Developing A Framework for Inappropriate Prescribing in a Community Pharmacy Setting: A Risk-Based Approach

Submitted in partial fulfilment of the requirements of the degree of the

Master of Pharmacy

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University of Malta

2023

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Dedicated to my family for the constant encouragement, patience and support throughout my journey.

Abstract

Risks from inappropriate use of medicines cause patient harm and adverse drug events. Evaluating risk is important before implementing a prescribing process model, to identify significant aspects required for optimum prescribing to ensure patient safety. The aims of this study were to evaluate different types of medication errors in community pharmacies and assess the frequency and the type of errors. An observational study and pharmacist interviews were conducted in seven community pharmacies selected by convenience sampling. A medication error documentation sheet (MedErr) and interview questions were developed and validated by three pharmacists, one general practitioner and one lay person to evaluate different types of medication errors encountered and assess pharmacists' perspective on medication errors. Data gathered by the MedErr documentation sheet was analysed using SPSS® version 28. Interview responses were thematically analysed. A focus group was set-up to quantify risks of prescription errors and develop a framework for safer prescribing. A risk priority number, which is the product of severity of consequences and probability of occurrence was given to ten of the medication errors identified. Severity and probability were measured on a 5-point Likert scale, anchored by 1 as the lowest score. From 140 prescriptions implemented within the MedErr documentation sheet, 282 medication errors were found. Error in dose (n=101), wrong quantity and frequency of medications (n=79) and error in naming of drug (n= 61) were the most common errors. From the 20 pharmacist interviews, pharmacists (n=17) confirmed that they have encountered prescription errors and the prescriber was contacted for clarification. Lack of communication between healthcare professionals was named by pharmacists (n=18) as one of the main reasons behind prescription errors. Pharmacists (n=19) believed that improved pharmacist accessibility to patient records and to the prescribing process will result in less prescription errors. Suggestions to reduce

inappropriate prescribing included access to online patient records (n=6), e-prescribing (n=6) and improved communication between healthcare professionals (n=5). From ten medication errors presented to the focus group, five of the errors were deemed as high risk (RPN >16) by five or more of the twelve participating members. Pharmacists play a role in identifying prescription errors and are aware that lack of communication between healthcare professionals increases inappropriate prescribing. By studying the risk associated with prescribing errors, strategies to reduce inappropriate prescribing may be implemented through the proposed framework, to improve the prescribing process and patient safety.

Acknowledgement

I would like to express my gratitude and appreciation to my supervisor, Dr Maresca Attard Pizzuto, for her guidance, constant support and encouragement through this study.

I would also like to express my gratitude to all those, who participated and contributed to the research in any way.

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List of Abbreviations

ADEs	Adverse Drug events
ADRs	Adverse Drug Reactions
BNF	British National Formulary
DRPs	Drug Related Problems
EP	Electronic Prescribing
GPs	General Practitioners
HCPs	Healthcare Professionals
MedErr	Medication Error Documentation Sheet
MTM	Medication Therapy Management
PCNE	Pharmaceutical Care Network Europe
PIMs	Potentially Inappropriate Medications
POMs	Prescription Only Medications
POYC	Pharmacy of Your Choice
RPN	Risk Priority Number
SmPC	Summary of Product Characteristics
SPSS	IBM Statistical Package for the Social Sciences

Chapter 1: Introduction

This study focuses on inappropriate prescribing encountered in community pharmacies and presents a framework to reduce prescribing errors based on the risk perceived from these errors encountered. This chapter outlines types of inappropriate prescribing, medication errors and DRPs associated with them from previous research carried out, together with the risks to patients of inappropriate prescribing, risk mitigation strategies and interventions which may be used to reduce risk to patients in Malta.

1.1 Inappropriate Prescribing

The use of medications is an integral part of healthcare and if used inappropriately may lead to situations where the risks outweigh the benefits (Fahrni et al, 2019; Petrovic et al, 2022). Inappropriate prescribing is a global healthcare concern since it results in adverse drug reactions (ADRs) or serious side-effects (Assiri et al., 2019; Mekonnen et al, 2021). It occurs when a prescription poses more harm than benefit and when there is a safer and a more advantageous option (Fahrni et al, 2019; Farhat et al, 2021).

An adverse drug reaction (ADR) is defined as: "harm that results from a normal medication dose" (Alazmi et al, 2019) or a "response to a drug which is noxious and unintended and which occurs at doses used in man for prophylaxis, diagnosis, or therapy" (Jha et al., 1998; Carr & Pirmohamed, 2018).[1] A common risk factor for ADR-related hospital admissions includes polypharmacy, which increases the risk of resulting in a prescribing cascade (Dreischulte et al, 2022).

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[1] The Council of Europe. Creation of a better medication safety culture in Europe: Building up safe medication practices [Internet]. Strasbourg (France) Expert Group on Safe Medication Practices (P-SP-PH/SAFE); 2007 [cited 2023 Apr 21]. Available from: http://optimiz-sih-circ-med.fr/Documents/Council_of_Europe_Medication_Safety_Report_19-03-2007.pdf

Inappropriate prescribing may result from a prescribing cascade. A patient is given a medication which results in side-effects. In order to relieve the side-effects further, medications are given, causing side-effects or drug interactions, creating an inappropriate prescribing cascade.[2] An example commonly observed in community is that after having prescribed a dihydropridine calcium channel blocker, such as amlodipine, the patient is also prescribed a loop or a thiazide diuretic to counteract the ankle oedema assoicated with the calcium channel blockers, possibly inducing hypokalameia (Dreischulte et al, 2022).

Prescribing involves a complex procedure which is influenced by several factors including: "pharmacotherapeutical knowledge, prescribing skills, access and use of local and national guidelines, workloads and patient- related factors" (Mahomedradja et al, 2021). Inappropriate prescribing has been described as over- prescribing, under-prescribing, and mis-prescribing (Cardwell et al, 2020; Ayalew et al, 2022). Misprescribing includes: "incorrect dose, frequency, modality of administration or duration of treatment" (O'Connor et al, 2012; Farhat et al, 2021). Overprescribing includes prescribing of medications even when there is no proper clinical indication (Safer, 2019). Under prescribing is the omission of favourable medications that show a clinical indication for either the prevention or treatment of a disease (O'Connor et al, 2012; Bare` et al, 2022).

Improper prescribing may result in patients with multiple comorbidities (Navickas et al, 2016). Inappropriate prescribing may be caused by polypharmacy (Wauters et al, 2016)

[2] Doherty A. Why inappropriate prescribing may be bad for your health [Internet]. Belfast (Ireland) RTE.ie; 2020 [cited 2023 Jul 18]. Available from: https://www.rte.ie/brainstorm/2020/0224/1117237-inappropriate-prescribing/

which is associated with negative connotations because of the possibility of drug- drug interactions and drug- disease interactions (Fahrni et al, 2019). Inappropriate prescribing results in potentially inappropriate medications (PIMs) and omission of medications even when indicated, bringing forward a number of potential risks to the patient brought about from medication errors (De Ruiter et al, 2020; Farhat et al, 2021).

1.2. Medication Errors

Medication errors can be defined as: "Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer" (Assiri et al, 2019).[3,4] Medication errors tend to be responsible for general patient harm, leading to Adverse drug events (ADEs) which result in hospital admissions and potentially death. Medication errors, not only give rise to ADEs but other negative outcomes such as physiological, physical, psychological and emotional pain (Tanti, 2011; Assiri et al, 2019). Medication errors occur most commonly at the first stage of prescribing due to error in route, dosage or dosage form (Tariq et al, 2020; Tariq et al, 2023). Medication errors may lead to medication-related harm which may often be prevented by the healthcare professional (HCPs) involved (Despott et al, 2023).

[3] World Health Organisation (WHO) Technical Series on Safer Primary Care: Medication Errors. [Internet]. Geneva (Switzerland): WHO; 2016 [cited 2023 Jul 18]. Available from: https://apps.who.int/iris/bitstream/handle/10665/252274/9789241511643eng.pdf;jsessionid=FDB1BE2683396D2DA592F947714EBF5E?sequence=1

[4] Lena L. Deter. Medication Administration Module [Internet]. Texas (USA) Medication aide program; 2017 [cited 2023 Jul 18]. Available from: https://www.hhs.texas.gov/sites/default/files/documents/doing-business-with-hhs/provider-portal/QMP/MedicationAdministrationModule.pdf?cv=1

1.2.1 Types of Medication Errors

There are several different types of medication errors according to the nature of error, including errors in: "prescribing, omission, wrong time, unauthorized drugs, improper dose, wrong dose prescription / wrong dose preparation, administration errors, monitoring errors, compliance errors" (Tariq et. Al, 2020; Yoon & Sohng, 2021).

1.2.1.1 Prescribing Errors

Prescribing errors are errors "in the choice or administration of drugs for patient"[5] which occur when the healthcare professional, more commonly the prescriber makes an error on the prescription due to uncertainty of certain drugs on the market (Assiri et al, 2019). Precribing errors can also be caused by a lack of a patients' history-taking (FitzGerald, 2009; Assiri et al, 2019) such as omitting currently prescribed drugs, any ADRs including hypersensitivity reactions, over the counter medications and any form of alternative medicines.

Prescribing errors are errors occurring during the prescription, writing the drug order or during the decision of treatment. These errors may be as a non-intentional divergence from standard modes of treatment (Velo & Minuz, 2009; Assiri et al, 2019). Prescribing errors involving drug selection are dependent on the indication for treatment, contraindications, known allergies and patient characteristics, such as drug interactions (Assiri et al, 2019; Shrestha & Prajapati, 2019).

The working environment is considered to be a contributing factor because of circumstances such as "large workloads, reduced supervision, poor communication and

[5] Medical dictionary, Prescribing error | definition of prescribing errors by medical dictionary; 2009 [cited 2023 Jul 22]. Available from: https://medical-dictionary.thefreedictionary.com/prescribing+error

poor health of workers” (Lavan et al, 2016; O'Mahony et al, 2016). Prescribing errors may be due to negligence of the prescriber (Lavan et al, 2016; O'Mahony et al, 2016; Tariq et al, 2020).

1.2.1.2 Omission

Omission is when there is missing data on in the prescription. This data would be of importance to supply the patient with the correct medication and avoid inappropriate prescribing (Assiri et al, 2019; Bare` et al, 2022). For example, if the prescriber were to fail to record a patient’s medication history; a patient is admitted to hospital due to recurrent syncope. The medical professionals were not informed that the patient was taking digoxin 0.125mg daily, resulting in inappropriate prescribing due to an omission medication error. Errors in medication history also fall within this category of medication errors (Tam et al, 2005).

1.2.1.3 Improper Doses, Wrong Dose Prescription or Preparation

Improper doses involve administering either too much or too little of a drug (Teixeira et al, 2010). Too much administered drug can result in overdosing (Pérez et al, 2018). Wrong dose prescription and preparation are a very common and very serious medication error. This could also occur directly by the pharmacist administering the wrong dose, due to illegible writing on the prescription, distractions and negligence (Tariq et al, 2020).

1.2.2 Causes of Medication Errors

A major cause of medication errors are distortions and illegible writing. Distortions result from unclear writing, symbols which are not known globally, use of abbreviations and

wrong translations. (Tariq et al, 2020; Tariq et al, 2023). A study carried out in Malta regarding risk assessment of prescribing errors in Malta showed that there is an increased risk of prescribing errors due to illegible handwriting where measures should be carried out to reduce these types of errors (Kupka et al, 2018).

Physicians have many obligations and tasks. In the busy timing and frenetic situation these physicians are placed in, an error in judgement can occur and result in medication errors. Distortions result from unclear writing, symbols which are not known globally, use of abbreviations and wrong translations. These distortions often result in physicians not understanding what drug is being referred to changing the drug to a similar one, which may lead to medications errors. Illegible handwriting is considered a common cause of medication errors for pharmacists and nurses, since at times physicians rush to write the prescription and scribble illegible prescriptions resulting in medication errors. Illegible writing is slowly being eliminated due to the conversion to electronic prescriptions, which could make medication errors resulting from this end obsolete (Tariq et al, 2020). Factors causing medication errors are related to health care professionals and to the patients.[3] The factors related to health care professionals include insubstantial amount of therapeutic training, lack of knowledge about the patient, and lack of communication between health care professionals.[3] Factors associated with patients include specific characteristics of the patient, such as personality, knowledge and language barriers[3] (Lassetter et al, 2003). An international study focusing on the "knowledge, attitude and behaviour" of medication errors found that medication errors may be linked to factors including exhaustion,

[3] World Health Organisation (WHO) Technical Series on Safer Primary Care: Medication Errors. [Internet]. Geneva (Switzerland): WHO; 2016 [cited 2023 Jul 18]. Available from: https://apps.who.int/iris/bitstream/handle/10665/252274/9789241511643eng.pdf;jsessionid=FDB1BE2683396D2DA592F947714EBF5E?sequence=1

excessive stress, lack of attention when prescribing, general discontent in their work life and wrong decision making (Gianetta et al, 2021).

1.3. Drug- Related Problems

A drug related problem (DRP), as defined by Pharmaceutical Care Network Europe (PCNE) is "an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes" (Ni et al, 2021).[6] DRPs result in a series of negative health outcomes, and increased morbidity and mortality. The negative health outcomes show the importance of taking caution when it comes to possible medication errors or inappropriate prescribing (Hailu et al, 2020).

Most DRP's are preventable with effort and attention from the healthcarers in charge of a patients' care, and because of this, hospital admission due to DRP's could be avoided (Konuru et al, 2019). Medications with a narrow therapeutic index and those which necessarily need constant monitoring are amongst the more difficult category of DRP's to avoid (Ayalew et al, 2019).

Identification, resolution and prevention of DRPs is of utmost importance from a community pharmacy health care point of view. To resolve them, DRPs have been classified to identify them in a more efficient and clear way (Hailu et al, 2020). In a study carried out in Malta, three drug-related problems were found to be the more common errors included: "potentially unnecessary drug therapy, "Risk for Adverse Drug Reactions" and "Potential Interaction Between Drugs" (Manluyang, 2022).

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[6] Pharmaceutical Care Network Europe (PCNE). PCNE Classification for Drug- Related Problems V9.00 [Internet]. [cited 2023 Mar 29]. Available from: https://www.pcne.org/working-groups/2/drug-related-problem-classification

1.4 Risks to Patient of Inappropriate Prescribing

Inappropriate prescribing presents a potential hazard to patient safety (Ayalew et al, 2022). Health risks are adverse events or negative health consequences due to a specifc event, disease, or condition.[7] The identification of different risk due to inappropriate prescribing is important not only to ensure proper management or treatment of a disease, but more to ensure patient safety (Volpe et al, 2016).

Appropriate prescribing may be assesed through patient outcomes and assesing the benefits versus the risks that patients overcome (Pérez et al, 2018). The identification of different risk due to inappropriate prescribing is important not only to ensure proper management or treatment of a disease, but more to ensure patient safety (Volpe et al, 2016). Medical errors result in consequences where the patients suffer increased morbidity and permanent injury (Okpoko et al, 2018). There is a positive correlation between inappropriate prescribing and hospital admission, for example when a patient is given a wrong drug or a wrong dose such that it potentiates the risk of hospital admission (Pérez et al, 2018). Inappropriate prescribing is not only linked to such serious risks of death but also to a poorer quality of life, including pain and suffering.[8] After having identified the risks, risk quantification may be done to further aid in reducing the possible risks (Bari et al, 2016).

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[7] Health risk Medical Definition Written by Doctors [Internet]. MedicineNet. 2017 [cited 2023 Apr 16]. Available from: https://www.rxlist.com/health_risk/definition.htm

[8] The Irish Times. Cullen P. Hospital stays linked to higher risk of incorrect drug prescriptions [Internet]. Dublin (Ireland):The Irish Times. 2018 [cited 2023 Apr 6]. Available from: https://www.irishtimes.com/news/health/hospital-stays-linked-to-higher-risk-of-incorrect-drug-prescriptions-1.3697791

1.5 Quantification of Risks

Risk assessment aims to identifty the particular risks associated with prescribing errors occurring, quantifying those risks and determining ideas and strategies to reduce the risks incurred (Lesko et al, 2013). Risk quantification is “the process of evaluating the risks that have been identified” and forming a set of data which will then be used in making a decision on the way forward[9] (Farooq et al, 2018).

The first step to risk quantification is to identify the risks. The identified risk, is then analysed to identify the probability of occurence and the effect it may have.[9] The Risk (R) is then calculated using the PI-model: Risk (R) = Probability (P) x Impact of the outcome (I) (Farooq et al, 2018). Risks can be graded as high, medium and low (Guo et al, 2021).

With the use of a risk matrix, risks are better visualised and categorised.[9] Categorising risks helps create a framework which may potentially help in risk minimisation. Different strategies such as increased communication, the use of technology and pharmacist interventions may be used to help decrease possible risks and inappropriate prescribing (Lavan et al, 2016; O'Mahony et al, 2016).

1.6 Risk Minimisation Stategies by Pharmacists

The pharmacist’s role in community is continually changing with time, from the conventional role of dispensing medication to more recently taking on an active role in patient care (Kumar et al, 2022). Pharmacists play an important role in improving

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[9] What is risk quantification? | The Project Management Question and Answer Book [Internet]. Flylib.com. 2017 [cited 2023 Apr 16]. Available from: https://flylib.com/books/en/4.107.1.72/1/

prescribing appropriateness (West et al, 2012; Khaira et al, 2020). Pharmacist may either choose to take action or act passively when it comes to having identified inappropriate prescribing. If the pharmacist choses to act, they communicate with the prescriber and recommend a change (Santos et al, 2019). In a research carried out in Canada in 2020 pharmacists role has evolved in multidisplicnary teams and in community where they have the authority to "prescribe, administer and monitor drug therapies" in addition to their dispensing role. Not utilising pharmacists within the patient care process, may decrease the chances of pharmacists identifying and rectifying prescription errors found, negatively effecting seamless care of patients (Raiche et al, 2020).

1.6.1 Increased Communication

Pharmacists are in an ideal position to help overcome communication barriers present between prescribers, health care providers and carers (Neuspiel & Taylor, 2013; Costa & Alvarez-Risco., 2018; Khaira et al, 2020). Pharmaceutical intervention involves the integration of the pharmacist with clinicians to prevent inappropriate pharmacotherapy. Pharmacists play an important role in encouraging rational use of medication by safeguarding proper pharmacotherapy, reducing negative outcomes especially due to errors in prescriptions (Costa & Alvarez-Risco, 2018; Santos et al, 2019). Medication reviews performed by pharmacists, after allowing direct communication with the prescriber, has shown to result in safer and more appropriate prescribing (Martin et al, 2018; Kroon et al., 2021). Giving adequate feedback to the prescriber about possible inappropriate prescribing may possibly help in reducing possible future repeated errors (Lavan et al, 2016).

1.6.2 Educational Interventions

One of the first important parts in the intervention is being aware of the situation (Okpoko et al, 2018). Education regarding possible risk factors which may be due to medication errors, will help reduce errors which have occured out of lack of knowledge or lack of training and poor organisation (Okpoko et al, 2018). Educational interventions can be organised in several different manners. Educational sessions for health care professioanls regarding rational drug use, as well as sessions for patients may be held by pharmacists regarding adherence to medical advice and may help patients should they have any concerns regarding treatments (Santos et al, 2019). It is considered critical to allow the opportunity for pharmacist training regarding validation tools of identification of inappropriate medications (Santos et al, 2019).

In an arbitrary clinical trial, with 303 patients using benzodiazepines long term, providing education about possible risks of the use of benzodiazepines in comparison with providing usual care, resulted in an "additional 23% of patients discontinuing their medication within 6 months" without the educational information given regarding their treatment (Martin at al, 2018). This study showed that the distribution of educational material such as brochures together with training to increase the general knowledge and skills of patients, care-takers and HCPs increase medication and prescribing appropriateness (Santos et al, 2019).

1.6.3 Improved Pharmacist Accessibility

Allowing pharmacists to presume a more active role in patient care would result in an improved quality of prescriptions (Santos et al, 2019). Pharmacists play a role in identifying and detecting a possible error, before it reaches the patient. Pharmacists are

known for giving advice, the advice can be a point of intervention to avoid inappropriate prescribing. (Lavan et al, 2016; O'Mahony et al, 2016).

Pharmacists may also take on a multi-displinary approach (Kumar et al, 2022).[10] Pharmacists may review prescriptions, correct problems and help carers deal with complex prescriptions. Pharmacists can also realise through their knowledge of medicines, that a patient cannot tolerate certain medications and can in turn suggest the prescribing of alternative modes of treatment (Hospital Case Management, 2014; Garin et al, 2021).

Pharmacists have adopted a person- centred approach, involving a medication review and individualised care to improve medication appropriateness. In this personalised approach, pharmacist intervene by: "stopping medications, starting new medications, patient education and referral to other health care professionals" and looking at each patient on an individual basis.[2] The modernisation Act of 2003 describes the role of "medication therapy management (MTM) programs", this involves pharmacists taking on a person-centred approach with a multidisciplary team in order to optimise prescribing and rationalise medication use (Moga et al., 2017). Pharmacists have shown to play a critical role in implementing the MTM programs (Moga et al, 2017).

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[2] Doherty A. Why inappropriate prescribing may be bad for your health [Internet]. Belfast (Ireland) RTE.ie; 2020 [cited 2023 Jul 18]. Available from: https://www.rte.ie/brainstorm/2020/0224/1117237-inappropriate-prescribing/

[10] Ebercott. The role of the pharmacist in a multidisciplinary team [Internet]. 2019 [cited 2023 Jul 12]. Available from: https://hospitalpharmacyeurope.com/news/editors-pick/the-role-of-the-pharmacist-in-a-multidisciplinary-team/

Giving pharmacists and other health care professionals access to 'high-quality formularies' such as the British National Formulary (BNF), allows for a more cautious prescribing culture, preventing and reducing the possibilty of inappppropriate prescribing (Lavan et al, 2016; O'Mahony et al, 2016; Mahomedradja et al, 2021).

1.6.4 Digitalisation

Technology plays an important role in reducing inappropriate prescribing. Computerised systems allow the use of electronic prescriptions and allows better access to medical records. Giving access to patient medical records to pharmacists will give them the opportunity to see the patients' history, allowing the pharmacist to study the treatment well, and through their knowledge of medicines, be the ones to notice any possible error, reducing inappropriate prescribing in the process (Santos et al, 2019).

Electronic prescribing (EP) is considered to be an important measure to decrease or prevent medication errors, improving patient safety (Volpe et al, 2016; Tariq et al, 2020). More complex systems even provide "cover checks for allergies, laboratory test results, drug interactions" and protocols which further support the prescriber (Ammenwerth et al, 2008; Volpe et al, 2016). The information given is considered to be essential information for the safety of patients and ensures the lack of inappropriate prescribing (Ammenwerth et al, 2008; Volpe et al, 2016). Computerised systems may also issue alerts when either the decision of treatment is inputted into the system, or when the pharmacist comes to dispense the prescribed medication (Santos et al, 2019). Computerised systems combined with other interventions such as education can benefit patient's safety and significantly reduce inappropriate prescribing (Santos et al, 2019).

1.7 Aims and Objectives

The aims and objectives were to:

1. Develop a medication error documentation sheet and pharmacist interview questions to evaluate and assess the different types of medication errors through analysing prescriptions in different community pharmacies.
2. Set up a focus group focus group to quantify risks associated with prescription errors found.
3. Develop a framework to reduce inappropriate prescribing and disseminate to healthcare professionals.

Chapter 2: Methodology

The purpose of this chapter is to describe the methodology undertaken in this study, and to assess the methods used to ascertain the study's aims and objectives.

2.1 Research Phase 1

In the first research phase, an observational study and pharmacist perception of prescription errors was evaluated using a Medication Error (MedErr) documentation sheet and pharmacist interview questions.

2.1.1 Observational Study

The study was carried out in seven community pharmacies, selected by convenience sampling from seven statistical districts in Malta as per the National Statistic Office Classification. The pharmacies were visited during the same time period to allow for better comparison of results which differ between the different pharmacies, since they were taken from different statistical districts.

A Medication Error (MedErr) documentation sheet (Appendix 1) was developed and validated by five people; three pharmacists; two working in the community and one working in the pharmaceutical industry, one general practitioner (GP) and one lay person. The MedErr. documentation sheet includes options of the different types of potential prescription errors such as error in dose, error in naming of drugs and wrong formulation prescribed as well as the levels of potential seriousness of the prescription error. The levels of harm are described within the MedErr documentation sheet as follows:

1. **Type 1:** The patient is in no danger due to the error and will not require monitoring or further patient care.

2. **Type 2:** The patient was in temporary and non- life-threatening harm. There may or may not be the need for further patient care and monitoring.
3. **Type 3:** The patient was in temporary and non- life-threatening harm; however, the patient will require monitoring through tests such as blood tests to assess patient's condition.
4. **Type 4:** The patient will experience significant, non-life-threatening harm, which will require patient care and possibly the administration of an antidote.
5. **Type 5:** The patient is in potential life-threatening temporary or possibly permanent harm. An antidote or intensive care may be required (Hoppes et al., 2014).

The MedErr documentation sheet presents a comprehensive tool used to systematically categorise medication errors.

Pharmacist interview questions (Appendix 2) were developed and validated by the same group of individuals who validated the MedErr. documentation sheet. One-hour interviews with 20 community pharmacists recruited from 7 pharmacies in different districts, chosen by convenience sampling from the same pharmacies which the observation study was conducted, were undertaken to assess the different types of prescription errors that pharmacists encounter during their practice. The interview questions were composed of 16 open-ended questions which aims to assess prescription errors encountered in community.

The interview questions can be divided into 4 sections/ aims as follows:

Section 1: Type, Frequency and Occurrences of Prescription Errors

Section 2: Factors Contributing to Prescription Errors

Section 3: Impact of COVID-19

Section 4: Potential for Pharmacist Prescribing

Section 1: Type, Frequency and Occurrences of Prescription Errors

Assessing the frequency and nature of prescription errors, by differentiating the types of errors encountered and identifying the more common types of prescription errors which pharmacists have encountered. This information helps in quantifying the extent of the errors and common areas or patterns of the more frequently encountered errors.

Section 2: Factors Contributing to Prescription Errors

The questionnaire aims to exhibit the impact of communication between healthcare professionals on prescription errors, the influence of pharmacist accessibility and the possible benefits of EP systems. Interpretation of factors which effect prescribing may help reduce prescription errors through the development of strategies which improve communication.

Section 3: Impact of COVID-19

This section aims to evaluate the impact of Covid-19 on prescription errors, whether the pandemic had led to a change; increase or decrease in errors and the handling of the prescription errors encountered.

Section 4: Potential for Pharmacist Prescribing

This section aims to analyse the opinion of pharmacists on whether pharmacist prescribing would decrease prescription errors. This may help broaden the role of pharmacists in patient care and gather insights to possible improvements in the prescribing process.

Upon granting of ethics approval (Appendix 3), prescriptions were analysed and implemented within the MedErr. documentation sheet in seven community pharmacies when and if a prescription error was found. Private prescriptions presented to the pharmacist during the observational study were analysed and the different prescription errors were categorised to facilitate their quantification. No patient details were recorded or divulged, and no patient recruitment was involved. Only data pertaining to what drug/s has/ have been prescribed and in what dose, in the specific age group were analysed. After completing the observational study, the prescription errors were classified, categorised, and analysed to aid in finding the 10 most challenging errors. The prescriptions implemented within the MedErr. Documentation sheet were coded and inputted to IBM Statistical Package for the Social Sciences (SPSS®) version 28 for further analysis.

2.2 Research Phase 2

In the second phase of the research, a focus-group of healthcare professionals was set up for the development of a framework to reduce inappropriate prescribing.

2.1.2 Risk Assessment of Prescription Errors

From the data extrapolated from the prescription errors implemented within the MedErr. Documentation sheet, ten cases based on the level of perceived risk, were presented to

the focus group (Appendix 4). The focus group consisted of six female pharmacists, one of which is a clinical pharmacist with 20 years of experience. Three of the pharmacists are full time community pharmacists with six, eleven and thirty-six years of experience respectively. Two of the pharmacists work as medical representatives and have thirteen and twenty-two years of experience respectively, these pharmacists' locum regularly in community pharmacies. The six doctors who formed part of the focus group consisted of four male doctors, of which two are GPs who work in the private sector, one is a paediatrician, and one is a specialised doctor working at hospital and two female GPs who work in the private sector.

A risk matrix of the severity of consequences and probability of a risk occurring was filled in by the focus group and a risk priority number (RPN), which is the product of severity and probability was calculated. The RPN is an extensively used tool to determine, evaluate and quantify risk, its simplicity allows decisions to be made in numerous fields including healthcare (Pascarella et al., 2021).

Risk can be categorised based on five levels as follows:

- Negligible risk where there is no further concern
- Acceptable risk where slight concern is present, however no investment is required to monitor that risk
- Controllable risk where certain measures should be adopted to avoid further risk
- Critical risk where risk reduction is investigated and considered taking into account that the benefits of carrying out activity outweighs the costs
- Unacceptable risk where cost is no longer considered, safety measures are carried out to reduce the risk to a critical level (Ruan et al., 2015; Qazi & Akhtar, 2020).

The two-dimensional risk matrix is a 5x5 matrix where the severity and probability are rated on a 5-point Likert scale, anchored by 1 denoting a low score. RPNs between 1 and 5 denote a low-risk score, 6 to 15 a medium-risk score and 16 to 25 a high-risk score (Table 2.1). Three risk groups were used, rather than five so as to facilitate selection of the risk of the prescription errors presented to the focus group.

Table 2.1: Risk Categorisation

Risk Rating Score	Colour Code	Level of Risk
1-5	Green	Low
6-15	Yellow	Medium
16-25	Red	High

Probability of consequences occurring		Severity of Consequences				
		Negligible 1	**Minor 2**	**Moderate 3**	**Major 4**	**Catastrophic 5**
	Rare 1	1	2	3	4	5
	Unlikely 2	2	4	6	8	10
	Possible 3	3	6	9	12	15
	Likely 4	4	8	12	16	20
	Almost certain 5	5	10	15	20	25

Figure 2.1: *Risk Matrix adapted from: Emovon I, Okwu MO. Risk assessment tools for categorisation of failure modes of Marine Diesel Engine: A comparative study. Journal of Advanced Engineering and Computation. 2018;2(1):30. DOI: 10.4018/ijrcm.2012100104*

A framework to reduce inappropriate prescribing and enable safer prescribing was developed through research of current prescription write-up methods, incorporating advice given by the healthcare professionals involved throughout the study and based on the results of the focus group. A validation document was compiled consisting of seven questions regarding the framework. The framework was presented and validated by the same participants of the focus group. This framework was disseminated to healthcare professionals. The same group of individuals were chosen since they were already familiar with the project, this allowed them to understand further the need for a framework to reduce inappropriate prescribing since they were in favour of it. The participants were asked to rate the clarity and level of understanding of the presentation

of the framework using close-ended questions rated on a 5-poing Likert scale, from 1 to 5, where 1 refers to strong agreement and 5 indicated strong disagreement. Participants were then also given the space to add any further comments in the form of a final open-ended question.

Chapter 3: Results

This chapter details the results obtained from both the qualitative and quantitative research that has been carried out. This chapter is grouped as follows:

1. Validation of the research tools used for the research
2. Results of the responses obtained from questionnaire conducted on twenty pharmacists
3. Results from private prescriptions implemented in the Medication Error (MedErr.) Documentation sheet during the observational study.
4. Results from the responses of risk matrix carried out during the focus group
5. Framework developed to reduce inappropriate prescribing validation process and evaluation.

3.1 Validation of Research Tools

When research tools are developed, validation of both the questionnaire and MedErr. Documentation sheet is fundamental to assess and ensure good quality of the instrument, determining the reliability of using the instrument for research (Elangovan & Sundaravel., 2021). Both the questionnaire and the MedErr. Documentation sheet were well received and established to be clear and thoroughly presented. All participants suggested that the MedErr. Documentation sheet was sufficient and will support the evaluation of potential prescription errors. Recommendations regarding changes to the language used in the questionnaire were amended, due to suggestions from the lay person suggesting that some terminology may not be understood by all. It was noted that the questionnaire was to be presented to pharmacy professionals, assuming certain terminology would be understood. Owing to the fact that this research was commenced during the outbreak of COVID-19, it was recommended by the healthcare professionals validating the questionnaire that the effects of COVID-19 be included.

It was recommended to include the role of medication errors due to prescriber's handwriting and hence lack of legibility, as well as missing information on a prescription such as prescriber's contact details in order to clarify any concerns regarding the prescription in question. This change was duly made to improve the tool. It was suggested that inclusion of 'Error in Naming of drug', may be considered under or similar to 'Lack of clarity due to prescription handwriting' which required further clarification so as to avoid confusions when implementing the prescription error into the MedErr. documentation sheet.

3.2 Interview Questions Evaluation

In this section, responses from the pharmacists' interview questions are presented, divided into each section in accordance with the interview questions (Appendix 2).

3.2.1 Section 1: Type, Frequency and Occurrences of Prescription Errors

From the 20 pharmacist interviews carried out, 14 pharmacists were female.

Table 2.1 shows the years of experience of each pharmacist undertaking the interview.

Table 3.1: Pharmacists' Years of Experience

Years of Experience	Number of Pharmacists
0-5	3
6-10	3
11-15	4
16-20	2
21-25	1
25+	7

Pharmacists (n=17) confirmed that they have encountered prescription errors and when they do the prescriber is contacted for clarification. Three pharmacists stated that they rarely find prescription errors but are not necessarily aware of the need to look out for prescription errors. Ten of the pharmacists rotate around different pharmacies, while the other half due to reasons such as being managing pharmacists do not rotate and stay in the same region or district. Six of the ten who do rotate do not notice a particular difference in the type or frequency of errors encountered in different regions, while four of the ten do notice a difference, such that in different regions of Malta more prescriptions errors would be encountered than in other areas. An example given was that in areas closer to public centres such as polyclinics more errors tend to be encountered.

When asked about the pharmacists' initial response to discovering a prescription error as stated previously pharmacists (n=17) would contact the prescriber. Two of the seventeen stated that they would attempt to contact the prescriber but more often than not do not get through, resulting in lack of communication between healthcare professionals (HCPs), and not necessarily being able to rectify the error found. One of the seventeen stated that he would not dispense without getting through to the prescriber, while another pharmacist stated that they would try to acquire the patients' personal details to enquire further detail, before concluding the error is present. Two pharmacists would check with sources such as the British National Formulary (BNF) and Summary of product characteristics (SmPC), with aims to acquire clarification without the need to contact the prescribing physician. Three pharmacists, two of which have also stated that they would contact the prescriber, would ask the patient what the doctor had told them during the visit to gauge from the patient's perspective what was meant to be prescribed.

Pharmacists (n=15) would not respond differently when finding prescription errors from a private as opposed to a Pharmacy of Your Choice (POYC) one. Four of the fifteen pharmacists find it difficult to contact the prescriber in the public sector, and one of the four, would not dispense if they cannot reach the prescribing physician. Four pharmacists would respond differently when encountering the prescriptions from POYC in comparison to private prescriptions, while one pharmacist does not work with POYC and has never encountered prescription errors of POYC. Pharmacists (n=4) would check the patients' history through the POYC system as well as their relevant entitlements. Two of these four pharmacists are of the pharmacists who would respond in the same way whether private or POYC prescription. Of the four who would respond differently all four pharmacists would contact the prescriber in the private sector, while for the POYC prescription errors two of the four would advise the patient to speak with their General practitioner (GP) or a prescribing physician to ensure clarification and rectification of the error.

When asked about the most common type of prescription errors observed in the community setting, pharmacists (n=9) mentioned more than 1 common type of prescription error. Ten pharmacists believed that incorrect or wrong dosage regimen, is the most common error they encounter followed by error in doses (n=8), incorrect spelling of certain medications (n=4) and known drug interactions with patients on chronic medications (n=2). Twenty pharmacists find that they commonly observe prescriptions for items which are not available on the local market. Paediatric errors in dosage regimens, number of days of treatment and doubled or halved doses of medicines were errors named by more than one of the pharmacists.

Pharmacists (n=14) stated that they observe more prescription errors in private prescriptions, one of the fourteen pharmacists stated that he observed more prescription errors within the private sector deriving from the hospital sector. Two pharmacists stated that they observe roughly equal prescriptions errors when comparing private prescriptions to POYC scheme. On the contrary two pharmacists stated that they observe more prescription errors from the POYC scheme since doctors have the tendency to copy the previous prescription without checking on the patient. One pharmacist was unsure since she does not generally work in the POYC sector.

Pharmacists (n=14) did not associate that errors are related to specific drug classes, while five believed that prescription errors are found within the antibiotic class, and one believed that they are found in cough and cold related prescriptions and other over the counter medications in association with their chronic medications.

When asked about the frequency of encountering a prescription error, five pharmacists stated that they don't find prescription errors too often while four stated that they observe prescription errors roughly once a week. While two pharmacists stated that they find prescriptions errors approximately once per month, three pharmacists stated that they rarely find any prescriptions errors. Pharmacist (n=1) presented their response as follows: "2-3 times per week, 1 every 4-6 weeks, 4-6 times per month, few times a week, 4 to 5 times a week and 2 to 3 times per month".

When enquiring about whether there are errors which are more obvious to find over others, five pharmacists found that dosage errors are more obvious to find, one of which believes that errors in dosage forms is a more common error to find. While two

pharmacists found that prescription errors where the doses do not exist a more common error. Four of the pharmacists stated that errors in dosage regimens are errors which are more obvious to find. Of the four pharmacists one believed that time of administration is also a more obvious error to encounter. One pharmacist stated that when a prescribing physician prescribes off-label, given that the required information would not be listed in the Summary of products characteristics, it may be more obvious to find especially if the use is completely unrelated. "Illegible handwriting, controlled release formulations stating to split the tablet, prescriptions regarding blood pressure, hypercholesterolaemia and diabetes, medicine being unavailable locally, errors regarding products with different dosage forms, wrong medicine name and lack of patient details" are seven different prescription errors which seven different pharmacists stated as errors which are more obvious to find. One pharmacist stated that there are no obvious errors to find over the other.

3.2.2 Factors Contributing to Prescription Errors

Pharmacists (n=18) believed that prescription errors occur due to a lack of communication between all healthcare professionals, and pharmacists (n=2) did not agree because they believe that errors are more due work pressure prescribing physicians encounter, or lack of pharmaceutical updates from the pharmaceutical companies. One of the eighteen pharmacists stated that it also due the doctors not keeping updated with new indications and dosages, another one of the eighteen pharmacists believed that another reason is the lack of proper drug detailing and forgetfulness of the prescribers themselves. Another pharmacist believed that the communication would help since it is pharmacists that know more detail regarding dosage, forms, and dosage regimens. High workload on doctors as a problem was also mentioned by one of the pharmacists. One

pharmacist stated that prescribers need more access to drug information especially since young doctors tend to make more errors, another pharmacist stated that it is especially due to the amount of new and changing medications, doctors need to be constantly reminded of them. One pharmacist stated that the communication is especially important in the private sector, decisions of which brand to prescribe are based on the comfort of the physician.

When asked about possible suggestions as to how one can reduce prescription errors from occurring, eight pharmacists gave more than one suggestion.

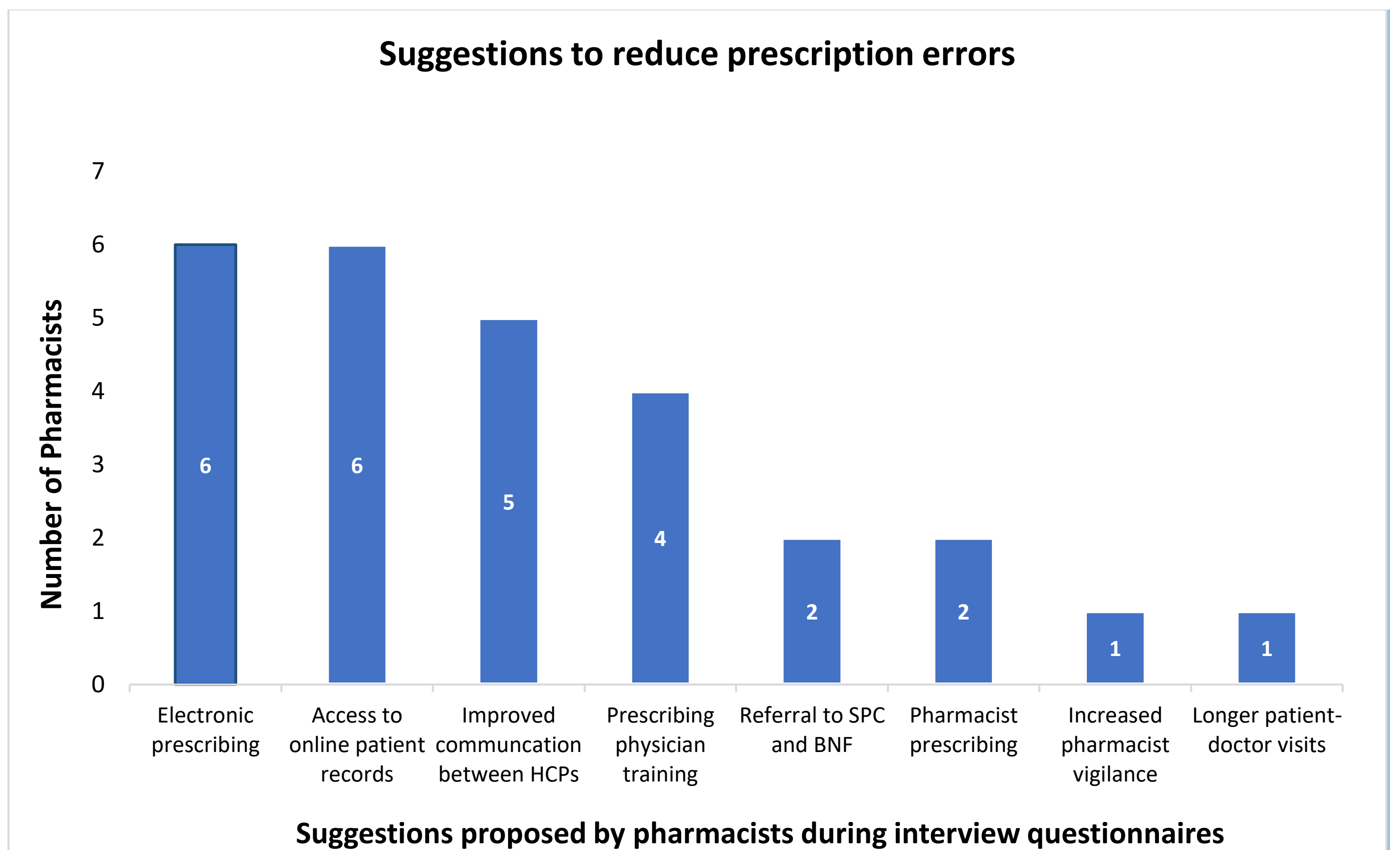

Figure 3.1: Suggestions to Reduce Prescribing Errors

With regards to access to online patient records (figure 3.1), information such as patient history and constant updates for all healthcare professionals was also suggested as useful

information. Given that pharmacists have a role in the identification of these errors, increased pharmacist vigilance may help reduce prescription errors from occurring. As shown in figure 3.1 four pharmacists suggested improving the training for prescribers to help increase familiarisation with local products and allowing doctors to be more up to date when it comes to new medications.

Pharmacists (n=19) believed that improved pharmacist' accessibility to patient records, and to the prescribing process will result in less prescription errors, with reasons given were that if more eyes are present in the prescribing process the less the chances of errors and this would allow for double checking of prescriptions. While one pharmacist explained that improved pharmacist accessibility would especially be beneficial if it includes accessibility to patient records, one pharmacist does not believe that pharmacist accessibility will result in less prescription errors.

Pharmacists (n=18) believed that electronic prescribing would decrease prescription errors, while two of the twenty pharmacists are unsure whether it would decrease prescription errors. Nine pharmacists mentioned more than one type of error which would be decreased if all prescriptions were to be converted electronically. Two pharmacists stated that this could also prevent any possible dispensing errors, decreasing the risk to patients to a higher extent. Pharmacists (n=7) explained that electronic prescribing would be beneficial since errors due to poor knowledge or patient history, allergies and drug interactions could be avoided. Four pharmacists stated that error in dosage regimen could be avoided. Errors due to poor handwriting and illegibility were stated as avoidable with e-prescriptions by five pharmacists. The possibility of forging of prescription dates can also be avoided, as expressed by two pharmacists. Avoiding dosage errors was also

mentioned by six pharmacists. Errors due to omissions of data could also be reduced, this was stated by one pharmacist. While two pharmacists believed that errors which have to do with the naming of the medication can be avoided, one pharmacist mentioned the errors of 'off-label' use of medications can be avoided. One pharmacist mentioned that using a system with drop-down menus showing all active ingredients, may decrease prescription errors.

3.2.3 Impact of COVID-19

When enquiring about the effects of COVID-19, pharmacists (n=6) stated that less errors were observed during COVID, since less prescriptions were being handled and the prescriptions were prepared less randomly, less workload for GPs gave more time for improved prescriptions. The 'repeat' had been used more to avoid doctor visits, prescribing physicians also used more electronic media such as emails, Whatsapp®, text-messages, and phone calls. Pharmacists (n=8) stated that they observed the same number of errors, since the doctors were seeing the patients less and prescriptions were done via emails/ messages. Four pharmacists stated that they observed less prescription errors with respect to POYC and relatively the same with regards to private prescriptions. This was because prescriptions were not required for POYC unless there was a change in dose or treatment. One pharmacist stated that more errors were observed due to more stressful visits with doctors. One pharmacist found a reduction in errors with regards to dosage regimens since many prescribing physicians started leaving certain decisions in the hands of pharmacists.

The pharmacists were asked if prescriptions were handled in the same way if any errors were found during COVID in comparison to before, to which pharmacists (n=11) stated

that they did not change the way prescriptions were handled and pharmacist (n=1) stated did she did not work actively during COVID periods. Pharmacists (n=8) stated that they did handle prescriptions differently during COVID-19. These eight pharmacists were asked a follow-up question of how they handled the prescription errors differently. Five pharmacists explained that majority of prescriptions were presented on electronic devices, this improved contact/ communication with prescriber in case clarification was required. One pharmacist explained that prescriptions were handled with more care especially those belonging to COVID-19 patients. The pharmacist tried to avoid sending patients back to doctors, to avoid encountering sick patients when possible. One pharmacist handled prescriptions differently since the 'repeat' has been used more to avoid doctor visits while another pharmacist handled the prescriptions differently since they felt more secure when contacting prescriber and discussing issues directly, certain patients took advantage of the pandemic when it came to Prescription Only Medications (POMs).

3.2.4 Potential for Pharmacist Prescribing

Pharmacists (n=16) believed that pharmacist prescribing would decrease errors, while two pharmacists were unsure, and one did not believe that pharmacist prescribing would decrease errors since pharmacists are still bound to make similar errors. The errors are not always due to the lack of knowledge but also due to the distractions and busy lifestyle of the doctors. One pharmacist stated that it is only possible if circumstances when prescribing can be done without examination of patient. One of the sixteen pharmacists stated that forming groups and collaborations will improve treatments for many patients. Six of the sixteen pharmacists stated that pharmacists have better knowledge of medications, formulations available and doses available as well as interactions and dosage regimens. The pharmacists would also know their contraindications and

interactions since they would know what medications their patients are taking. Minor ailments or diseases can be discussed with the pharmacist. The pharmacist hase enough knowledge to tackle these complaints as they are more aware of products on the market. Pharmacist prescribing ensures medication safety and reduces strain on physicians within the health sector. One of the sixteen pharmacists believed that pharmacist prescribing would definitely be possible with electronic access to patient records and patient history.

3.3 Prescription Analysis

From 140 prescriptions implemented within the MedErr documentation sheet 282 medication errors were found (Figure 3.2). The 'other' category represents the following: drug-drug interactions (n=7), preparation not available in Malta-limited list (n=5), wrong formulation prescribed (n=4), improper drug selection (n=2), adverse drug reactions or side-effects (n=1), and miscellaneous (n=3).

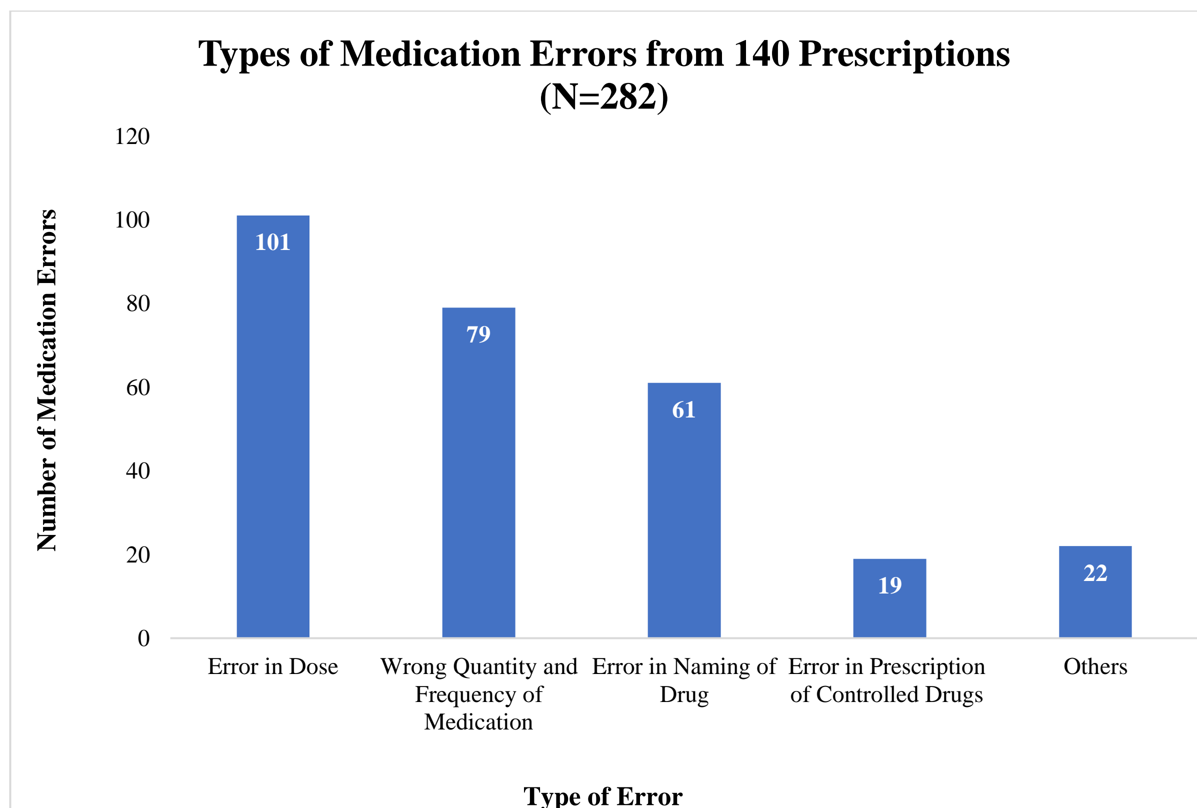

Figure 3.2: Types of Medication Errors

Error in dose was further subdivided into several different categories in the MedErr. Documentation sheet (Figure 3.3). Error in dose was marked as a type of error in this section in the case where the error was not of a specific sub-category but was an error in dose in general.

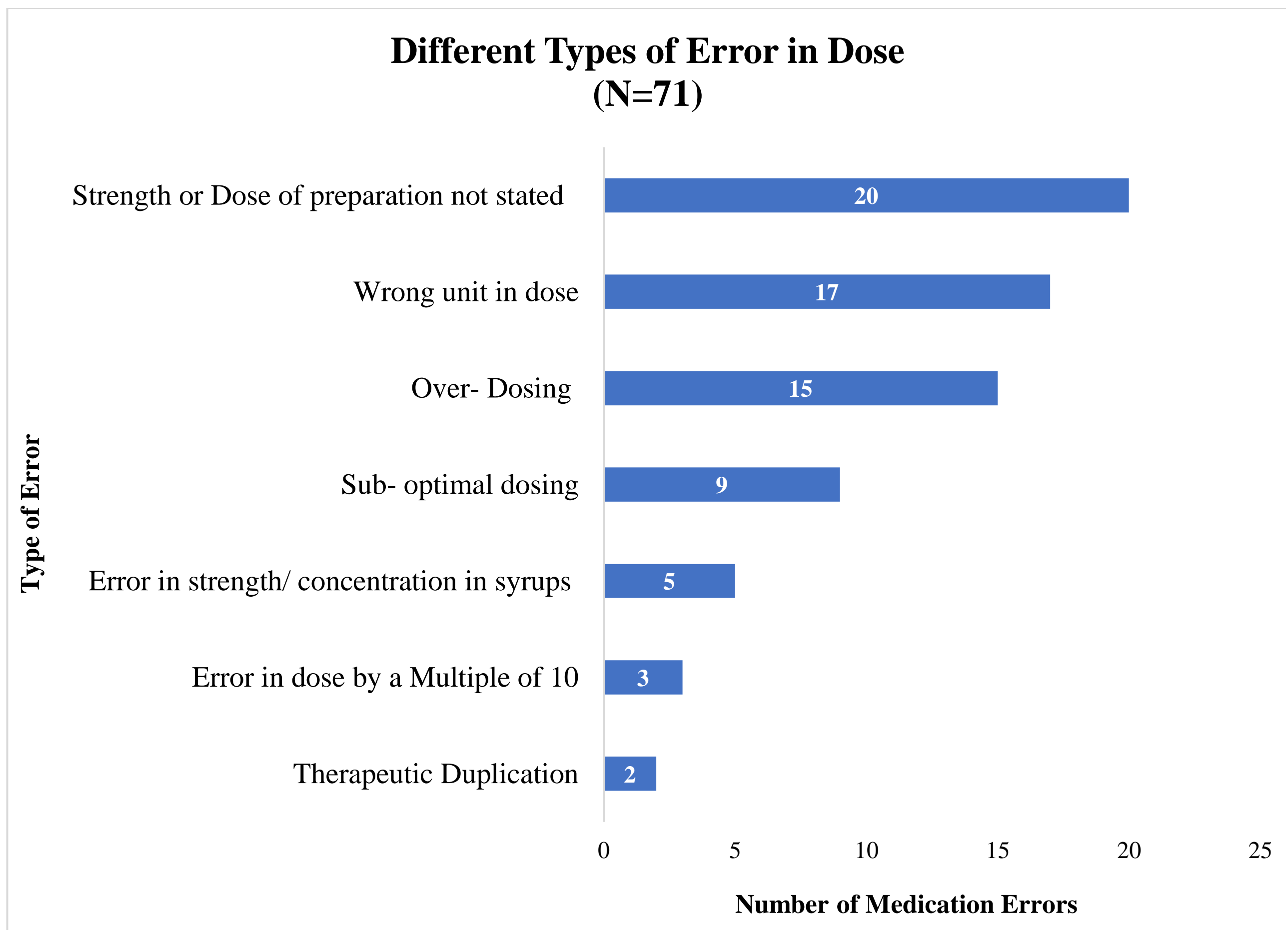

Figure 3.3: Different Types of Error in Dose

Error in naming of drug also includes subdivisions of different types of prescription errors (Figure 3.4).

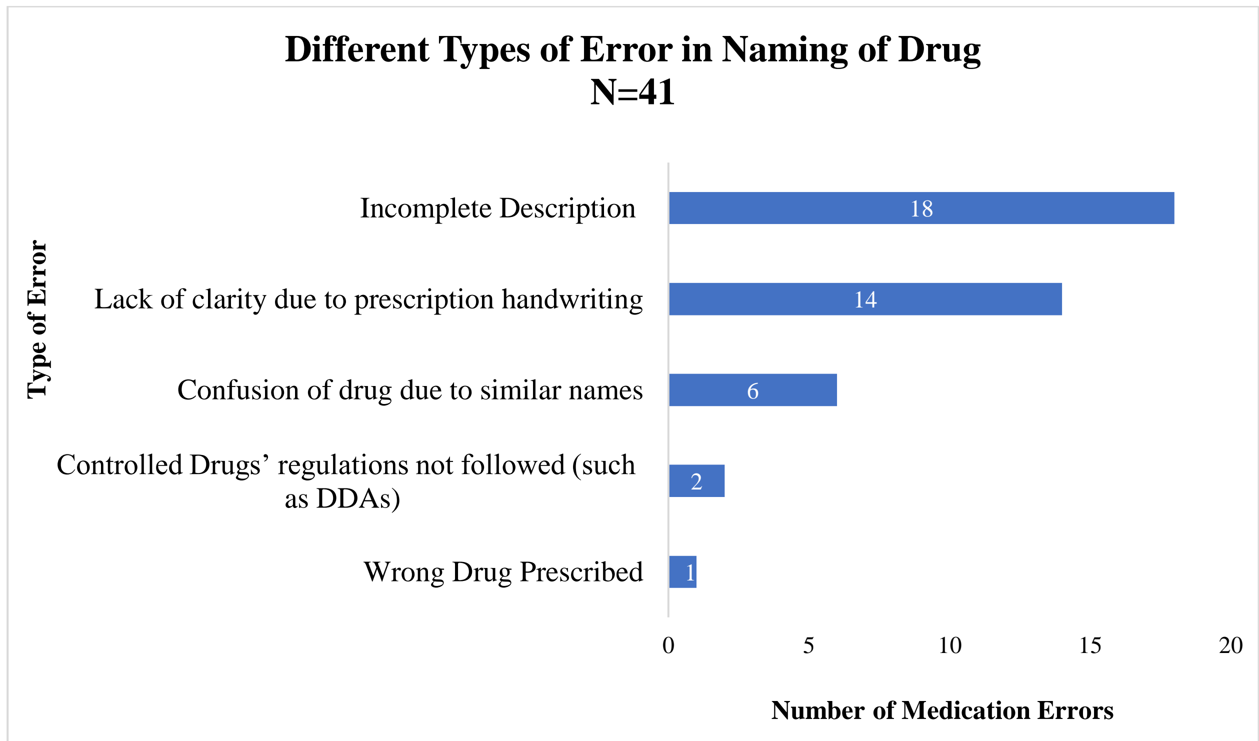

Figure 3.4: Different Types of Error in Naming of Drug

Error in prescription of controlled drugs was further subdivided into several different categories. Error in prescription of controlled drugs was marked as a type of error in this section in the case where the error was not of a specific sub-category but was an error in prescription of controlled drugs in general (Figure 3.5).

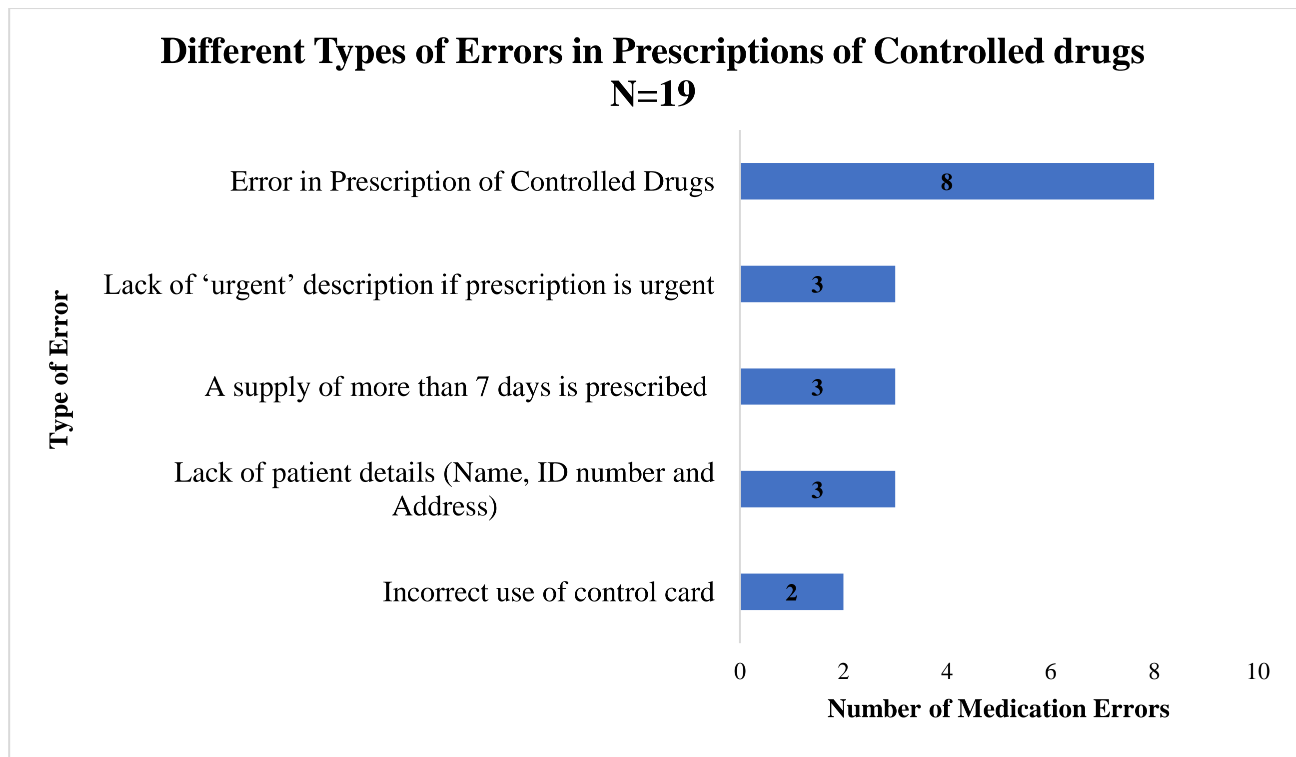

Figure 3.5: Different Types of Error in Prescriptions of Controlled Drugs

Some examples encountered included a prescription of etoricoxib 100mg with no regimen or length of treatment. This example included an error in dose, since the dose does not exist together with an error of wrong quantity and frequency of medication. Another example encountered included over-prescribing of dangerous drugs such as diazepam, with bromazepam, lorazepam and zolpidem, these drugs were all on the same prescription as an urgent prescription, prescribed for two months. These were categorised as errors of over-dosing together with error in prescription of controlled drugs and a supply of more than 7 days prescribed for an urgent prescription. On another prescription prednisolone

was prescribed instead of pregabalin, this error was considered to be an error in naming of drug.

From the 140 prescriptions implemented within the MedErr. Documentation sheet the pharmacists evaluated the type of harm as follows in figure 3.6:

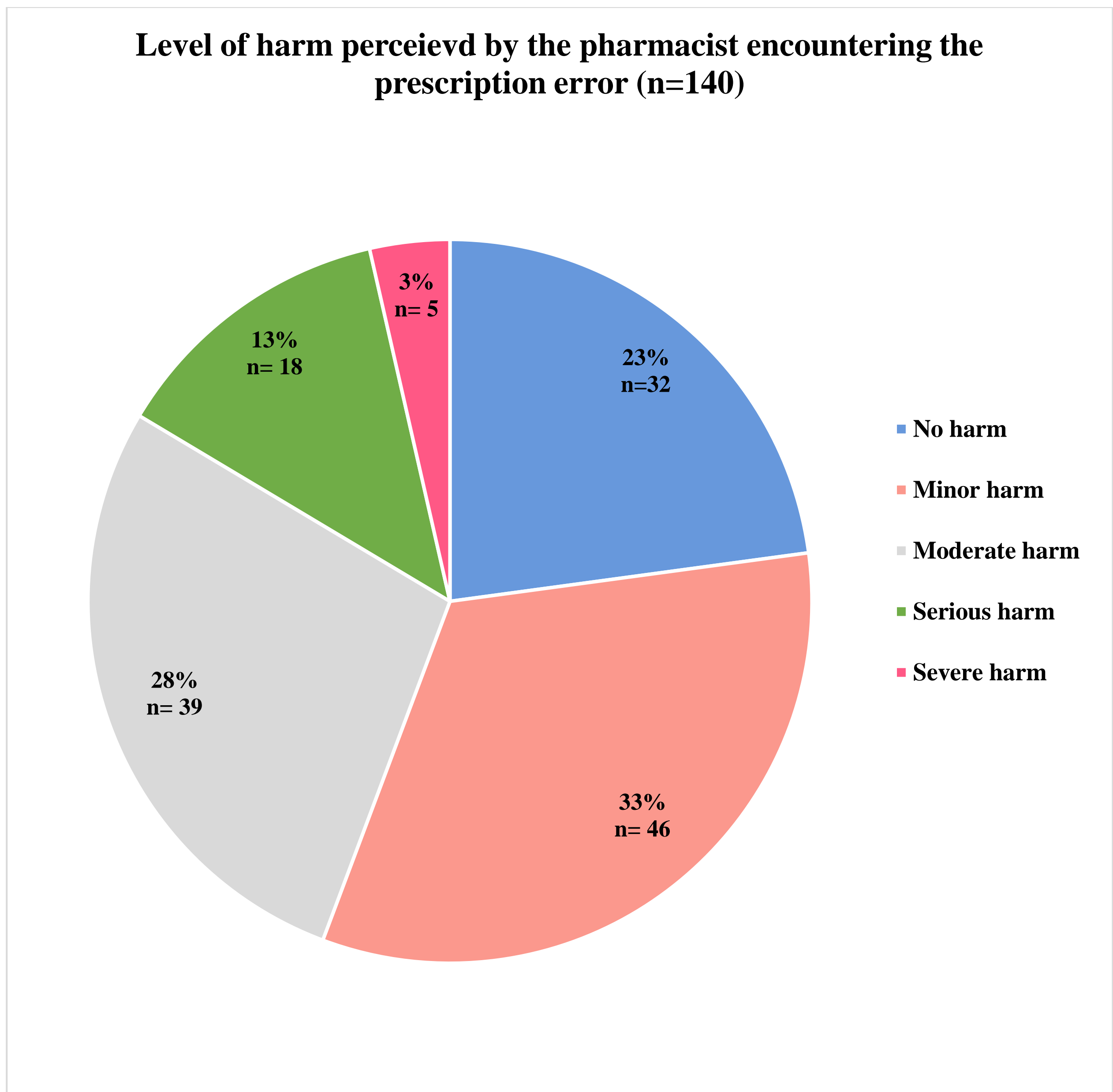

Figure 3.6: Level of Harm of Prescription Errors Encountered

The types of errors encountered were compared to the location where a particular error was encountered. When comparing the pharmacy location, each pharmacy was given a number corresponding to the location as follows:

Table 3.2: Pharmacy Number in Correlation with their Location

Pharmacy Number	Area	Location
1	7	Sliema
2	5	San Gwann
3	5	Gzira
4	10	St. Paul's Bay
5	17	Dingli
6	11	Tarxien
7	14	Zejtun

The number of prescription errors found in each pharmacy are shown in figure 3.7 below:

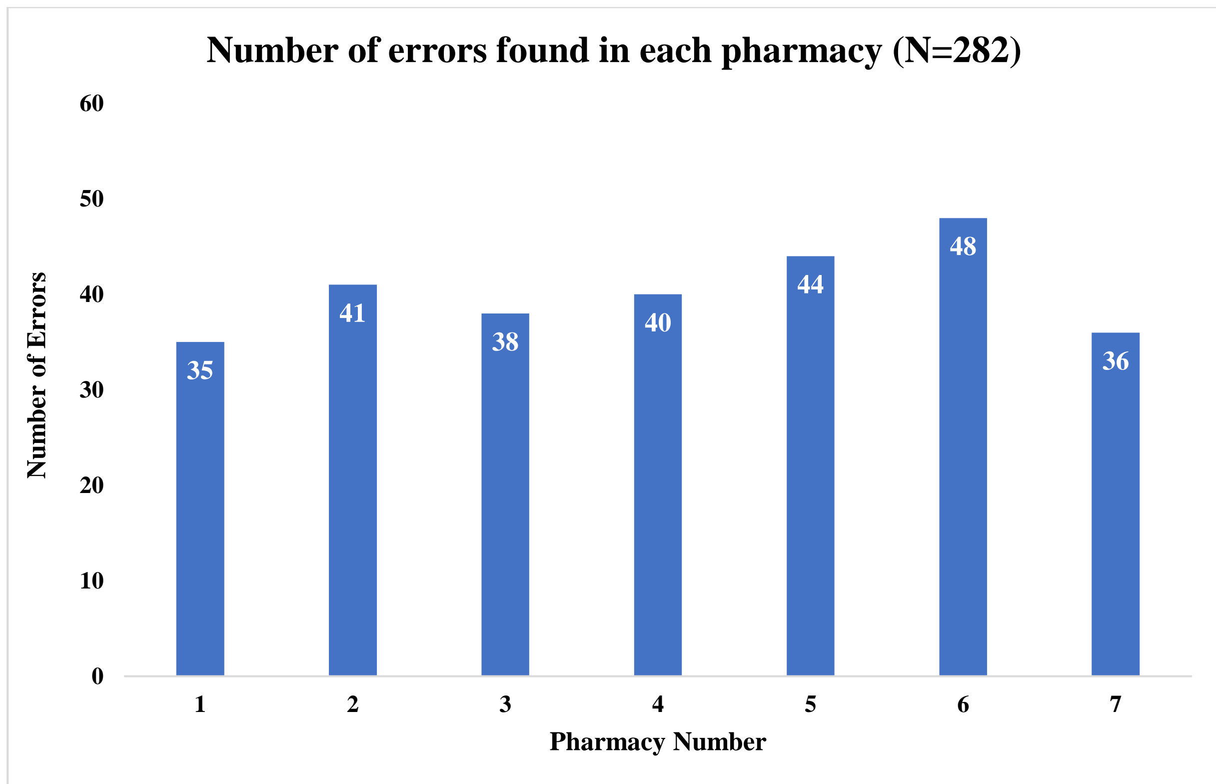

Figure 3.7: Number of Errors Found in Each Pharmacy

Figure 3.7 shows that from 282 prescription errors, each pharmacy ranged from 35-48 prescription errors in each pharmacy and that the number of errors were similar in quantity in each of the areas studied. In all seven pharmacies, not taking into account the total number of errors of each sub section, the most common error found was wrong quantity and frequency of medications with (n=11) in pharmacy 1, (n=10) in pharmacy 2, (n= 6) in pharmacy 3, (n=13) in pharmacy 4, (n=15) in pharmacy 5, (n=16) in pharmacy 6 and (n=8) in pharmacy 7.

When grouping "Error in dose", the most common pharmacies to encounter these errors were pharmacies number 2, 6 and 5 with 18, 17 and 16 errors respectively. When grouping "Error in Prescription of Controlled drugs" pharmacies number 3 and 1 were found to have the most of these types of errors with 8 and 6 errors respectively.

Pharmacies number 7 and 6 we found to have the most errors of “Error in Naming of drug” with 11 and 10 errors respectively.

3.4 Focus Group Responses

From the 10 medication errors presented to the focus group, 5 of the errors were considered to be of high risk (>16) by 5 or more of the 12 participating members, where one case scenario involved error in dose, two case scenarios involved error in naming of drug, one case involved therapeutic duplication and overdosing, and one involved a drug-drug interactions (Table 3.3).

Table 3.3: Errors Classified as High Risk (>16) by Healthcare Professionals

Type of Error	Example	Number of HCPs
Error in Naming of Drug	*Prescription:* Augmentin® 1g - once daily for 3 months ⇩ Prescription should have read amitriptyline 10mg once daily for 3 months	7
	Prescription: Fluanxol® 0.5mg stat and Daktarin® cream BD for seven days ⇩ Prescription should have read Fluconazole 150mg stat	6
Therapeutic Duplication	*Prescription:* Catafast® 50mg TDS for 7 days and Dicloduo Combi® BD for 10 days. ⇩ Same Active Ingredient	6
Drug- Drug Interaction	*Prescription:* Ranexa® 500mg and Klacid® XL once daily for 7 days ⇩ Contraindicated	5

When comparing the opinions of the doctors versus the pharmacists, it was commonly observed that pharmacists find the errors to be of higher risk than the doctors. Most of the low-risk numbers were given by the doctors rather than the pharmacists. More commonly the participants of the focus group found the errors to be of medium risk when comparing them to the number of errors considered to be of low risk.

3.5 Framework

A framework entitled: "Prescribing Process Enhancement Framework: A comprehensive Strategy for Reducing Prescription Errors and Enhancing Patient Safety" (Appendix 5) was developed. This was based on existing literature and recommendations put forward by the focus group, ensuring the inclusion of the important points suggested by the focus group, to avoid certain common prescription errors which they encounter frequently, and the errors presented during the focus group.

All twelve members who took part in the previous part of the focus group responded to the validation questionnaire regarding the framework. Validation of the framework received positive feedback. On a Likert scale of 1 to 5 where 1 is strongly agree and 5 is strongly disagree, all the participants either strongly agreed (1) or agreed (2) that the clarity and presentation of the framework were appropriate. The participants also either strongly agreed (1) or agreed (2) that the framework was relevant to the study, has sufficient detail, and the purpose of the framework was appropriate.

Recommendations by the panel included factors such as patient's age and the prescription date. Three of the pharmacists taking part in the focus group stated that patients visit the pharmacy with expired prescriptions, where the prescription date is necessary. For

example, prescriptions for dangerous drugs expire within a week and are not applicable 7 days after the prescription has been issued. Similarly, prescriptions for antibiotics are generally not a repeat prescription, unless there is a specific exception. Another pharmacist suggested taking into account off-label use of medications which would not necessarily be a medication error, since the prescribing physician chose to use the medication “off-label”.

Two of the physicians from the panel suggested including the framework as an online “fill in” form. This ensures each step, especially the patient’s information such as family history, drug and medical history is inputted, so that when a new diagnosis and new drugs are added, drugs or disease interactions can be easily detected. A pharmacist commented that the follow-up with the patient is not always plausible since not all patients would return to the physician or pharmacist shortly after the visit, unless a new issue is encountered by the patient. A pharmacist panel member also suggested the addition of intolerances or allergies which patients may have when discussing the patient interview. This should be taken into account when determining therapeutic options.

Chapter 4: Discussion

The aims of this study were to evaluate and assess the different types of medication errors through analysing prescriptions in different community pharmacies as well as a pharmacist's perception on inappropriate prescribing.

Pharmacists' opinions on prescribing errors and their associated risks were studied using an interview open-ended questionnaire. The prescription errors encountered were evaluated by a panel of Healthcare Professionals (HCPs) to assess the degree of risk associated with the prescription error. A framework to improve the prescribing process was developed from previous research together with the opinions of the expert panel, for the possibility of prescribing physicians to follow.

4.1 Evaluation of Pharmacist Interviews and Prescribing Errors

The existence of inappropriate prescribing shows that, despite the presence of clinical practice guidelines, this undoubtedly does not mean that these guidelines are abided by (Kroon et al, 2021). In this study, a framework to reduce inappropriate prescribing was developed and disseminated to HCPs. Reducing inappropriate prescribing will effectively reduce the potential need for hospitalisation or other emergent situations, effectively improving quality of life for patients. Through adequate information of the patient provided by the framework, Adverse Drug Reactions (ADRs) and drug-drug interactions will be reduced ensuring patient safety (Prados-Torres et al, 2017; Conn et al, 2021). In a study carried out in Malta (2013) regarding: "Medication errors through a national pharmacovigilance database approach" stated that "17.9% of Adverse Drug Events (ADEs) from 2005 to 2010 adopted from the Maltese pharmacovigilance database" were due to medication errors, these may have been preventable ADEs (Tanti et al, 2013).

Suggestions to prevent medication errors stated in a research study by Tariq in 2023, include: writing one prescription for each medication, checking the dose and frequency and stipulate the duration of therapy rather than stating the quantity of medication to dispense. Other suggestions may be to include the condition to be treated on the prescription as well as the route of administration. It is advisable to avoid abbreviations of drugs as this may result in a confusion of a drug due to similarities in the name (Tariq et al, 2023). Similarly, this was seen in this study where there was a confusion between flupentixol and fluconazole, one of the prescription errors found.

In research conducted by Despott et al, 2023, the most common prescribing errors found included: drug-interactions, unlicensed dose and contraindications with 138, 122 and 103 errors respectively carried out in a hospital setting, unlike this study where the most common errors found were: error in dose, wrong quantity and frequency of medication and error in naming of drug with 101, 79 and 61 errors respectively, however the setting was based in community. The different settings are also an important aspect. As mentioned by pharmacists noticing drug-interaction in a community setting might not always be as easy and possible, since the pharmacist might not always have access to the patient's medication history.

In research conducted by Tanti in 2011 in which physicians were interviewed, it was found that risk of medication errors was increasing with an increase in the number of errors encountered. Physicians suggested having electronic access to patients' medical records, using formularies available specifically if dealing with a medication which is used rarely and keeping doctors up to date on the new medicines available. Similarly in this study, pharmacists also suggested electronic access to patients' medical records.

Other suggestions mentioned in the study conducted by Tanti which were not mentioned by the pharmacists in this research were: double checking original prescriptions when writing repeats, decreasing workload on prescribing physicians, avoiding interruptions and receiving more information about medications from medical representatives of the pharmaceutical companies (Tanti, 2011).

In a study conducted by Curmi et al, 2017, having collected 222 prescription errors which were intercepted by pharmacists, errors of omission were the most common prescription errors found with: omission, error in dose and errors in strength or frequency included 73% of the errors found. In this study, similar errors were found, where error in dose and wrong quantity and frequency of medication combined, included 64% of the prescription errors found. In the study carried out by Curmi, the severity of the prescription errors was evaluated, and errors were assigned a medium to high level of severity. Drug-drug interactions found were given the highest level of severity. Throughout this research the level of harm was evaluated differently, by categorisation of five levels of harm, including: no harm, minor harm, moderate harm, serious harm and severe harm where moderate harm was assigned to 28% of the prescription errors and severe harm was assigned to 33% of prescription errors based on the perception of the pharmacists intercepting the prescription error.

4.2 Evaluation of Risk

Risk evaluation and risk management are of importance in healthcare to discover the ramifications which may impact patient safety and the HCPs who are caring for the patient (Pascarella et al., 2021). Healthcare has become more complex, resulting in an increase in medication errors, where methods to reduce the risk associated with these

errors are necessary. Detecting the risk of the errors and managing the errors through professional education of HCPs are crucial for risk minimisation (Cagliano et al, 2011; Theuma et al, 2022).

Evaluating the risk associated with prescribing errors encountered in community is valuable for determining whether the framework proposed would be of good purpose. Those individuals it directly impacts include prescribing physicians, the pharmacist encountering or missing the error and the patient. This may improve the level of acceptability of the framework.

The risk matrix method as used in this research is a valuable process used to unveil which risks are more dangerous than others, which require to be tackled first and help reduce the risk from potentially occurring (Pascarella et al, 2021). Throughout this study, the objective of implementation of the framework for prescribing was addressed through a risk-based approach to implement the framework. Using the 2-Dimensional risk matrix, the risk was quantified by considering the probability of consequences occurring and the severity of the consequences if the prescription error were to occur. Using the Risk Priority Number (RPN) the risk was quantified, presenting a scientific approach and reducing differences in the opinions of the HCPs, resulting in decreased variations. In risk management, as mentioned in Sarma's research in 2017, including detectability as another criteria in risk management ensures identification of possible failures early enough to prevent negatively effecting the event. Using detectability as another dimension together with probability and severity will increase its robustness, however, still involves its own limitations. Detectability may prove to be useless if the failure is not detected at the beginning of the process, as the harm may still be caused. Undertaking

training of employees, ensuring detectability and making the necessary changes may help overcome these challenges. Risk mitigation strategies including recognition of risks, as seen in this research where the pharmacists played a role in identifying the errors and the risk associated with the errors, is important in the recognition and avoiding of the potentially harmful error from occurring (Sarma, 2017: Theuma, 2022).

4.3 Strategies to Reduce Inappropriate Prescribing

Studies carried out also suggested that strategies to reduce inappropriate prescriptions include creating a double-checking system for dosings and frequencies especially for high-alert medications. Switching to e-prescribing will help with prescriptions with illegible handwriting. Other suggestions may be only writing one medication for each prescription, not using drug abbreviations and specifying the duration of therapy as well as stating what condition is being treated on the prescription (Tariq et al, 2020).

The risk minimisation strategies from the framework for safer prescribing will generate several implications for pharmacists. Lack of communication between HCPs was named in this study and developing a framework may help in overcoming the communication barriers between prescribers, health care providers and carers. This allows the integration of the pharmacist with the clinician, preventing inappropriate pharmacotherapy (Neuspiel & Taylor, 2013; Santos et al, 2019). In order to improve communication, the pharmacist should describe the situation and error in detail, offer resolutions such as substitute medications, repeat the prescription order, confirm that as HCPs both the pharmacist dispensing and the doctor who is prescribing have understood the change and all the amendments were documented. In a multidisciplinary team, open debate and dialogue should always be encouraged (Tariq et al, 2020).

Educational interventions for health care professionals and the formation of multidisciplinary teams as suggested by pharmacists may help in decreasing inappropriate prescribing. Ideas include having a multidisciplinary team where a pharmacist may conduct a medication review to decrease the possibilities of polypharmacy. The pharmacist may review what the doctors prescribe on the prescription to avoid and reduce prescription errors (Kroon et al, 2021). Prescribing training should be aimed at junior doctors as well as doctors who have been practicing for longer, as refresher training (Lavan et al, 2016).

Medication reconciliation is an important strategy in reducing inappropriate prescribing. This point was not mentioned by pharmacists during the pharmacist interviews, however documentation of previous, new and medication changes may help in decreasing prescribing errors (Lavan et al, 2016).

Frameworks including computer interventions such as computerised alerts may help in reducing inappropriate prescribing which are due to adverse drug reactions, drug-drug interactions, inappropriate dosing and double prescriptions (Kroon et al, 2021). Electronic prescribing (EP) systems are useful especially if they are linked to patient databases which can alert any possible drug interactions. In this study this alert was not mentioned by pharmacists as a suggestion to reduce inappropriate prescribing. Similarly, to Despott's study, EP and access to online patient records were suggested by the pharmacists interviewed (Despott, 2017). EP was not mentioned as a suggestion by pharmacists in this study possibly because as to date there are no systems in place for such alerts so this may not have crossed their minds as a suggestion.

In this study, when enquiring about strategies to reduce inappropriate prescribing 30% of the pharmacists suggested converting to electronic prescribing rather than handwritten prescriptions, due to the illegibility of prescriptions which result in possible dispensing errors. In a study conducted in Malta regarding medication errors due to student and doctors' handwriting, it was found that 422 prescribing errors were due to illegible handwriting resulting in errors such as error in dose or missing doses and wrong frequency of medications. Zhang's study concluded that if prescribing physicians do not abide by writing legibly, prescriptions should be converted electronically to avoid these preventable errors and improve patient safety (Zhang et al, 2020).

4.4 Development and Implementation of Framework

The framework developed in this study may help fill the current gap that is present between the HCPs writing up the prescriptions and the pharmacists who are dispensing (Farhan, 2016). The framework may help in supporting prescribers to develop and preserve a "holistic and patient-centred" approach to prescribing, bringing together different HCPs and creating a harmonised form of education about prescribing. The framework for safer prescribing will ensure that the medical practitioner is taking active steps to better the prescribing process and that the prescriber is acting according to the scientific evidence-based recommendations (Farhan, 2016).

During the focus group a point brought up by one of the panel members to improve the framework was to always include the patient's age, this was also stated in the research carried out by Tariq in 2023.

The developed framework also serves as an educational tool to pharmacists, other HCPs as well as the public. Understanding and having the knowledge of the risks which inappropriate prescribing brings about and how to prevent them from occurring will increase patient safety due to reduced prescribing or medication errors (Okpoko et al, 2018).

4.5 Impact of Study

The study has several implications as it identifies the types of errors that are more prevalent within a community pharmacy practice setting. The study may act as an incentive to improve the awareness associated with the dangers of prescribing inappropriately and shortcomings of healthcare given to patients resulting in decreased patient safety. The implementation of the framework created during the research, given that it is used by both prescribing physicians and pharmacists, may help in the patient's treatment process from the diagnosis phase to the dispensing stage as well as in patient follow-up care. Changing and enhancing the prescribing process may be a driving force for seamless patient care.

This study may also help improve pharmacist accessibility by allowing the pharmacist to perform a clinical check, based on the same steps which are used by the prescribing clinician in their own prescribing process (Cousins et al, 2019). Allowing pharmacists to presume a more active role in patient care would result in an improved quality of prescriptions (Santos et al, 2019). Pharmacists, especially those working in community, are considered to be one of the most accessible and readily available to patients (Theuma, 2022). Pharmacists play a role in identifying and detecting a possible error before it reaches the patient (Lavan et al, 2016). The proposed framework may help pharmacists

review prescriptions and correct any possible problems. Since pharmacists can help through their knowledge of medicines, the risk minimisation strategies developed may help pharmacists realise that a patient cannot tolerate certain medications and can then suggest the prescribing of alternative modes of treatment (Hospital Case Management, 2014; Kroon et al, 2021). Introducing pharmacist prescribing can reduce dispensing and prescribing errors as described by Aquilina in 2018. Pharmacist prescribing may also help in enhancing patient adherence, reducing communication errors and improving patient safety and care (Attard Pizzuto et al, 2019).

The role of pharmacists is constantly evolving despite the previous idea of pharmacists having a role "behind the glass" simply for dispensing medications. On the contrary pharmacists safeguard patients' safety through checking the appropriate prescribing and dispensing of medicines and can nowadays be observed as important professionals in a multi-disciplinary team, when dealing with complicated patient requirements. If pharmacists were to make use of this framework as a guideline for patient care, it may help in addressing safety concerns such as medication appropriateness, medication access and adherence and decreased risk of hospital readmissions due to medication errors.[11]

This study may impact HCPs including prescribing physicians and pharmacists due to an increased need for training to complement the new prescribing duties which are recommended in the framework. Training both professionals together may help in allowing them to show more reliability on each other and collaborate as a team to optimise therapeutic options for patients considering patient allergies, contraindications, drug-drug

[11] Dopp AL, Hall KK, Fitall E. Pharmacist role in patient safety [Internet]. US. Patient Safety Network; 2020 [cited 2023 Jul 30]. Available from: https://psnet.ahrq.gov/perspective/pharmacist-role-patient-safety#:~:text=Ensuring%20the%20safe%20prescribing%20and,the%20medication%20safely%20and%20effectively.

interactions and pharmacotherapeutic needs of patients. Allowing HCPs to collaborate may result in a more effective and safe prescribing process.

The study shows an exclusive perception on patient safety mainly from a pharmacist perspective from the beginning to the end of the research, with a smaller inclusion of the perspective of prescribing physicians during the focus group. This study may also help as an addition to literature that already exists regarding inappropriate prescribing, embellishing the current knowledge on the aspect of patient care.

4.6 Limitations of Study

Using open-ended interview questions has several implications, however sine the questions are open ended, they may also result in misinterpretation of the comments and deviation from the main context of the questions. The choice of the pharmacists was based on those working in the seven community pharmacies where the observational study was carried out, and this may present an element of bias. Despite the pharmacies chosen were from different statistical districts and pharmacy areas in Malta, they were chosen by convenience sampling rather than by random sampling. The pharmacies chosen did not take into account pharmacies in Gozo, as they were all pharmacies based in Malta.

A limitation of the study includes a small sample size, in terms of pharmacists and HCPs who participated in the focus group, as well as the number of prescriptions collected from each pharmacy.

A possible limitation was lack of patient data taken for each prescription. With certain demographics, the risk associated with each prescription error may have been evaluated further.

The fact that all pharmacists taking part in the focus group were all female and not male may have also been a limitation due to a biased female opinion. This may have been counteracted by the prescribing doctors taking part in the focus group which included four males and two females.

Another limitation in this research was related to the time frame as an issue. Given that this study was undertaken as a part of a master's degree, with a pre-defined time frame, time to recruit pharmacists for the interviews in the first part of the research and time to recruit HCPs for the second part of the research was limited. The implementation of prescriptions was in-part during the COVID-19 period, where a lot of prescriptions were not being issued, to avoid contact which patients. This made the finding and implementation of prescriptions all the more difficult, taking into the account the limited time frame as previously mentioned. Had more time been available especially not during times of Covid-19, more HCPs including pharmacists for the interviews and HCPs for the focus group may have been recruited into to the study, allowing for better comparisons of the perceptions of pharmacists and HCPs regarding the risk associated with inappropriate prescribing and the proposed framework for improving the prescribing process.

4.7 Recommendations of Future Studies

The aims of the research were to evaluate healthcare professionals' opinions on inappropriate prescribing based on prescription errors found within community. Suggestions to reduce inappropriate prescribing included implementation of electronic prescribing and improving pharmacist accessibility. Delving deeper into research regarding improving pharmacist accessibility by integrating the pharmacists' role in a multidisciplinary team and improving communication between HCPs. This integration may help improve the prescribing process and result in safer prescribing. Once the prescribing framework is implemented, the quantity and risk of new prescribing errors encountered may be re-evaluated to observe what errors are encountered despite the use of the proposed framework. This would allow a comparison of the similarities and differences encountered during this study versus a replicate of this study having used the proposed framework. The concept of further research in improving pharmacist accessibility may eventually lead to the possibility of pharmacist prescribing.

Further research regarding inappropriate prescribing in a hospital setting rather than in community, may help to evaluate the risks associated with prescribing errors and expand the need for a framework to improve prescribing in the public sector too, apart from the private sector.

4.8 Conclusion

This research portrayed an approach to improving the prescribing process adopted in Malta. A framework for safer prescribing was developed by evaluating the risk of inappropriate prescribing and putting forward ideas for risk reduction. This was done through a collaboration between pharmacists and physicians to ensure acceptability of the

framework. The RPN was used as guide to help in establishing the level of risk associated with the different prescribing errors identified. Due to the number of errors encountered and their associated risks, the pharmacist interviews and the focus group allowed the gathering of data with promising results. In the focus group, the feedback received regarding the need to reduce prescribing errors and need to implement an improved prescribing procedure were positive.

The framework developed for this study may help fill the current gap between HCPs, allowing pharmacists to presume a more active role in patient care. The framework will also serve as an educational tool for HCPs and as a step forward in improving pharmacist accessibility, since pharmacists can contribute within a multidisciplinary team to identify medication errors and provide action to improve patient safety.

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List of Publications and abstracts

Galea Salomone P, Serracino-Inglott A, Attard Pizzuto M. Department of Pharmacy, University of Malta, Msida, Malta. Inappropriate Prescribing in Community Pharmacy Practice. Poster session presented at: FIP World Congress; 2023 September 24-28; Brisbane, Australia

Abstract 1

Inappropriate Prescribing in Community Pharmacy Practice

Philippa Galea Salomone, Anthony Serracino-Inglott, Maresca Attard Pizzuto

Background:

Inappropriate prescribing involves the prescribing of drugs where this is no straightforward indication and where the risks outweigh the benefits. Risks from inappropriate use of medicines cause patient harm and adverse drug events. Identifying and studying the risks which come about from medication errors and from prescribing inappropriately are an important first step to preventing errors from occurring.

Purpose:

To evaluate the different types of medication errors and to assess the frequency and the nature of medication errors.

Method:

An observational study and pharmacist interviews were conducted in seven community pharmacies around Malta selected by convenience sampling. The pharmacies were visited during the same time period to allow for better comparison of results. A Medication Error

(MedErr) documentation sheet was developed and validated by five people: three pharmacists, one general practitioner and one lay person. Pharmacist interview questions were developed and validated by the same group of individuals who validated the MedErr documentation sheet. Private prescriptions presented to the pharmacist during the observational study carried out over 25 hours per week for approximately 18months, were analysed and categorised according to the MedErr sheet to facilitate their quantification. One-hours interviews with twenty community pharmacists recruited from the same pharmacies which the observation study was conducted, were undertaken to assess the different types of prescription errors that pharmacists encounter during their practice.

Results

From 140 prescriptions implemented within the MedErr documentation sheet, 282 medication errors were found. Error in dose, wrong quantity and frequency of medications and error in naming of drug were the most common prescription errors found, with 101, 79 and 61 errors respectively. Error in dose was further subdivided into different categories in the MedErr, of which 'strength or dose of preparation not stated', 'wrong unit in dose' and overdosing were the most common with 20, 17 and 15 errors found respectively.

From the 20 pharmacist interviews, pharmacists (n=17) confirmed that they have encountered prescription errors and the prescriber is contacted for clarification. Lack of communication between healthcare professionals was named by pharmacists (n=18) as one of the main reasons behind prescription errors. Pharmacists (n=19) believed that improved pharmacist accessibility to patient records and to the prescribing process will result in less prescription errors. Suggestions to reduce inappropriate prescribing included

access to online patient records (n=6), e-prescribing (n=6) and improved communication between healthcare professionals (n=5).

Conclusion:

Pharmacists play a role in identifying prescription errors and are aware that lack of communication between healthcare professionals increases inappropriate prescribing. Evaluating prescriptions allows for the identification of existing or potential problems, and enable interventions to be implemented, promoting the appropriateness of prescriptions and clinical drug usage.

Topic area: Community Pharmacy

Galea Salomone P, Serracino-Inglott A, Attard Pizzuto M. Department of Pharmacy, University of Malta, Msida, Malta. Risk-based Approach to Inappropriate Prescribing. Poster session presented at: FIP World Congress; 2023 September 24-28; Brisbane, Australia

Abstract 2

Risk-based Approach to Inappropriate Prescribing

Philippa Galea Salomone, Anthony Serracino-Inglott, Maresca Attard Pizzuto,

Background:

The use of medications is an integral part of healthcare and if used inappropriately may lead to situations where the risks outweigh the benefits. Appropriate prescribing may be assessed through patient outcomes and assessing treatment benefits versus risks. Medical errors result in consequences where patients suffer increased morbidity and mortality. Assessing the risk associated with inappropriate prescribing is important to help assure patients of appropriate treatment.

Purpose:

To evaluate and quantify the risks of medication errors risk matrices.

Method:

A Medication Error (MedErr) documentation sheet was developed and validated by five people. Private prescriptions presented to the pharmacist during observational studies carried out were analysed and implemented within the MedErr sheet and categorised to facilitate their quantification. Ten cases, based on the level of the researcher's perceived

risk, were presented to six pharmacists and six general practitioners. A 5x5 risk matrix, comprising of the severity of consequences and probability of the risk occurring was filled in by the focus group and a risk priority number (RPN), which is the product of severity and probability, was obtained.

Results

Twelve members participated in the focus group. From the 10 medication errors presented to the focus group, 5 of the errors were considered to be of high risk by 5 or more of the participating members. The risk matrix represents severity and probability which are rated on a 5-point Likert scale, with a RPN of 1-5 denoting a low-risk score, 6-15 a medium-risk score and 16-25 a high-risk score. One of the examples presented was an error in dose and naming of drug which read: flupentixol 0.5mg stat for seven days where the prescription should have read fluconazole 150mg stat. This was deemed as a high-risk error by six of the healthcare professionals. Another example presented was a drug-drug interaction which read: ranolazine 500mg and clarithromycin modified release once daily for 7 days, which are contraindicated when used simultaneously. This error was deemed as high-risk by 5 of the healthcare professionals who participated in the focus group.

Conclusion:

Pharmacists can help through their knowledge of medicines to identify medication errors and associated risks and can contribute within a multidisciplinary team to provide mitigation strategies to improve patient safety.

Topic area: Community Pharmacy

Appendices

Appendix 1: Medication Error Documentation Sheet (MedErr)

Prescription Number: ______

Potential Prescription Errors:

- O Error in Dose
  - O Over- Dosing
  - O Sub- optimal dosing
  - O Strength or Dose of preparation not stated
  - O Wrong unit in dose
  - O Therapeutic Duplication
  - O Error in dose by a multiple of 10
  - O Error in strength/ concentration in syrups
- O Wrong Quantity and frequency of medication
- O Error in Prescription of Controlled Drugs
  - O Lack of patient details (Name, ID number and Address)
  - O Incorrect use of control card
  - O Lack of 'urgent' description if prescription is urgent
  - O A supply of more than 7 days is prescribed (if prescription is urgent)
- O Error in Naming of drug
  - O Incomplete Description
  - O Lack of clarity due to prescription handwriting

    - O Confusion of drug due to similar names
    - O Wrong Drug Prescribed
    - O Controlled Drugs' regulations not followed (such as DDAs)
- O Wrong Formulation Prescribed
- O Limited List – Preparation is not available in Malta
- O Drug- Drug Interactions
- O Adverse Drug Reactions/ Side effects
- O Improper Drug Selection

Potential Seriousness of Prescription Error:

- Type 1: No harm
- Type 2: Minor harm
- Type 3: Moderate harm
- Type 4: Serious harm
- Type 5: Severe harm

Description of harm levels

- Type 1: The patient is in no danger due to the error and will not require monitoring or further patient care.
- Type 2: The patient was in temporary and non- life-threatening harm. There may or may not be the need for further patient care and monitoring.

- Type 3: The patient was in temporary and non- life-threatening harm; however, the patient will require monitoring through tests such as blood tests to assess patient's condition.
- Type 4: The patient will experience significant, non-life-threatening harm, which will require patient care and possibly the administration of an antidote.
- Type 5: The patient is in potential life- threatening temporary or possibly permanent harm. An antidote or intensive care may be required.

Name of Pharmacist: Date:

______________________ ____________________

Appendix 2: Pharmacist Interview Questions

Section 1: Type, frequency and occurrences of prescription errors

1. Have you ever encountered a prescription error at your community pharmacy?
2. Do you rotate around different pharmacies?
    a. If yes, do you observe/ encounter different errors in different pharmacies and in the different districts?
3. What would your initial response to discovering a prescription error be?
4. Would you respond differently when finding prescription errors from a private prescription as opposed to a POYC one?
5. Which is the most common type of prescription error that you observe in the community setting?
6. Where do you find more prescription errors, in private prescriptions or from the POYC scheme?
7. Do prescription errors occur more with a specific class of drugs?
    a. If yes: Which class?
8. How frequently do you encounter prescription errors?
9. Do you think that there are errors which are more obvious to find over others?
    a. If yes, which prescription error would this be?

Section 2: Factors contributing to Prescription errors

10. Do you think that prescription errors occur due to a lack of communication between the health care professionals involved?
11. Do you have any suggestions of how one can reduce these errors from occurring?
12. Do you think that improved pharmacist's accessibility will result in less prescription errors?
13. Would electronic prescribing decrease prescription errors and which errors?

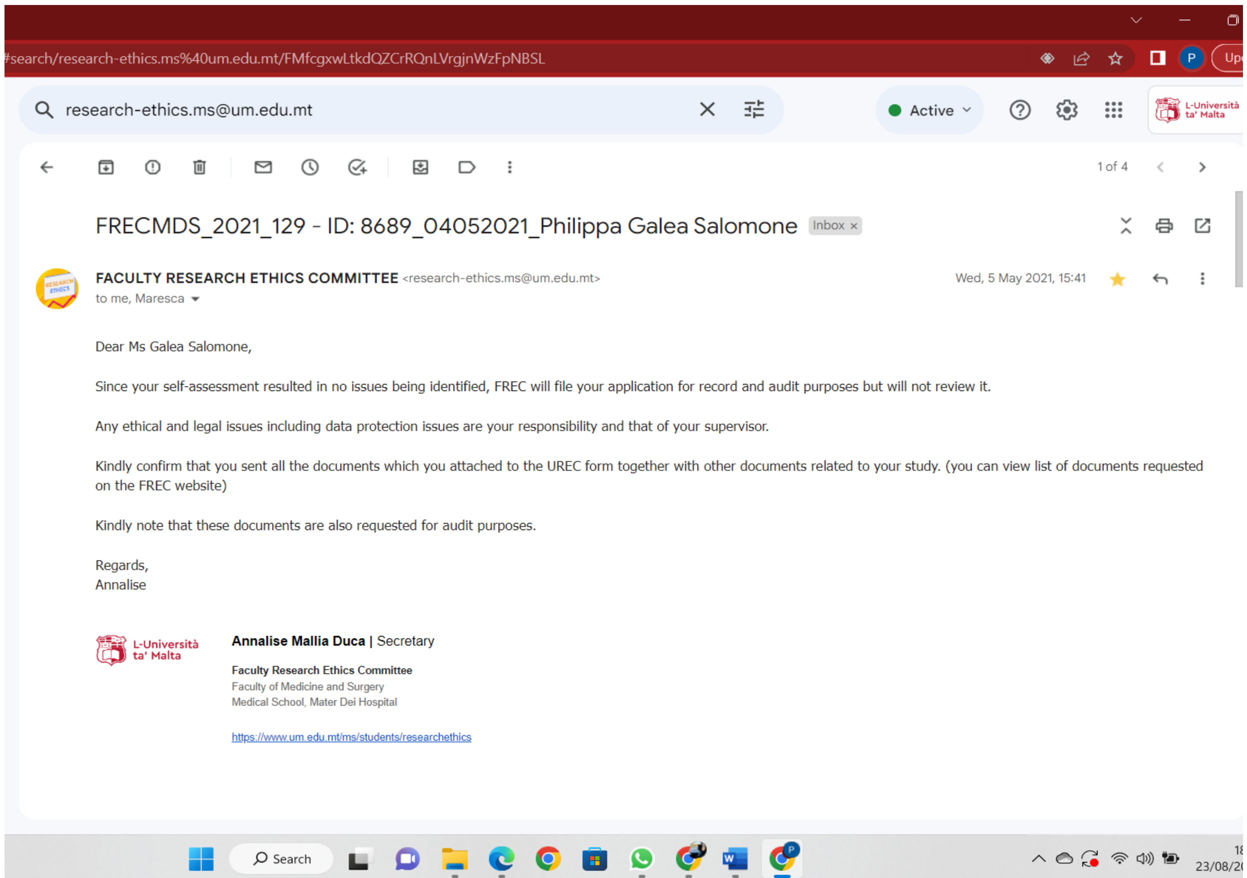
Section 3: Impact of COVID- 19

14. Given the current circumstances of COVID- 19, have you observed more, less or the same amount of errors? Can you explain why?
15. Has COVID- 19 changed the way you handled prescriptions and any errors found?
    a. If yes, how were they handled differently?

Section 4: Potential for Pharmacist Prescribing

16. Do you think that pharmacist prescribing would decrease errors?

Appendix 3: Ethics Approval



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research-ethics.ms@um.edu.mt

FRECMDS_2021_129 - ID: 8689_04052021_Philippa Galea Salomone Inbox

FACULTY RESEARCH ETHICS COMMITTEE <research-ethics.ms@um.edu.mt> Wed, 5 May 2021, 15:41
to me, Maresca

Dear Ms Galea Salomone,

Since your self-assessment resulted in no issues being identified, FREC will file your application for record and audit purposes but will not review it.

Any ethical and legal issues including data protection issues are your responsibility and that of your supervisor.

Kindly confirm that you sent all the documents which you attached to the UREC form together with other documents related to your study. (you can view list of documents requested on the FREC website)

Kindly note that these documents are also requested for audit purposes.

Regards,
Annalise

L-Università ta' Malta

Annalise Mallia Duca | Secretary

Faculty Research Ethics Committee
Faculty of Medicine and Surgery
Medical School, Mater Dei Hospital

https://www.um.edu.mt/ms/students/researchethics

Appendix 4: Prescription Errors Presented during Focus Group

DEVELOPING A FRAMEWORK FOR INAPPROPRIATE PRESCRIBING IN A COMMUNITY PHARMACY SETTING: A RISK-BASED APPROACH

Philippa Galea Salomone

1

RISK MATRIX

- You are all provided with blank risk matrices. For each Error please fill in your opinion, as per below:

		Severity of Consequences				
		1	2	3	4	5
Probability of consequences occurring	1					
	2					
	3					
	4					
	5					

Risk Matrix adapted from: Emovon I, Okwu MO. Risk assessment tools for categorisation of failure modes of Marine Diesel Engine: A comparative study. Journal of Advanced Engineering and Computation. 2018;2(1):30. DOI: 10.4018/ijrcm.2012100104

2

RISK CATEGORISATION

- The risks are categorised:

Risk Rating Score	Colour Code	Level of Risk
1-5	Green	Low
6-15	Yellow	Medium
16-25	Red	High

Risk categorisation adapted from: Raydugin Y. Consistent application of risk management for selection of engineering design options in mega-projects. International Journal of Risk and Contingency Management. 2012;1(4):44–55. DOI: 10.4018/ijrcm.2012100104

3

PRESCRIPTION ERROR WRONG DRUG PRESCRIBED 1

- Patient: 30 year old female, presenting a prescription for:
- Upon questioning she explained that she recurrently suffers from fungal infections.
- The prescribing physician was contacted.
- Prescription should read: Fluconazole 150mg Stat.

Prescription

- Fluanxol 0.5mg Stat
- Daktarin cream 1-0-1 x 7 days

4

PRESCRIPTION ERROR WRONG DRUG PRESCRIBED 2

- Patient: an elderly female patient presented a prescription for:
- Upon questioning the patient, she explained that she was suffering from lack of sleep. The prescribing physician was contacted. Prescription should read:
- Amitriptyline 10mg - 1 daily x 3months

Prescription

- Augmentin 1g – 1 daily x 3months

5

PRESCRIPTION ERROR ERROR IN DOSE 1

- Patient: 6-year-old boy; mother presented a prescription for:
- Upon discussing with the GP present at the Pharmacy; it was concluded that prescription should read:
- Prednidelt® 30mg

Prescription

- Prednisolone Supp 2g
  - 1 for 2 days
  - ½ for 4 days

6

PRESCRIPTION ERROR
ERROR IN DOSE 2

- Patient: 3-year-old girl; mother presented a prescription for:
- In Malta the available Co-amoxiclav is 400/ 57mg per 5mL.
- Recommended dose: 25 mg/3.6 mg/kg/day (0.4 ml of suspension/kg/day) to 45 mg/6.4 mg/kg/day (0.6 ml of suspension/kg/day), given in two divided doses.
- Higher dose – up to 70 mg/10 mg/kg/day (1.0 ml of suspension/kg/day) given in two divided doses.

Prescription

- Co-amoxiclav syrup (250/62) 3.7mL once daily.

7

PRESCRIPTION ERROR
THERAPEUTIC DUPLICATION

- Patient: 44-year-old male presented a prescription for:
- Upon contacting the prescribing physician, the doctor explained that the patient had a severe chest infection and requires more than one antibiotic. Physician wasn't aware that they are in the same class.
- Patient opted to return to physician and get a 2nd opinion.

Prescription

- Cefixime 400mg PO,
- Ceftriazone 250/500mg I daily,
- Azithromycin 1g one daily

8

PRESCRIPTION ERROR
THERAPEUTIC DUPLICATION & OVER- DOSING

Patient: 55-year-old male patient presented a prescription for:

The prescribing physician was contacted and informed that these medications shouldn't be prescribed simultaneously. Physician then confirmed with us which is stronger. Catafast® was chosen to be taken by the patient.

Prescription

- Catafast 50mg 1-1-1 x 7 days
- Dicloduo Combi 1-0-1 x10 days

9

PRESCRIPTION ERROR
DRUG- DRUG INTERACTION

- Patient: 66-year-old female presented a prescription for:
- Clarithromycin will increase the level or effect of ranolazine by affecting hepatic/intestinal enzyme CYP3A4 metabolism.
- Clarithromycin and ranolazine both increase QTc interval.
- The use of these drugs together is classified as contraindicated.

Prescription

- Ranexa 500mg
- Klacid XL 1 daily x 7 days

10

PRESCRIPTION ERROR
LACK OF INFORMATION

- Patient: 50-year-old female presented a prescription for:
- The type of drops (whether Otic or ophthalmic) – Not Stated
- Length of treatment and dosage regimen – Not stated

Prescription

- Ciloxan Drops

11

PRESCRIPTION ERROR
LACK OF INFORMATION

- Patient: 48- year-old male presented a prescription for:
- Dosage regimen and Length of treatment Not written on Prescription.
- The prescribing physician was contacted. Prescription should read:
- 2-0-2 x 5days.
- Possible advice: The patient should not take any alcohol due to the risk of side effects such as redness of the face, feeling hot, vomiting and increased heart rate, which is known as disulfiram-like reaction.

Prescription

- Rodogyl

12

PRESCRIPTION ERROR
WRONG QUANTITY OR FREQUENCY OF MEDICATION

- Patient: 16-year-old female presented a prescription for:
- Upon contacting the prescribing physician, the doctor meant to have prescribed:
  - Augmentin 1g: 1-0-1 x 7days

Prescription

- Augmentin 1g – 1-1-1 x 7days

13

Appendix 5: Framework to Improve Prescribing Process

Prescribing Process Enhancement Framework: A Comprehensive Strategy for Reducing Prescription Errors and Enhancing Patient Safety.

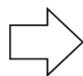
1 - Diagnose the Patient
- Presenting symptoms
- Examination & investigations

2 - Determine treatment Goals
- Prevention, symptom relieving, prognostic benefit.

3 - Patient interview and Medication Review
- Family history
- Contraindications
- Allergies or Intolerences
- Systematic assessment of pharmacotherapeutic needs
- Comprehensive Medication History

4 - Determine Therapeutic Options
- Clinical pharmacotherapeutic options
- Use of BNF & Malta Medicines Authority*
- Check for possible Drug-Drug interactions*

5 - Write up of Prescription
- Patient Name, Age, Drug Name, Dose, Dosage regimen, Treatment Duration, Route and Date.
- Consider using Electronic Prescribing



When Prescribing DDA's
- Include Patient Details, use of Urgent or Control card
- Regulations of DDA

6 - Patient Counselling
- Ensure Patient is clear on treatment

7 - Follow-up with patient
- Monitor efficacy and safety of therapy
- Enquire about side-effects or issues encountered by patient

Malta Medicines Authority*
https://medicinesauthority.gov.mt/medicinesdatabase

Drug-Drug interactions*
https://healthlibrary.brighamandwomens.org/Library/DrugReference/DrugInteraction/

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