماتية صحية تحت اشراف كل من الدكتور شهيناز نجّار والدكتور يوسف الميمي.

يستغرق الاستبيان ٣ دقائق

سيتم التعامل مع المعلومات بسرية تامة ولن يتم استخدامها خارج إطار البحث

إذا لديك اي استفسارات يمكنك التواصل معنا من خلال:
رقم جوال: 097595193486+
ايميل: hibafalana@yahoo.com

موافقة المشارك في البحث:

حصلت على شرح مفصل عن الدراسة وأهدافها وإجراءاتها .

☐ أوافق على أن أشارك في هذه الدراسة

☐ لا اوافق

التاريخ:_____

التخصص: عدد سنين الخبرة: العمر: الجنس: ذكر/ انثى المحافظة:

مكان العمل:

- ☐ عيادة تأهيل للمدمنين
- ☐ عيادة علاج عقلي/ نفسي
- ☐ عيادة/مركز علاج اورام
- ☐ مستشفى خاص
- ☐ عيادة خاصة. حدد.....
- ☐ غير ذلك(حدد): .....

اعلى تخصص:

- ☐ طب عام
- ☐ تخصص أول
- ☐ تخصص فرعي

ما هو معدل وصفك للأدوية المراقبة شهرياً:

- ☐ توقفت عن صرفها
- ☐ نادراً (اقل من ٥ وصفات بالشهر)
- ☐ اكثر من ٥ وأقل من ٥٠ وصفة شهرياً
- ☐ من ٥٠-١٠٠ شهرياً
- ☐ أكثر من ١٠٠ وصفة شهرياً

الرجاء وضع علامة Xبجانب المستحضر الذي تقوم بصرفه)

( ) Tramadol
( ) Pregabalin
( ) Phenobarbital
( ) Diazepam
( ) Codeine
( ) Clonazepam
( ) Alprazolam
( ) Phentermine
( ) Lorazepam

	الرجاء الإجابة بنعم او لا		
1CPD	أجد صعوبة في الحصول على دفتر وصفات مراقبة جديد	**نعم**	**لا**
2 CPD	تنفذ وصفات الأدوية المراقبة المتوفرة لدي أحياناً	**نعم**	**لا**
3 CPD	أشعر بالقلق بشأن قوانين وصف الأدوية المراقبة وما يليها من تبعات	**نعم**	**لا**
4 CPD	أتلقى مكالمات من الصيدليات لتأكيد او توضيح وصفات الادوية المراقبة	**نعم**	**لا**
5 CPD	استخدم وصفة جديدة في حال وجود خطأ ما في الوصفة المكتوبة	**نعم**	**لا**
6 CPD	تعرضت لسرقة دفتر الوصفات المراقبة من قبل	**نعم**	**لا**
8 CPD	تم كتابة وصفة طبية جديدة لفقدان المريض الوصفة المكتوبة سابقاً	**نعم**	**لا**
8 CPD	أفكر احياناً في التخلي عن وصف الادوية المراقبة (أو توقفت عن وصفها) لتجنب المشاكل المحتملة	**نعم**	**لا**
9 CPD	تم صرف علاج خاطئ او جرعة خاطئة من قبل الصيدلية	**نعم**	**لا**
	.		
1B	امتلك حاسوب شخصي أو هاتف ذكي	**نعم**	**لا**
2B	استخدم الحاسوب أو الأجهزة الذكية بشكل مرضي	**نعم**	**لا**
3B	تتوفر شبكة انترنت مستقرة معظم الوقت	**نعم**	**لا**
	.		
1C	عندي معرفة بالمفهوم العام للوصف الالكتروني للأدوية	**نعم**	**لا**
2C	لدي تجربة في استخدام الوصف الالكتروني للأدوية في عملي الحالي او السابق	**نعم**	**لا**

	.	أوافق بشدة	اوافق	محايد	لا اوافق	لا أوافق بشدة
PE1	الوصف الالكتروني للأدوية المراقبة سيساعدني في القيام بأعمالي بشكل أسرع	5	4	3	2	1
PE2	الوصف الالكتروني سيساعدني على كتابة وصفات أكثر التزاماً بالتشريعات والتوصيات الطبية	5	4	3	2	1
PE3	الوصف الالكتروني سيحد من انتشار الإدمان وإساءة استخدام الأدوية المراقبة	5	4	3	2	1
PE4	الوصف الالكتروني للأدوية المراقبة سيقلل من الأخطاء الطبية	5	4	3	2	1
PE5	الوصف الالكتروني للأدوية المراقبة سيحسن من رضى المرضى	5	4	3	2	1
EE1	استخدام الوصف الالكتروني للأدوية المراقبة سيكون سهلاً	5	4	3	2	1
EE2	استخدام الوصف الالكتروني للأدوية المراقبة لن يؤثر على روتين عملي	5	4	3	2	1
EE3	تجديد الوصفات باستخدام الوصف الالكتروني للأدوية المراقبة سيكون أسهل	5	4	3	2	1
EE4	تعديل الوصفات من خلال الوصف الالكتروني للأدوية المراقبة سيكون أسهل	5	4	3	2	1
EE5	الغاء الوصفات من خلال الوصف الالكتروني للأدوية المراقبة سيكون أسهل	5	4	3	2	1
T1	الوصف الالكتروني للأدوية المراقبة سيحد من فرصة اختراق النظام وانتحال شخصية طبيب وصرف وصفات مزورة	5	4	3	2	1
T2	الوصف الالكتروني للأدوية المراقبة سيسهل تتبع الاختراق اذا حدث وابطال الوصفات الغير قانونية المرسلة	5	4	3	2	1
T3	الوصف الالكتروني للأدوية المراقبة سيكون أكثر حماية لبيانات المريض	5	4	3	2	1
T4	الوصف الالكتروني للأدوية المراقبة سيقوم بالتوثيق الدقيق لكافة الوصفات المصروفة	5	4	3	2	1
T5	الوصف الالكتروني للأدوية المراقبة سوف يسهّل تتبع الأخطاء الطبية	5	4	3	2	1
G1	الية صرف الادوية المراقبة المتبعة حالياً بحاجة الي تطوير	5	4	3	2	1
G2	سأقوم باستخدام الوصف الالكتروني للأدوية المراقبة إذا تم توفيره	5	4	3	2	1

لقد وصلت الى نهاية الاستبيان

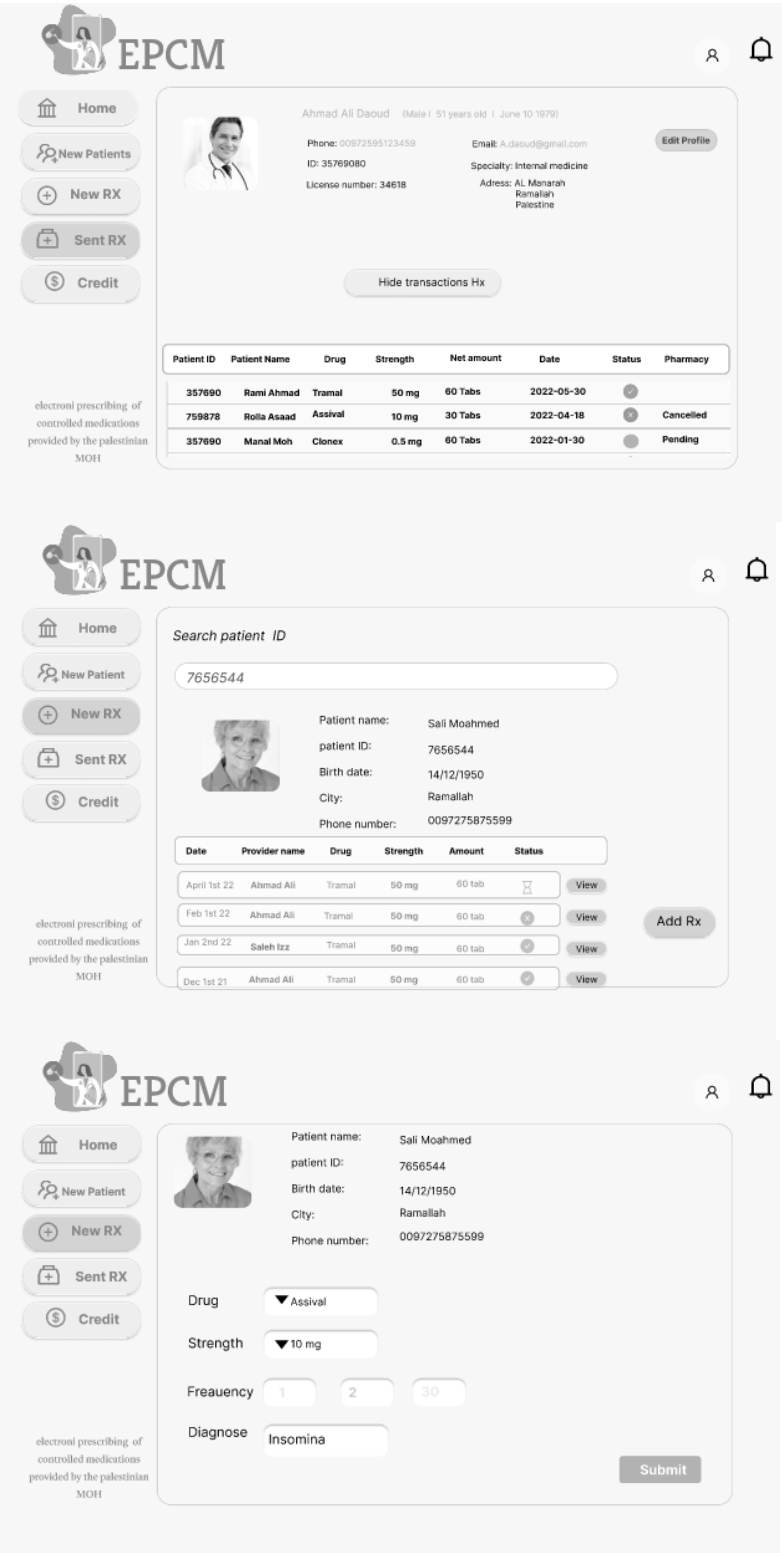
شكراً لمساهمتك القيّمة

☺

Appendix B: Questionnaire Validation Experts Panel

Name	Position
Dr. Shahenaz Najjar	Faculty of graduate's studies, Arab American University, Palestine
Dr. Yousef Mimi	Head of health sciences department, Arab American University, Palestine
Dr. Abdallah Abu Khalil	Head of Pharmacy department, Birzeit University, Palestine
Dr. Hani Naseef	Faculty member, Pharmacy department, Birzeit University, Palestine
Dr. Atef Abu Safat	General director of pharmacy, Ministry of Health, Palestine
Dr. Hussein Jabareen	Head of Pharmacy department, Hebron University, Palestine
Dr. Faisal Awartani	Faculty member (a professor in statistics), health sciences department, Arab American University, Palestine
Dr. Sa'ed Zyoud	Faculty member, Pharmacy department, Al-Najah University, Palestine

Appendix C: EPCM Primary Interfaces



ملخص الدراسة

في فلسطين، لا تزال وصفات الأدوية الخاضعة للرقابة تصرف من خلال الوصفات الورقية. على الرغم من المحاولات القيمة لتنظيمها، إلا أنها لا تزال معرضة للاختراق وتلاعب المرضى بالنظام واستغفال الطاقم الطبي للحصول على المستحضرات المذكورة بطرق غير قانونية. يمكن معالجة هذه المشاكل من خلال تبني الوصفات الإلكترونية للأدوية الخاضعة للرقابة (EPCM). لكن كون قبول المستخدم شرطًا أساسيًا مهمًا للتبني الناجح لأي تقنية، من الأهمية بمكان تحديد موقف الأطباء تجاه إدخال EPCM في مرحلة مبكرة قبل التطبيق. لم يتم التطرق إلى هذه القضية في فلسطين من قبل والتي بدون العلم الكافي فيها فإن مشروع التنفيذ ينطوي على مخاطر كبيرة بالفشل. في هذه الدراسة، طُلب من إجمالي ٣٠٠ طبيب إكمال استبيان مشتق من النظرية الموحدة لقبول المستخدم واستخدام التكنولوجيا (UTAUT) لتحديد العوامل الأكثر تأثيرًا على تصورهم عن ECPM. أشار غالبية الأطباء الذين شملهم الاستطلاع إلى أنهم على استعداد لاستخدام EPCM، بمعدل قبول ٨٥٪. تم العثور على أن هذا التصور يتأثر بشكل كبير بمستوى الأداء المتوقع، وتوقع الجهد والثقة. لم تتأثر أي من العلاقات السابقة بالعمر أو الجنس أو الخبرة بالوصفات الإلكترونية. كما وجد أن العمر ومستوى التخصص من العوامل المستقلة التي ترتبط بشكل كبير بنيّة تبني EPCM. لم يتم العثور على علاقة ذات معنى إحصائي تربط ما بين مستوى الصعوبات الحالية في وصف الأدوية المراقبة ونيّة استخدام EPCM.