



A Review on the Medication-Related Errors in the Community Pharmacy and its Effect on Patient Safety

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Abstract

The pharmacy professionals are the intermediary within the healthcare system that handles the intervention of medication-related errors. Patient safety is significantly impacted by medication errors. Medication errors are revealed and safe practices are promoted through effective disclosures and active treatment of errors. This article review tackled the identification and intervention of MREs—self-medication, illegible prescriptions, communication issues, non-adherence, labeling errors, drug interactions, drug duplication, under and overdosing, polypharmacy, incorrect dosing instruction, incorrect dose formulation, improper drug selection, etc.—within the community pharmacy setting, utilizing online databases for literature to further expound on the MREs listed, not just in a local setting but also to the various locations around the globe who are still under the pressure of MREs. This review's overview of systematic studies demonstrates that pharmaceutical errors or medication-related errors (MRE) do occur occasionally. Error prevention needs to be systematically evaluated for safety. Pharmacy practitioners and owners need to do more than just try to steer clear of errors. To increase safety, pharmacists at all levels must endeavor to learn from past errors. One could argue that an error that has already been made at a pharmacy is the most serious one. Hence, to minimize MREs, early identification and proper intervention are a must.

Introduction

Medication errors are one of the most common medical problems, causing harm to at least 1.5 million people to suffer each year (AMCP, 2019). According to Tariq *et al.* (2022), medication-related errors cause injury or death to about 7,000 to 9,000 patients in the United States each year. A study conducted by Gandhi *et al.* (2005) disclosed that issues with prescribing, communicating, and labeling frequently cause such errors, which result in unwanted adverse drug events and, in some cases, life-threatening injuries. Treatment of drug-related injuries in hospitals alone costs at least \$3.5 billion per year, not including lost wages, productivity, and healthcare costs (AMCP, 2019). In addition to these financial costs, patients suffer psychological and physical pain, leading to decreased patient satisfaction and a growing distrust in the healthcare system (Wittich *et al.*, 2014).

According to a national observational study of 50 community pharmacies in six cities across the United States on dispensing accuracy and safety found that approximately 51.5 million dispensing errors occur among the 3 billion prescriptions dispensed annually, or four errors daily in a typical pharmacy filling 250 prescriptions per day (Flynn *et al.*, 2003). Furthermore, a more recent meta-analysis of this and eight other studies estimated a 1.5% error rate in community pharmacies (Campbell *et al.*, 2018). Although there have only been a few studies on medication-related errors in community pharmacies in the Philippines, the most common errors discovered were prescribing errors (Pasco *et al.*, 2017).

Pharmacists, as drug experts, ensure that patients receive the appropriate medication and dosing and the necessary guidance to use the drugs safely and effectively (APhA, 2019). As they are at the forefront of reducing medication errors and, as an outcome, increasing patient safety (Lopes *et al.*, 2015), it is crucial that they learn and comprehend the types, causes, and frequency of such errors, both locally and globally, as well as the appropriate measures taken to reduce them (Cheung *et al.*, 2009). In this study, the researchers will review several different articles regarding medication-related errors in community pharmacies worldwide to understand the cause and provide appropriate interventions to prevent the increase of such errors, compromising the health and safety of patients.

Methodology

In this article review about medication-related errors in community pharmacies and their effect on patient safety, the researchers searched, collected, and analyzed a wide range of articles related to the topic. The review was conducted using various journal databases, including PubMed, Journal of Pharmaceutical Health Services Research, International Journal for Quality in Health Care, ScienceDirect, Google Scholar, National Library of Medicine, etc. From these databases, articles are reviewed and discussed. The search terms included the following: medication-related errors; drug-related errors; pharmaceutical care issues; pharmacy; community pharmacy; patient safety; patient outcomes; and others. The researchers reviewed studies conducted from different locations globally with no restrictions on the year of publication. The tables present the findings of the articles reviewed. The first table

shows the most common medication-related errors found in each study, while the second table shows the implications of different errors on patient safety. The articles are discussed in detail in the paragraphs that follow.

Result and Discussion:

Table 1.

Authors	Type of Medication-related Error	Findings
Takaki, H., Kaneko, E., Sonoda, M., Yamano, T., & Jeiri, I.	Dosage and administration errors, noncompliance, untreated indications, and adverse drug reactions	There were 5,073 drug-related problems identified from 95,023 prescriptions, with inappropriate dosage and administration being the most common, followed by non-adherence and incorrect prescription periods.
Teinilä, T., Kaunisvesi, K., & Airaksinen, M.	Medication error related to polypharmacy – drug to drug interaction	The most common potential causes of medication errors were associated with physicians (39%), followed by organizational (23%), and patient (19%) causes. Another common cause of medication errors was doctors' lack of knowledge about their patients' medications. Respondents, on the other hand, cited workload as the primary cause of such errors.
Hämmerlein, A., Grieses, N., & Schulz, M.	Drug to drug interaction, incomplete or unreadable prescription, drug that is not on the market, patient does not know the dose, wrong data on prescription, inadequate patient knowledge about the proper application or administration of a drug, followed by inappropriate dosage prescribed, delivery problems, the wrong dosage form prescribed, and the wrong dosage prescribed.	The most common cited DRP was drug-drug interactions. The most frequent drugs associated with DRP were nonsteroidal anti-inflammatory drugs (NSAIDs) and cardiovascular drugs. DRPs were identified as having three levels of origin: prescription, patient, and delivery. These categories were further sorted according to level of origin for greater comprehensibility and structure. Adverse drug reactions accounted for 2.1% of DRPs at the prescription level, with drug-drug interactions being the most significant subgroup. Meanwhile, most DRPs on the patient level were related to the patient's understanding and how the medication is being used. The most prevalent DRPs at the delivery level are drug market unavailability and supply constraints.
Obreli-Neto, P. R., Nobili, A., de Oliveira Baldoni, A., Guidoni, C. M., de Lyra Júnior, D. P., Duzanski, J., Tettamanti, M., Cruciol-Souza, J. M., Gaeti, W. P., & Cuman, R. K. N.	Adverse drug reactions (ADRs) caused by drug to drug interactions in elderly outpatients	Other than Acetylsalicylic acid, Digoxin, and Spironolactone, Warfarin is the most frequently implicated drug in DDI-related ADRs in elderly outpatients. The research uncovered adverse drug reactions including gastrointestinal bleeding, hyperkalemia, and myopathy. In addition, 37% of the DDI-related ADRs identified in the study were severe enough to necessitate hospitalization.
Gandhi, T. K., Weingart, S., Seger, A., Borus, J., Burdick, E., Poon, E., Leape, L., & Bates, D.	The most common errors identified are those related to dose, frequency, and route.	A total of 1879 prescriptions for a total of 1202 patients were reviewed. 542 of these (29%) had potential prescribing errors or rule violations. A prescribing error was discovered in 143 of the 1879 prescriptions reviewed. There were 62 (43%) potential ADEs, 3 avoidable ADEs, and 78 (55%) innocuous errors. The most types of errors were incorrect or missing doses, followed by frequency. Aside from that, rule violations accounted for 203 additional events, with the most commonly used type being missing route (i.e., failure to write "po").
Pervanas, H., Revel, N., & Alotaibi, A.	Incorrect medications, incorrect doses, and incorrect directions.	The study identified that 79% of prescription errors occurred when a new prescription was processed, and 17% involved refilling a prescription. In terms of the different dispensing errors, 40% involved the wrong medication, and 31% involved the wrong dose. The following most frequent error

		type among the remaining designated categories was incorrect directions (12%), followed by erroneous labels and inaccurate refill.
Gogazeh, E.	Illegible prescriptions or poorly handwritten medical orders and self-medication, leading to misuse or drug abuse.	Illegible physician handwriting constituted the most common reported significant correlate with dispensing errors (3.78 out of 5). Another major medical issue is self-medication, which is common among Jordanians. The study discovered that financial constraints were the primary reason for patients to self-medicate. As a result, there is an increase in drug misuse and inappropriate dispensing, with analgesics and antipyretics being the most commonly dispensed OTC medications.
Szeinbach, S., Seoane-Vazquez, E., Parekh, A., & Herderick, M.	Inconsistencies in communication and disruptions in prescription analysis, pharmaceuticals efficiency and physical mobility are impacted by practice setting and socio-technological factors like services, such as drive-through pickup windows and automated dispensing management system.	Pharmacists presumed that pharmacy design was a substantial ($P < 0.05$) contributing factor to dispensing errors, communication errors, and efficiency issues, and that similar concerns were observed for all aspects relevant to drive-through window pick-up services. Automated dispensing systems were interpreted to be less likely to cause to dispensing errors, communication errors, incompetence issues, and extra physical movement ($P < 0.05$). The apparent percentage error in dispensing was 0.057%, and the number of errors was substantially ($P < 0.001$) correlated with prescription volume. Cognitive errors were liable for 80% of dispensing errors.
Perry, J., Chen, A., Kariyawasam, V., Collins, G., Choong, C., Teh, W. L., Mitrev, N., Kohler, F., & Leong, R. W. L.	Noncompliance with the medication	There were 98 Crohn's disease patients and 75 ulcerative colitis patients among 173 inflammatory bowel disease or IBD patients. Twenty-four percent, or 42 patients, of which, did not take their IBD maintenance medications as prescribed. Thus, the study discovered that noncompliance with medication was significantly associated with worsening disability.
de Las Mercedes Martínez Sánchez, A.	Prescription errors, prescribing errors, and dispensing errors. Illegible handwriting, the wrong medicine, strength, quantity, or dosage, missing information about the prescriber, no route specified, and problems with subsidies are all examples of prescription errors. Dispensing errors are drug duplication, wrong drug dispensed, and drug to drug interaction.	The study included 42,000 prescriptions, which resulted in 2,117 medication errors, 1,127 prescribing errors, 216 dispensing errors, and 774 near-misses. Medication illegibility (26.2%), medication, strength, quantity, or dosage non-existence (6.3%), lack of prescriber information (4.8%), no route specified (2.9%), problems with subsidies (3.4%), medicine no longer in stock (1.4%), the patient wanted to change the prescription (3.8%), and medicine not immediately in stock (4.1%) were the most frequent type of medical error. Meanwhile, prescriptions with inadequately specified dosages or frequency (17.8%) appeared to be the majority common type of dispensing error or close encounter, followed by inaccurate or missing patient identification (12.6%).
Ashcroft, D., Quinlan, P., & Blekinsopp, A.	Labelling errors, selection errors, and bagging errors. Labelling errors include: incorrect drug/form, strength, and directions, erroneous patient name, incorrect quantity on labels and wrong label on container.	During the 4-week study period, 330 error incidents were recorded on 310 prescriptions out of 125,395 prescribed items. The incident rate was 26.32 per 10,000 items dispensed. Near misses accounted for 280 of the incidents (84.8%), while dispensing errors accounted for the remaining 50 (15.2%). Selection errors (199, 60.3%) were considered the most common type of incident, next on the list is labeling errors (109, 33.0%) and bagging errors (22, 6.6%). The study found out that the pharmacist was significantly more likely

	<p>Selection errors involve: incorrect drug, drug form and strength selected, and counted quantity.</p> <p>Bagging errors include: incorrect name and address written on the bag, excluded item, and extra item.</p>	to make dispensing errors, whereas dispensers and medicines counter assistants were more likely to make near-misses.
Jani, Y. H., Ghaleb, M. A., Marks, S., Cope, J., Barber, N., & Wong, I. C. K.	Drug duplication and omissions, incorrect route of administration, frequency, underdosing, and overdosing.	In the pediatric renal outpatient clinic, the recorded prescribing error percentage rate for handwritten items was reported to be 77.4%, while electronic prescriptions had a rate of 4.8%.
Assiri, G. A., Shebl, N. A., Mahmoud, M. A., Aloudah, N., Grant, E., Aljadhey, H., & Sheikh, A.	Errors in prescribing, inappropriate prescribing, monitoring errors, polypharmacy, increased patient age, the number of comorbidities, the use of anticoagulants, instances in which multiple physicians were involved in patient care.	Forty-six studies reported prescription errors with prevalence estimates from 2% to 94% and the most frequently reported type of error was inappropriate prescribing. On the other hand, Seventy-three percent of patients had incomplete therapeutic/safety laboratory test monitoring, according to a single study on the prevalence of monitoring errors. The estimated incidence of drug-drug interaction-related adverse drug events (ADEs) was reported to be 7%, while the incidence of preventable ADEs was 0.4%. Several patient, healthcare professional, and medication-related risk factors were identified, including the number of medications taken by the patient, increased patient age, numerous comorbidities, the use of anticoagulants, cases in which multiple physicians were involved in the patient's care, and care provided by family physicians/general practitioners.
Knudsen, P., Herborg, H., Mortensen, A. R., Knudsen, M., & Hellebek, A.	Prescribing errors	There are 976 prescription cases totaling 1,015 incidents were included in the study. These incidents included 234 near-misses spread across 229 cases, 209 dispensing errors across 203 cases, and 206 adverse drug events across 198 prospective cases. The most common type of error was prescription corrections, which were evenly distributed between clinical (51.3%) and administrative (48.7%) causes. Mistakes or deficiencies in dosage (37.4%), strength (19.2%), dispensing form (14.4%), and quantity (11.3%) accounted for the majority of clinical cause corrections.
Odukoya, O. K., Stone, J. A., & Chui, M. A.	Incorrect drug quantity, incorrect dosing instructions, incorrect treatment duration, and incorrect dose formulation.	During the 45-hour pharmacy observation, pharmacy staff discovered 75 e-prescription errors. The most prevalent e-prescribing errors were incorrect drug quantity, incorrect dosing instructions, incorrect therapy duration, and incorrect dosage formulation. Participants predicted that 5 out of 100 electronic prescriptions are inaccurate. Anti-infective, inhaler, ophthalmic, and topical agents were among the drug classes implicated in e-prescribing errors. Such errors could have a variety of negative effects, including a higher chance that patients would receive the incorrect prescription therapy, poor disease management for patients, more work for pharmacy staff, higher expenses for pharmacies and patients, and frustrated patients and staff. Other factors that contributed to errors would include technology confliction among pharmacy and clinic systems, technology design problems such as the utilization of auto-populate features and dropdown menus, as well as unintentionally entering incorrect information.

Simegn, W., Weldegerima, B. Seid, M., Zewdie, A., Wondimsiegn, D., Abyu, C., Kasahun, A. E., Seid, A. M., Sisay, G., & Yeshaw, Y.	Overall prescribing errors include drug selection, error of commission, and errors of omission.	The survey had 74 pharmacy professionals respond, with a 93.6% response rate. Medication errors were found in 75.1% of cases (95% CI 71.08-78.70). One of the most widespread of these mistakes was drug choice (82.4%), followed by errors of commission (79.7%) and errors of omission (78.4%). Prescription mistakes were most typically related with antibiotics (63.5%), analgesics (44.5%), and antipsychotics (39.5%).
Lima, S. I., Diniz, R. S., Egito, E.S., Azevedo, P. R., Oliveira, A. G., & Araujo, I. B.	Illegible items, one or more missing items, and lack of complete patient identification, dosing schedule and patient identification, using antimicrobials without prescription and guidance on its administration..	In the study, an estimated 29.3% of prescriptions contained unreadable items, 91.3% contained missing items, and 29.0% comprised both unreadable and missing items. The dosing timeline and patient information were the parts of prescriptions that were most frequently illegible, at 18.81% and 12.14%, respectively. In 90.53% of the prescriptions, the patient's identification was incomplete. Antimicrobials were reportedly utilized by 40.3% of users without a prescription, while 46.49% of users reported not receiving any drug administration instructions.
Ylä-Rautio, H., Siissalo, S., & Leikola, S.	Uncertain indication for the drug	There were 339 drug-related issues reported by 0.6% of over-the-counter clients at the 52 community pharmacies, with "uncertainty about the indication for the drug" accounting for 39.2% of all issues. High-risk over-the-counter medications were a significant contributor to the reported issues (26.3%), with non-steroidal anti-inflammatory drugs being the most common culprit in these cases (21.8%). Pharmacies made a total of 641 interventions to deal with drug-related problems. The large percentage of drug-related issues (87%) required the intervention of a pharmacist. In more than half of the problem cases, the pharmacy intervention served a preventative purpose.
Sell, R. & Schaefer, M.	Knowledge gaps about medication, medication non-adherence, and drug-drug interactions.	In 300 pharmacies, pharmacists reviewed medication for 1090 patients, 51.9% of whom were female and 62.0% of whom had medication plans. Polypharmacy, defined as the regular use of five or more drugs, was present in 1052 patients, with one-fifth of the medications available over-the-counter. Furthermore, nearly a third of the patients had knowledge gaps, with the proportion increasing steadily with age from under 65 to over 85 years. Men's knowledge gaps were greater than women's, and medication plans had no effect.
Tesfamariam, S., Anand, I. S., Kaleab, G., Berhane, S., Woldai, B., Habte, E., & Russom, M.	Lack of knowledge on medication use, medication non-adherence, inappropriate storage of drugs, self medication, and inappropriate dose.	With a response rate of 96.4%, 587 of the 609 participants finished the interview completely. Almost all respondents (93.7%) said they had used OTC drugs for self-medication at least once. Self-medication was performed once per month on average. The majority of those who had used self-medication, 450 (81.8%), engaged in risky behavior. Seventy-nine (14.4%) of the 550 people who had self-medicated admitted to taking more than the recommended dose at least once. Among the 550 people who self-medicated, 79 (14.4%) admitted to taking more medication than was instructed at least once. The 14 claimed they took more than the recommended dose unintentionally, while 65 of them took more medication than was advised in order to increase the medication's efficacy. As a result of using OTC

		medications, 6.9% of patients who self-medicated experienced drug-related problems.
Panda, A., Pradhan, S., Mohapatra, G., & Mohapatra, J.	Self-medication and inappropriate drug dosing	Self-medication was prevalent, at 18.72%. Among patients, 17.36% had DRPs. DRPs were more prevalent in the self-medication group (40.78%) than in the non-self-medication group (11.97%). DRP caused by improper medicine dose was discovered in 44.83% and 40.45% of subjects who self-medicate and who did not self-medicate, respectively (P 0.001). The probability of having a DRP was around five times higher in subjects who self-medicated.
Eickhoff, C., Hämmerlein, A., Griese, N., & Schulz, M.	Self-medication, inappropriate drug, drug abuse, incorrect dosage, and drug to drug interactions.	In the study, 109 community pharmacies documented a total of 12,567 interactions, with DRPs discovered in 17.6% of all cases. Pain, respiratory, gastrointestinal, and skin diseases made for more than 70 percent of all DRPs. Self-medication (29.7%), improper product sought (20.5%), too long intended period of drug use, including misuse (17.1%), and erroneous dosage (6.8%) accounted for over 75% of all DRPs identified. All patients with DRPs received adequate counseling. In addition, the most common treatments were referral to a physician (39.5%) and switching to a more appropriate medicine (28.1%).
Doucette, W. R., McDonough, R. P., Klepser, D., & McCarthy, R	Non-adherence, need additional therapy, wrong drug, unnecessary drug, adverse drug reaction, dose too low, and dose too high.	In the study, over the course of two years, the pharmacists found 886 drug-related problems for the 150 patients, involving 109 doctors. The majority of problems (34.9% [309/886]) were related with appropriate indication. While inappropriate adherence (25.9% [229/886]) was the most prevalent drug-related issue. Additionally, 60.7% (538/886) of the problems found had to do with the demand for extra therapy, unnecessary medication therapy, and improper adherence.
Apikoglu-Rabus, S., Yesilyaprak, G., & Izzettin, F. V.	<p>Drug selection</p> <ul style="list-style-type: none"> • Synergistic/preventive drug required and not given. <p>Dose selection</p> <ul style="list-style-type: none"> • Deterioration/improvement of disease state requiring dose adjustment. • Drug too low. • Pharmacokinetic requiring dose adjustment. <p>Treatment duration</p> <ul style="list-style-type: none"> • Duration of treatment is too long. <p>Drug use process</p> <ul style="list-style-type: none"> • Inappropriate timing of administration and/or dosing intervals. • Drug underused/under-administered (deliberately). • Drug overused/over-administered (deliberately). 	<p>In 44 patients with asthma, 59 DRPs were found, with 93% manifest and 7% potential. The majority of these issues (98%) were discovered by the pharmacist, while the remaining were discovered by the patient (one problem involving adverse effects). 96.6 percent of the problems were related to "treatment effectiveness" (not optimal drug treatment effect). The drug usage process and the patient were the primary causes of DRPs. Each issue may have up to three causes, and each issue may have more than one cause. A total of 134 causes were identified for 59 problems.</p> <p>For COPD patients, sixty drug-related issues were recognized, with 88% of the problems manifesting and 12% being potential. Similar to asthma patients, the majority of these issues were identified by pharmacists (95%) while the patient identified the remainder. Similarly, each problem could have more than one cause, and each problem could have up to three causes. A total of 128 causes for 60 problems were identified.</p>

	<ul style="list-style-type: none"> • Drug not taken/administered at all. • Patient unable to take drug/form as prescribed. <p>Patient</p> <ul style="list-style-type: none"> • Patient forgets to use/take drugs. • Other causes. 	
Goedken, A. M., Huang, S., McDonough, R. P., Deninger, M. J., & Doucette, W. R	Nonadherence, duplication, and drug-drug interactions are three of the most common problems in the pharmaceutical industry.	In 1566 patients, substance abuse issues were observed. Nonadherence accounted for the majority (63.2%) of medication-related issues. Second was therapeutic duplication (22.3%), followed by drug-drug interactions (6.3%).
Westerlund, T., Almarsdóttir, A. B., & Melander, A.	Education level of professional	On average, pharmacists discovered, There are approximately 2.5 more drug-related problems per 100 patients for prescriptions, and roughly 3.6 more for technicians. The problem identification rate was significantly influenced by previous participation in a drug-related problem study or activity as well as the size of the pharmacy.
Paulino, E. I., Bouvy, M. L., Gastelurrutia, M. A., Guerreiro, M., Buurma, H., & ESCP-SIR Rejkjavik Community Pharmacy Research Group	Wrong dosage, drug duplication, drug interactions and prescribing errors.	There were 108 issues (24.0%) with dose, drug duplication, drug reactions, and prescription errors. Patients reported practical issues 56 times (12.4%).
Becker, M. L., Caspers, P. W., Kallewaard, M., Bruinink, R. J., Kylstra, N. B., Heisterkamp, S., de Valk, V., van der Veen, A. A., & Stricker, B. H.	Pharmaceutical interactions	There were a total of 246 returned questionnaires (96.1% response rate). The only D-DI with dispensing determinants was the one between macrolide antibiotics and digoxin. This drug interaction was dispensed differently by pharmacies utilizing different medication tracking systems, and it was dispensed more frequently by pharmacies affiliated with a health care center.

Table 2.

Authors	Impact on Patient Safety
Takaki, H., Kaneko, E., Sonoda, M., Yamano, T., & Ieiri, I.	As determined, it was discovered that the dosage and administration were incorrect, in addition to a lack of adherence. In the interview, 74.77% experienced adverse drug reactions. The common drugs that were purchased include Bufferin or aspirin tablets, Tylenol or Paracetamol tablets, Gasta 10, and Yoidome. These over-the-counter drugs manifest severe side effects such as black, tarry stools and unusual bleeding, peeling or blistering skin, facial pallor, and ringing of the ears, respectively.
Teinilä, T., Kaunisvesi, K., & Airaksinen, M.	Due to patients' comedication, the safety of individuals are not granted as these polypharmacy- errors include overdose, overuse and/or underuse of drug, and drug-to-drug interaction. With this, the patient is exposed to further harm that may result in the exacerbation of their conditions or injury.
Hämmerlein, A., Grieses, N., & Schulz, M.	The patients experience unwanted side effects, prolonging their drug therapy regimen. Even though they are uncommon, these types of errors have the potential to cause harm to the patient, most notably in the form of adverse drug effects. It is essential that these

	errors be identified so that the appropriate interventions can be provided and the issue can be addressed.
Obreli-Neto, P. R., Nobili, A., de Oliveira Baldoni, A., Guidoni, C. M., de Lyra Júnior, D. P., Duzanski, J., Tettamanti, M., Cruciol-Souza, J. M., Gaeti, W. P., & Cuman, R. K. N.	In 37% of the adverse drug reactions associated with DDI, gastrointestinal bleeding was observed, followed by hyperkalemia (17%) and myopathy (13%).
Gandhi, T. K., Weingart, S., Seger, A., Borus, J., Burdick, E., Poon, E., Leape, L., & Bates, D.	According to the findings of this study, nearly half of all prescribing errors resulted in serious injuries to patients as a consequence of toxicity, drug interactions, or the potential to cause harm to patients.
Pervanas, H., Revel, N., & Alotaibi, A.	Medication errors identified can lead to undesirable adverse drug interactions and, in such case scenarios, can even endanger the life of patients.
Gogazeh, E.	Self-medication leads to an increase in antimicrobials and the severity of misuse and overuse, according to (3.92 out of 5) respondents (3.11 out of 5).
Szeinbach, S., Seoane-Vazquez, E., Parekh, A., & Herderick, M.	The patient was unable to comprehend his drug therapy completely. As a result, he does not question the pharmacist about receiving the incorrect medication or dose, which worsened his condition and caused a drug-to-drug interaction in which he experienced unwanted side effects.
Perry, J., Chen, A., Kariyawasam, V., Collins, G., Choong, C., Teh, W. L., Mitrev, N., Kohler, F., & Leong, R. W. L.	Patients non adherent to their medication is associated with greater risk of relapse in IBD, have symptoms like arthralgia and rectal bleeding, and have impaired quality of life.
de Las Mercedes Martínez Sánchez, A.	These mistakes could be harmful to the patient's condition. Fortunately, the errors were identified as "near-misses," which meant that the wrong medicine was not delivered to patients.
Ashcroft, D., Quinlan, P., & Blekinsopp, A.	Frequency and impact of medical errors resulted in serious medication-related adverse events, causing further harm and financial cost to the patient.
Jani, Y. H., Ghaleb, M. A., Marks, S., Cope, J., Barber, N., & Wong, I. C. K.	The discovered inaccuracies may be a significant factor in adverse medication events, which could endanger the patient's health.
Assiri, G. A., Shebl, N. A., Mahmoud, M. A., Aloudah, N., Grant, E., Aljadhey, H., & Sheikh, A.	The increasing number of adverse drug events such drug-drug interactions is attributed in part to these medication-related risk factors.
Knudsen, P., Herborg, H., Mortensen, A. R., Knudsen, M., & Hellebek, A.	There are 198 potential adverse drug incident cases that have been identified as errors that have reached the patients.
Odukoya, O. K., Stone, J. A., & Chui, M. A.	Errors in e-prescribing increase the probability of patients receiving improper medication administration, poor disease treatment for patients, additional work for pharmacy professionals, higher costs for pharmacies and patients, and customer and health personnel dissatisfaction.
Simegn, W., Weldegerima, B. Seid, M., Zewdie, A., Wondimsiegn, D., Abyu, C., Kasahun, A. E., Seid, A. M., Sisay, G., & Yeshaw, Y.	These medication errors increase the potential consequences for patients' morbidity and mortality.
Lima, S. I., Diniz, R. S., Egito, E.S., Azevedo, P. R. Oliveira, A. G., & Araujo, I. B.	These medication and prescribing errors increase the prevalence of antibiotic resistance in the patients.
Ylä-Rautio, H., Siissalo, S., & Leikola, S.	The increasing incidence of adverse drug reactions in over-the-counter medicines increases the risk of using medications like analgesics. This is due to the customer's lack of knowledge which can lead to serious consequences.

Sell, R. & Schaefer, M.	Knowledge gaps and the quantity of prescriptions were both inversely linked to an increased likelihood of drug-related issues. Potentially unsuitable drugs are a risk factor for older patients and pose a risk of drug-drug interaction.
Tesfamariam, S., Anand, I. S., Kaleab, G., Berhane, S., Woldai, B., Habte, E., & Russom, M.	The respondents acknowledged that they took more OTC medications than what was recommended. Furthermore, 6.9% reported having drug-related problems as a result of using OTC medications.
Panda, A., Pradhan, S., Mohapatra, G., & Mohapatra, J.	Self-medication is linked to a greater likelihood of numerous DRPs including inappropriate drug dosing which could either increase the risk of the disease or would not treat the medicine at all.
Eickhoff, C., Hämmerlein, A., Griese, N., & Schulz, M.	A direct pharmacist-patient connection involving self-medication demonstrated significant DRPs in roughly one out of every five visits including drug-drug interactions.
Doucette, W. R., McDonough, R. P., Klepser, D., & McCarthy, R	Patients who do not take their medications as prescribed experience a disease progression, an increased risk of death, and higher overall medical expenses. Severe drug side effects are also observed such as severe abdominal pain, bloody stool, upset stomach, gas, and diarrhea.
Apikoglu-Rabus, S., Yesilyaprak, G., & Izzettin, F. V	Incorrect inhaler use can result in uncontrolled asthma attacks, disease states, unfavorable side effects such as rapid heart rate or tachycardia, and feelings of fluttering or pounding heart (palpitations), and increased treatment costs.
Goedken, A. M., Huang, S., McDonough, R. P., Deninger, M. J., & Doucette, W. R	Prescription of medicines that the patient had been possibly allergic to and the requirement to make additional therapy are examples of medication-related issues.
Westerlund, T., Almarsdóttir, A. B., & Melander, A.	Due to the drug-drug interaction, patients may encounter undesirable side effects, notably the duplication of the drug with severe side effects. An example of this is when a pharmacist administers amoxicillin to a patient who is allergic to penicillin, worsening the patient's condition.
Oparah, A. C., & Eferakeya, A. E	Patients with more drug regimen changes (drugs started to stop, new drugs decided to start, or high dose modifications) and drug users had a higher probability to develop DRPs.
Becker, M. L., Caspers, P. W., Kallewaard, M., Bruinink, R. J., Kylstra, N. B., Heisterkamp, S., de Valk, V., van der Veen, A. A., & Stricker, B. H.	The increased risk of side effects, such as an increased risk of bleeding (22.0%), hypotension (14.9%), nephrotoxicity (12.6%), and electrolyte disturbances (10.5%), are the most common potential clinical outcome that could be caused by DDIs.

The major medication-related errors identified by the community pharmacists are prescribing errors which include wrong dosage, wrong medicine, wrong drug form, wrong administration or use of medication, as well as illegible or unreadable prescriptions. Besides that, other medication errors were also discovered such as duplicative therapy, misuse, abuse of drugs, drug-to-drug interactions, and non-adherence. These errors can negatively affect the patients' safety as these cause toxicity, unwanted adverse drug events, and increase the potential consequences for patients' morbidity and mortality.

- (1) A cross-sectional study was carried out in a community pharmacy at Fukuoka Prefecture, Japan, with the goal of identifying drug-related problems (DRPs) utilizing data from pharmacists' phone conversations with prescribers at a community pharmacy. DRPs were found in 5,073 of the 95,023 prescriptions. An inappropriate dosage and administration (1349/5073 = 26.59%) and non-adherence problem (1272/5073 = 25.07%) were the most common DRPs identified. Patient interviews were useful in detecting the following DRPs: non-adherence (1057/1272 = 83.10%), untreated indication (590/631 = 93.50%), and adverse drug reactions (80/107 = 74.77%). The study recommends additional research to address the impact of DRPs on patient safety.
- (2) In primary outpatient care, maintaining the integrity of medication safety falls primarily on the shoulders of physicians and community pharmacists. The study discovered that problems related to polypharmacy as a result of physicians' ignorance of patients' entire current medication were regarded as the most challenging in medication safety. Many of the issues stemmed from communication and coordination issues, which could be alleviated by better use of information technology.
- (3) Only 8.6% of DRPs in the study were related to OTC medications. The identified DRPs were most commonly associated with the use of NSAIDs, cardiovascular medications, insulin and insulin analogs, and inhaled β_2 -agonists. These findings are consistent with a review of international studies on drug-related visits to the emergency department, which discovered that NSAIDs and cardiovascular agents are the

most frequently involved in severe drug-drug interactions. Further, almost 55% of all DRPs reported originated at the prescription level, with "incorrect or missing data on the prescription" accounting for more than half of these issues (30.1%). However, due to the already large and ever-expanding number of products on the German market, prescribing medications can be a very difficult process. Because of the often limited time available for individual physician-patient consultation, the likelihood of prescription error is high, and computers cannot, without a doubt, prevent all problems.

- (4) Awareness of the occurrences of medical issues that involve drug, clinical consequences, severity, and preventability of DDI-related ADRs could aid in the development of preventive practices and policies. A total of 77 ADRs were identified in the prospective cohort study, with a high incidence related to DDIs (n=30); >90% required some change in the drug therapy regimen to manage the negative outcome, and all were preventable.
- (5) Four adult primary care practices were analyzed in this study wherein the researchers discovered errors in prescribing in about 1 out of 13 prescriptions, and nearly half of these errors had the potential to cause harm. Antibiotics and nonsteroidal anti-inflammatory drugs, for example, were frequently implicated in prescribing errors. Basic computerized prescribing was not linked to a lower rate of prescribing errors or potential adverse events. These rates, however, could have been significantly reduced with more advanced decision support, such as dose and frequency checking.
- (6) Information about medication errors in community pharmacy settings was collected and analyzed using the Quality-Related Event Report. A total of 68 errors were reported, with the most serious being the dispensing of the incorrect medication. Furthermore, it was determined that pharmacy issues such as workloads and insufficient pharmacist coverage and staffing may contribute to the identified medication errors in community pharmacies.
- (7) Drug dispensing errors and self-medication are common occurrences in Jordan. One of the major medication errors identified and observed by community pharmacists was an unreadable handwritten prescription. It has also been discovered that improving doctors' handwritten prescriptions and utilizing printed prescriptions can contribute to reducing such medication errors.
- (8) Transcribing, dispensing, and administering are only a few of the medication errors in every 100 admissions in hospitals for inpatients. Whereas outpatient medication errors are rarely monitored. In this study, only 15-21% of prescriptions have errors, and 1-5% of prescriptions require clarification. Most studies report error rates and types, rather than medications, severity, or impact. Outpatient medication errors must be known in order to evaluate safety strategies such as computerized prescribing. With e-prescribing, errors are reduced by 80%. Outpatient EMR and handheld prescribing devices have undiscovered benefits.
- (9) The concept of disability can serve as a stronger motivator to improve adherence, as it is persistent, identifiable, and relevant. The researchers discovered a link between medication non-adherence and disability. Medication non-adherence was found to be significantly related to decreased activity participation and impairment across all IBDDI domains. Disability was also associated with flare symptoms, the need for corticosteroids, IBD-related hospitalization, and surgery.
- (10) A 13-month study was conducted in community pharmacy in Spain. Data for medication errors were collected and calculated employing internal pharmacy records, with a 5.0% error rate. Prescription errors, prescribing errors, and dispensing errors have all been identified. Moreover, medication knowledge deficiency and lack of a safe systematic procedure for dispensing medications were the potential contributors of these medication errors.
- (11) A prospective study discovered that misreading prescriptions, identical drug names, and selecting the previous drug or dose from the patient's medication record on the pharmacy computer were some of the factors detected in 35 community pharmacies in the UK that contributed to a wide range of medication error incidents. Also, it was determined that the pharmacists were significantly more prone to make the dispensing errors, whereas dispensers and medicines counter assistants were more likely to cause near misses.
- (12) Electronic prescribing successfully lowered overall rates in errors of prescribing, resulting in an increase in the number of error-free patient visits. Dosing errors are commonly regarded as the most common type of error in pediatrics. However, omission errors (particularly those involving the route of administration) were more common in the study. It could be attributed to the original prescription form's design. Other categories, such as dosage errors, showed no significant difference after excluding legibility and omission errors. However, with the implementation of advanced clinical decision support, such as dose calculations and pediatric dosing guidance, this may change in the future.
- (13) This article critically reviewed previous community studies on the incidence/prevalence of medication errors and associated adverse events, as well as identified the main risk factors. The reported point or period prevalence of medication errors in community settings ranged from 2% to 94%. In terms of preventable ADEs, which in some cases can occur as a result of medication errors, only one study reported an error-related adverse event incidence of 15/1000 person-years. The prevalence of preventable ADE was also reported in five other studies, and it varied according to the type of medication error that caused the adverse event. The most common patient-related risk factors for both medication errors and preventable ADEs mentioned were the number of medications used by the patient and the patient's age.
- (14) The most frequently reported kind of error was a mistake in the prescription. The number of errors that actually reached the patients were low, but the majority of those errors had the potential to cause harm to the patients. The absolute number of medication errors was high, as the

administration of medication is a common occurrence in primary care in Denmark. The safety of patients could be increased even further by making the most of the opportunities to learn from the incidents that have been described.

- (15) Electronic prescribing has its fair share of errors, especially in the community setting. This article critically reviews the potential consequences of such errors and the factors involved. Results show that a total of 75 e-prescription errors were identified during the 45 hours of observation in pharmacies. The most prevalent e-prescribing mistakes were incorrect drug quantity, incorrect dosing instructions, incorrect treatment duration, and incorrect dose formulation. Participants assessed that 5 out of every 100 e-prescriptions include errors. In addition, Anti Infectives, inhalers, ophthalmic, and topical treatments were among the drug classes involved in e-prescribing mistakes. The possible implications of e-prescribing mistakes included an increased risk of patients obtaining improper prescription treatment, poor disease management for patients, greater labor for pharmacy professionals, higher costs for pharmacies and patients, and patient and pharmacy staff irritation. Technology mismatch between pharmacy and clinic systems, technology design difficulties such as the usage of auto-populate features and dropdown menus, and mistakenly inputting wrong data were all factors that contributed to mistakes.
- (16) The purpose of this study was to evaluate prescribing errors that were identified and reported by community pharmacy professionals in Gondar Town, North West Ethiopia. Result shows that The survey included 74 pharmacy professionals, with a response rate of 93.6%. Prescription errors were found in 75.1% of cases (95% CI 71.08-78.70). The most prevalent of these errors was medication selection (82.4%), followed by errors of commission (79.7%) and errors of omission (78.4%). Prescription errors were most usually associated with antibiotics (63.5%), analgesics (44.5%), and antipsychotics (39.5%). Thus, the high rate of DRPs shows its potential to have a serious effect on the morbidity and mortality of patients.
- (17) It has been identified that prescribers continue to disregard the current legislation criteria, specifically in relation to materials that are required for the fulfillment of the prescription. This is the case despite the measures that have been taken by health authorities to restrict the misuse of antimicrobials. In addition, users receive scant information regarding the antimicrobial treatment they are receiving.
- (18) Pharmacists deal with over-the-counter drugs issues, which include high-risk drugs like analgesics, where improper usage due to consumers' ignorance can have serious implications. Pharmaceutical counseling should be easily accessible and actively given to customers to enable safer self-medication as the choice and use of over-the-counter pharmaceuticals are continuously rising. There were 339 drug-related issues in 0.6% of over-the-counter consumers, with the most common complaint being "Uncertainty about the indication for the drug" at 39.2%.
- (19) The occurrences of different kinds of DRPs in pharmacies particularly in community, potential inappropriate medication in geriatric patients, and the potential risk factors were aimed to determine this cross-sectional study. With the systematic pharmacy-based medication reviews, pharmacists identified 247 potential inappropriate medications mostly indicated for the nervous system and one-third of medications had drug-related problems, followed by drug use and adherence issues. According to the findings of the study, pharmacists are well-positioned to conduct medication reviews to resolve DRPs and thus improve medication safety.
- (20) Despite the fact that OTC drugs are strictly regulated in pharmacy outlets only, self-medication with OTC drugs was found to be prevalent accompanied by high risky practice. In the current study, most respondents (73.9%) reported that they always check expiry dates before taking OTC drugs. This result emphasizes that the respondents were very cautious about using expired drugs. In the present study, 14.4% of the respondents admitted that they had taken more than the recommended dose which is much lower than studies conducted in Nepal (86.4%) and the USA (33%). The majority of respondents, either continue or stopped taking the suspected drugs to cause drug related problems before consulting pharmacists or other health care professionals. This implies that there is a lack of knowledge towards reporting side effects concerning authorities.
- (21) 1100 of adult participants are included in a cross-sectional study, utilizing a convenience sample of six retail private pharmacy counters. The data collection form was based on the Pharmaceutical Care Network Europe version 6.2 DRP classification. Self-medication was used by 18.72% of people. DRPs were discovered in 17.36% of people. DRPs were more common in the self-medication group (40.78%) than in the non-self-medication group (11.97%). DRP due to inappropriate drug dosing was found in 44.83% and 40.45% of self-medication and non-self-medication subjects, respectively (P 0.001). Self-medication subjects were approximately 5 times more likely to have a DRP. In conclusion, Self-medication is associated with a higher risk of various DRPs. Since retail pharmacy outlets are often the first point of contact between the patient and the health care system in a developing country.
- (22) Problems related to self-medication of over-the-counter [OTC] drug use were quantified by community pharmacists (CPs) in Germany at the time the drug was dispensed. 100 CPs were asked to document 100 consecutive customers presenting symptoms or requesting OTC drugs using a standardized documentation form. To assess the set goal, 10,000 encounters seemed reasonable. For each encounter, data such as age, gender, first or repeated request, and the availability of a patient file in the pharmacy including drug history were recorded. DRPs were identified in 17.6% of all cases, according to 109 CPs who documented 12,567 encounters. More than 70% of all DRPs were caused by pain, respiratory, gastrointestinal, or skin disorders. Self-medication was inappropriate (29.7%), the requested product was inappropriate (20.5%), the intended duration of drug use was too long, including abuse (17.1%), and the dosage was incorrect (6.8%). There were significantly more cases of incorrect dosage (p 0.05) and drug-drug interactions if a drug history was available (p 0.001). All patients with DRPs received appropriate counseling. In nearly one out of every five encounters, a direct pharmacist-patient interaction about self-medication revealed relevant DRPs. Access to patient files, including prescription and OTC medication data, may improve patient safety.

- (23) This study aimed to identify and describe issues related to drug encounters, identify which medication types were associated with these issues, and list the actions taken by physicians and pharmacists to address them. Community pharmacists and physicians collaborated in the medication therapy management program studied to manage the drug therapy of ambulatory Iowa Medicaid recipients who were dispensed $>$ or $=4$ medications for chronic conditions by a community pharmacy. Following an initial assessment, pharmacists made written recommendations to the patient's physician, to which the physicians responded. Data were extracted from pharmacy records for patients who visited the pharmacy at least once during the first two years of the program. Patient demographics, the number of chronic conditions and medications at enrollment, the type and number of drug-related issues, medication category, pharmacist recommendations, and physician acceptance of recommendations were all collected. Data was collected on 150 patients. The mean (standard deviation) age of the participants was 54.4 (19.4) years, and 74.0% were female. At the time of enrollment, they were taking 9.3 (4.6) medications and had 6.1 (3.1) medical conditions. Inappropriate adherence (25.9%), additional therapy required (22.0%), incorrect drug (13.2%), unnecessary drug therapy (12.9%), adverse drug reaction (11.1%), dose too low (9.7%), and dose too high (5.3%) were the classifications for 886 drug-related issues. Overall, physicians accepted 313 (47.4%) of the 659 pharmacist-recommended changes in drug therapy, with the highest rates of an agreement to stop or change a medication (50.3% and 50.0%, respectively) and the lowest rate of agreement to begin a new medication (41.7%).
- (24) Asthma and chronic obstructive pulmonary disease are both manageable and preventable chronic airway conditions that show that it has a high incidence and prevalence. Over the age of 18 who attended the research pharmacy during the six-month duration. Patients with "not fully controlled" disease states were included in the study for further steps. There were 59 drug-related problems and 134 causes of these problems identified in the 44 asthma patients. However, the highest percentage in drug-related problems that are identified is when patients forgets to use/take drugs which is approximately reached for the Asthma patients that have 38 population size (28.4%) and COPD 32 population size (25%). Over all, 50-80% patients failed to administer the inhaler device correctly.
- (25) The clinical and dispensing data in this study came from a single, United States, independently owned community pharmacy. Medication-related issues are noted in clinical records by pharmacists. Patients who filled at least one prescription at a pharmacy and experienced at least one medication-related issue during the study period had their issues recorded. 1566 patients had a total of 8439 medication-related issues, or 5.4 issues on average per patient. Nonadherence accounted for almost 63% of issues. The central nervous system and analgesic drug class was the one that caused issues the most commonly.
- (26) The study aims to determine the various factors that increase the proportion of drug-related problems discovered in community pharmacies. During the course of the study, a total of 1,098 medication related problems were identified. The findings of this study highlight the importance of pharmacy practitioners education and training in detecting drug-related problems.
- (27) The purpose of this research is to catalog the types and rates of drug-related problems (DRPs) experienced by hospital-discharged patients who visit local pharmacies in a number of different nations. The research was carried out in 112 community pharmacies across Europe, including Austria, Denmark, Germany, the Netherlands, Portugal, and Spain. The study included 435 participants. Drug-related issues were discovered in 277 patients (63.7%). The most common DRPs were uncertainty or lack of knowledge about the drug's purpose or function (133; 29.5%) and side effects (105; 23.3%). Patients reported practical issues 56 times (12.4%). Dosage, drug duplication, drug interactions, and prescribing errors were revealed by 108 pharmacists (24.0%). Patients with more drug regimen changes (drugs stopped, new drugs started, or dosage modifications) and who used more drugs were more likely to develop DRPs. Community pharmacists documented 305 interventions in 205 DRP patients. Pharmacists mostly intervened by patient medication counseling (39.0%) and practical patient instruction (17.7%). To conclude this, demonstrates that community pharmacists can uncover a large number of DRPs that may be relevant to patient health outcomes through a systematic intervention in discharged patients or their proxies. More efforts should be made to ensure continuity of care, as DRPs after hospital discharge appear to be quite common.
- (28) There are numerous drug-drug interactions, some of which can have serious consequences for patients. When the risks outweigh the benefits, interacting medication combinations must be prevented. 256 Dutch community pharmacies were used to select based on the dispensing of 11 undesirable interacting drug combinations. The Inspectorate for Health Care (IHC) sent these pharmacies a questionnaire requesting information about their process and structure. There were 246 questionnaires returned (96.1% response rate). Only one of the ten D-DIs had dispensing determinants, the one between macrolide antibiotics and digoxin. This interacting drug combination was dispensed differently in pharmacies with different medication surveillance systems, and it was dispensed more frequently in pharmacies affiliated with a health care center.

Conclusion

This study provides an overview of the studies on Medication-Related Errors in Community Pharmacy and their Effect on Patient Safety. This article review emphasizes the crucial role that pharmacists play in the primary care setting as well as the importance of community pharmacists in preventing, detecting, and correcting errors and thus preventing patient harm. However, a summary of systematic reviews included in this study shows that pharmaceutical errors do happen from time to time. Safety demands systematic examination of error prevention. Drugstore owners and professionals must go beyond simply avoiding mistakes. All levels of pharmacists must work together to learn from past mistakes in order to improve safety. It's possible to argue that the most severe mistake committed at a pharmacy is one that has already been made. The articles included here are intended to raise awareness of potential drug use system flaws and highlight distinguishing qualities of secure pharmacy systems. The knowledge gathered from completing

this study will assist pharmacy professionals in identifying and assessing potential risk-reduction strategies. In addition, pharmacy personnel should utilize these tools to proactively assess the safety of their practice site and their own awareness of contributing factors to errors and to take steps to consistently enhance the safety and quality of the care they offer.

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