Prescription Errors and Pharmacists Intervention in a Belizean Hospital: A Preliminary Study

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Abstract

Presently, there is no reported data on prescription errors in Belize, even though the potential for such errors exists and is discussed among pharmacists. A prescription is a written order explicitly explaining what drugs are to be administered, the person to whom the drugs shall be given, dose, formulation, route, frequency, and intake. A prescription error, therefore, is a departure from the prescription writing process, leading to wrong instruction from the normal features of a prescription. Inadequate knowledge or competence and incomplete information about clinical characteristics or previous treatment of individual patients can result in prescription errors, including the use of potentially inappropriate medications. Frequent review of prescriptions by a pharmacist is a part of routine prescription monitoring duties; however, it is not routine for pharmacists to prospectively record details of identified prescribing errors. In this study, we examined the potential prescription errors and interventions by the pharmacist during ward rounds in Belize. The outcomes of the study have the potential to establish a protocol for reporting potential prescription errors in a blame-free and non-punitive environment. Furthermore, the results could assist in developing an improved quality of care when prescribing medications, thereby creating a culture where prescription review is seen as an essential and formal intervention by pharmacists. This research utilized a quantitative assessment to examine prescription errors in a selected hospital. All handwritten inpatient prescription orders and drug charts from admission and discharge in the accident and emergency ward, general medical, surgical, pediatrics and medical wards, and intensive care unit were reviewed for prescription from. The identified errors on prescriptions were coded and documented using a checklist; this data was then coded and analyzed using SPSS version 20. Six thousand nine hundred eighty-eight prescriptions were reviewed for prescription errors over four months from June to September 2019. Overall, an average of 0.03 errors per prescription was documented in the study out of a total of 189 prescription errors documented, with the majority of these errors identified from the general medical ward. The most common prescription errors identified were inappropriate (wrong) frequency 88 (46.3%). Among the frequent prescription errors in medicines, the highest were antibiotics errors, 44 (23.2%). Ninety-eight percent (98%) of the pharmacist interventions were accepted by the prescribers. Although the prescription error rates found in this study are minimal compared to the number of prescriptions reviewed, the results showed that prescription errors exist, at least in the hospital where the study was conducted. The potential for this error is an

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avoidable risk, and improvement is still needed. The pharmacists' interventions were accepted. These findings could be incorporated into a regular monitoring and feedback system to emphasize the importance of communication and collaboration between pharmacists and prescribers to prevent patient harm

Keywords: Prescription errors, medication errors, patient safety, pharmacist intervention, Belize.

Background of the Study

A prescription is a written, electronic, or verbal order from a prescriber to a dispenser with a specific medication for a particular patient at a specified time. A prescription order is an essential transaction between the physician and the patient with the elementary requirements to indicate what medication is to be given, to whom and by whom it was prescribed, and gives instructions on how much should be taken, how often, by what route and for how long or total quantity to be supplied (Sheikh et al., 2017). Most hospitals use paper prescription charts for inpatients that are handwritten or transcribed electronically to generate a prescription record to be followed in the hospital (Iftikhar et al., 2019).

A prescription error is a failure in the writing process resulting in giving the wrong instructions about the patient, the drug, the formulation, dose, route, timing, frequency, and duration of administration (Poudel et al., 2015; Abdel-Qader et al., 2021). Prescription errors include mistakes or inaccuracies when choosing and ordering treatments, such as wrong doses or illegible prescriptions. The definition of prescribing errors may vary from errors that cause harm to patients to errors that cause the administration of the wrong therapy with or without harm. The definition may also extend to documentation errors, often procedural errors. Prescription errors were categorized according to their severity, including minor, significant, serious, or potentially lethal errors, and were based on rating scales used in previous medication error research (Fig. 1). The severity of prescription errors has been measured and described in various ways in previous studies (Poudel et al., 2015; Iftikhar et al., 2019).

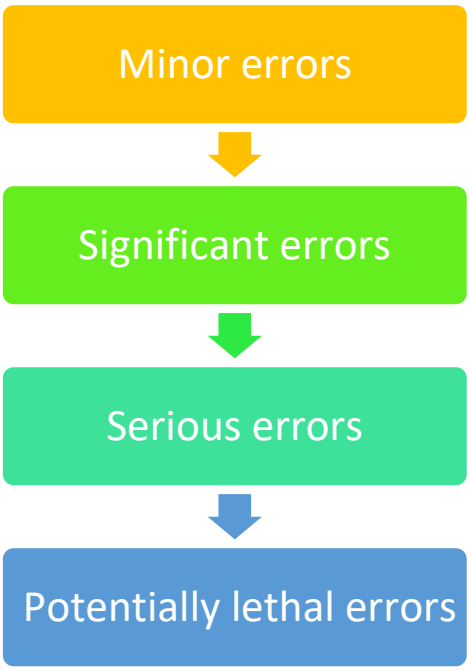

Figure 1. Categories of prescription according to their severity

Prescribing errors that occur in clinical settings has been a source of concern for decades. For instance, in a study of nine hospitals across Northwest England, of the 4,238 prescriptions evaluated, one or more errors

were observed in 43.8% (1857) prescriptions, with 3011 errors observed. Of these, 41.9% (1264) were minor, 54.1% (1629) were significant, 3.6% (109) were severe, and 0.30% (9) were potentially life-threatening (Sedan et al., 2013). Similarly, Ashcroft et al. (2015) reported that a total of 26,019 patients and 124,260 medication orders were reviewed by pharmacists, from which 10,986 medication orders had prescribing errors, resulting in 11,235 prescribing errors being identified.

Prescription errors commonly occur in clinical settings, and pharmacists are vital in reducing such errors. The American Society of Health-System Pharmacists (ASHP) indicates the mission of pharmacists is to provide pharmaceutical care to improve a patient's quality of life through medication-related care (Husaini et al., 2023). One of the primary duties of a pharmacist is to review prescriptions and, when indicated, suggest a therapeutic intervention to improve the safety, efficacy, or cost-effectiveness of medications (Abu-Naser, 2021; Husaini et al., 2019)**.** A pharmacist intervention is the process where a pharmacist identifies and recommends preventing or resolving drug-related problems (Mongaret et al., 2018). For instance, in a study among pediatric patients, Fernández-Llamazares et al. (2012) reported that a total of 1,475 interventions in medical orders for 14,713 pediatric patients were examined, where 1,357 prescribing errors, 833 of which were dosing errors. The overall acceptance rate of the pharmacist's suggestions was 94.3%, with 2.2% of the errors detected as potentially fatal (30 cases) and 14.3% (194 cases) clinically severe, signifying the importance of the pharmacist's intervention with prescription errors. A few studies have reported common prescription errors were made including analgesics, antimicrobials, antihypertensives, and antiasthmatic drugs (Dean Franklin et al., 2005; Abdel-Qader et al., 2010; Reis et al., 2013; Billoro & Lorato, 2018; Langebrake et al., 2015; NHS Resolution, 2023).

Presently, no published study has reported prescription errors in Belize, even though these types of errors are common in many clinical practices. In this study, we examined the inpatient prescriptions and medication charts in a hospital in Belize from June to September 2019 to identify prescription errors and to provide timely interventions to improve the quality of care to the patients. The study results might lead to establishing reporting and intervention protocols at hospitals in Belize to minimize medication errors and improve quality care.

Materials and Methods

The research was quantitatively designed to examine, detect, and record prescription errors and provided interventions based on a checklist (Table 1) adapted from a previous study (Al Jedai et al., 1999). Experienced pharmacists at the hospital identified prescription errors as the selected study wards during routine clinical practices where the errors were recorded for analysis and immediate intervention. The pharmacists then completed a pharmacists' intervention form containing a checklist to record the type of prescription error, medication, and intervention and whether the intervention was accepted or rejected (Fig. 2). All doctors whose prescription had an error were contacted for an intervention session by the ward pharmacist as soon as a prescription error was detected. Assurance of confidence was provided to the medical officers during the intervention. The prescription was presented with the identified error and the intervention was made. The types of prescription errors and the causes of errors were described and classified according to type mistake, slip, lapse, and violation (Al Jedai et al., 1999; Aronson, 2009). The collected data on prescription errors was coded and analyzed using SPSS version 20. The mean number of prescription orders reviewed by the pharmacist per day was tallied. The types and quantities of prescribing errors were tallied as well. The topmost everyday drugs involved in prescription errors were documented. The prospective study was conducted from June to September 2019.

Table 1: Pharmacists' Intervention Form (Al Jedai et al., 1999).

Clinical Pharmacist Intervention Form

Pharmacist : _____ Date: _____ Serial No: _____

Drug Related Problems (DRPs)	Type of Intervention (T)	Clinical Significance (S)	Expected Outcome (O)	Acceptance (A)
1- No indication for drug therapy 2- No drug order for medical condition 3- Inappropriate drug selection 4- Inappropriate dosage regimen a) dose b) frequency c) route d) rate 5- Prescribed drug not administered 6- Experiencing ADR's or S.E. 7. Experiencing drug interactions (DI's): a) drug drug interactions (DDIs) b) drug food interactions (DFIs) c) drug lab test interactions (DLTIs) 8- Miscellaneous	1- Pharmacokinetics 2- Pharmacotherapeutics 3- Drug Information 4- Miscellaneous	1- Potentially severe/ highly clinical significance 2- Important/serious /moderately clinically significance 3- Minor/low clinical significance	1- Cost savings only 2- Potential ADR's/ Toxicity prevented 3- Enhanced therapeutic effect	A Accepted MA Modified then Accepted R Rejected N.B. if MA or R specify: a) what was the reason? b) Was it reasonable?

Pt. Account number and unit	Intervention	DRP #	T #	S #	O #	Acceptance
	Rx Rec					a) b)

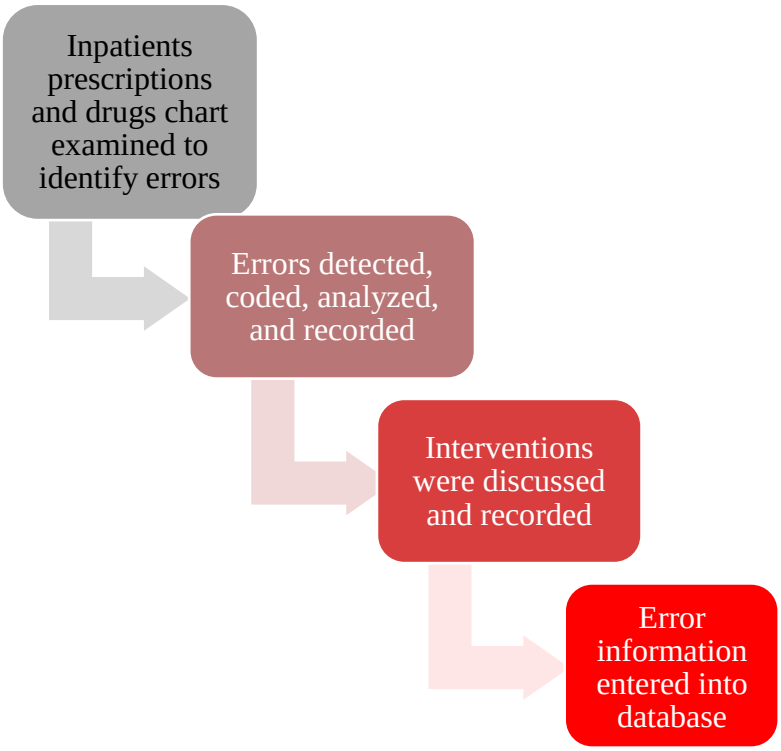

Figure 2. Steps for data collection

Ethics

The hospital management provided ethical permission for the research to be conducted provided the hospital's name was kept confidential. Helsinki's declaration for human research was applied in the study.

Results

Six thousand nine hundred eighty-eight prescriptions were reviewed and documented from five different hospital units, with 189 prescription errors detected, representing 2.70% errors out of the total prescriptions reviewed (Table 2).

Table 2. Total prescriptions reviewed from different units.

Month	**Accident & emergency**	**Intensive care unit**	**General Medical ward**	**General Surgical ward**	**Paediatric ward**	**Total**
June	120	167	615	718	64	1684
July	129	123	713	730	70	1695
August	97	154	739	695	39	1724
September	133	133	789	730	30	1785
Total	**479**	**577**	**2856**	**2873**	**203**	**6988**

The surgical and medical wards had the highest number of prescriptions, while the pediatric ward had the least (Table 2).

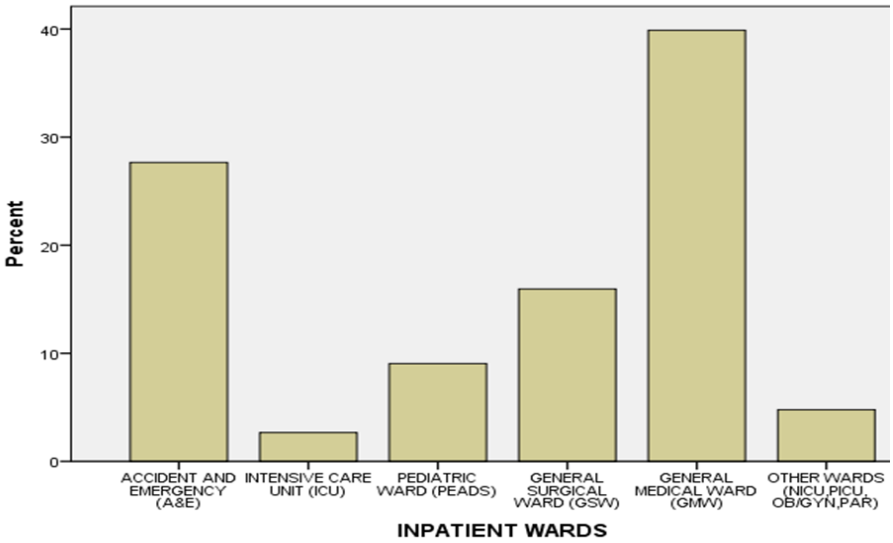

Fig. 3. Incidence of prescription errors at the inpatient wards

Most prescription errors occurred in general medical wards and during admission in the accident and emergency units (Fig. 3).

Table 3. Prescription errors identified		
Type of error	**Frequency**	**Percentage (%)**
Wrong dose	73	38.6
Wrong frequency of intake	88	46.6
Wrong route	3	1.6
Wrong rate	1	0.5
No drug for the medical condition	3	1.6
Drugs that interact	4	2.1
Allergies	1	0.5
Illegible prescription	2	1.1
Drug without dose	13	6.9
Miscellaneous	1	0.5
Total	**189**	**100**

The most encountered error type was that of inappropriate (wrong) frequency 88 (46.3%), inappropriate (wrong) dose 73 (38.4%), and drug without dose 13 (6.8%) (Table 3).

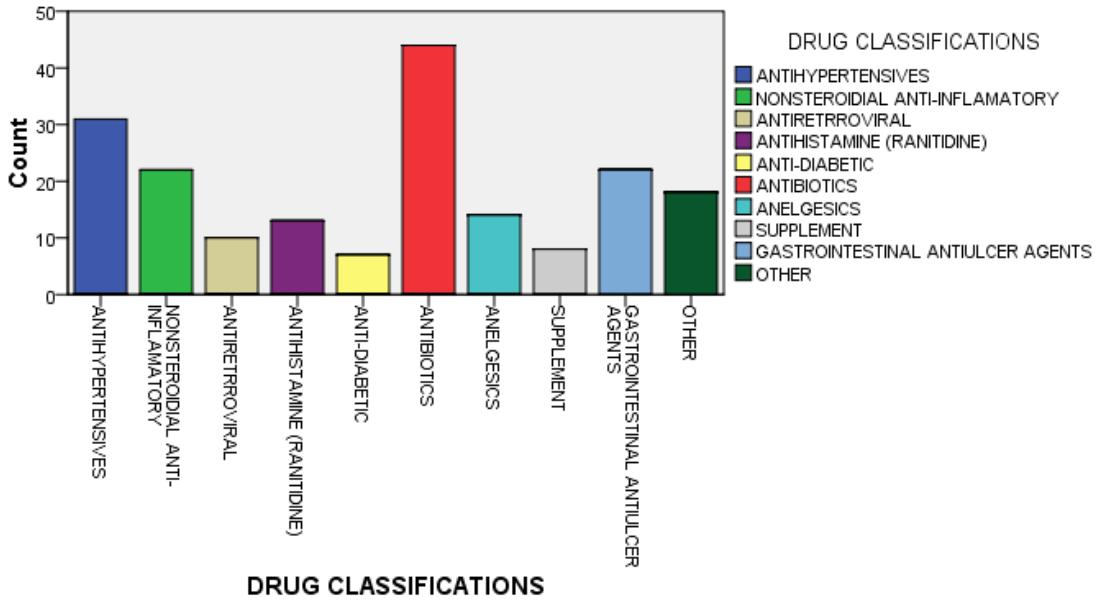

Fig. 4. Drug Classifications

Concerning the drug classification that demonstrated the most prescription errors; the drug classes showing the greatest number of errors were antibiotics (44, 23.2%), anti-hypertensive (31,16.3%), non-steroidal anti-inflammatory drugs (22, 11.6%), and gastro-intestinal anti-ulcer agents (22, 11.6%) (Fig. 4).

Table 4. Pharmacists' intervention of identified prescription error.

Pharmacist intervention of identified error	Frequency	Percentage (%)
Intervention accepted	19	10
Intervention accepted and modified	168	88.9
Interventions rejected	2	1.1
Total	**189**	**100**

Table (4) demonstrates the percentage of interventions accepted, accepted and modified, or rejected by the prescriber. Prescribers accepted 98.4% of the interventions made by the pharmacists, and 1.1% of them were not accepted, citing the medical conditions and other circumstances as reasons for non-acceptance.

Discussion

As a preliminary study, examined potential prescription errors in a Belizean hospital and the pharmacist's intervention in reducing such errors during ward rounds. A total of 6,988 prescriptions were reviewed and documented from five different hospital units, with 189 prescription errors detected, representing an average of 0.03 errors per prescription (Table 2). The surgical and medical wards yielded the most written prescriptions, while the pediatric wards yielded the least (Table 2). In addition, most prescription errors occurred in the general medical wards and during admission at the accident and emergency unit (Figure 2). The detection of prescription errors in this study calls for greater vigilance in identifying and analyzing prescriptions. Efforts to minimize prescription errors should include implementing a double-checking and verification system for prescriptions, developing and adhering to standardized prescribing protocols and guidelines, pharmacist's involvement in medication management, educating patients about their medications, and regularly monitoring prescriptions and reviewing incident reports. Integrating these approaches can decrease prescription errors, reduce adverse reactions, and improve patient safety and confidence in the healthcare system. Elliott et al. (2020) reported that approximately 1 in 5 medication errors occur in hospitals. It was estimated that nearly 3 out of 4 medication errors (72%) are minor, while approximately 1 in 4 (just under 26%) had the potential to cause moderate harm. Only 2% could potentially result in serious harm (Elliott et al., 2020). Previous studies reported in other countries indicate prescription errors could be detected in any hospital setting, the pharmacists' interventions could help to minimize the incidence of harm, thereby saving lives and costs from legal engagements (Boostani et al., 2019; Gebre et al., 2021; Shrestha & Ramanath, 2023).

Furthermore, the results of this study indicated the most encountered prescription error type of inappropriate prescription designation (wrong) frequency 88 (46.3%), followed by inappropriate (wrong) dose 73 (38.4%), and drug without dose 13 (6.8%) (Table 3). Prescription errors can lead to dispensing errors, which in turn can lead to medication errors with dire consequences. The medication errors identified in this study suggest that patients may not receive correct pharmacotherapy for their ailments, leading to ineffective treatment and worsening health. Medication errors can lead to severe adverse reactions, morbidity, and mortality. Detecting prescription errors through the pharmacist's intervention ensured patient safety and well-being. For instance, in the United States alone, an estimated 7,000 - 9,000 thousand people die because of medication errors, with several suffering from complications of align with previous studies (Dean et al., 2002; Ibrahim et al., 2020; Gebre et al., 2021; Shrestha & Ramanath, 2023). where wrong dose, inappropriate frequency and dose, and drug without dose were reported as errors found in prescriptions (Dean et al., 2002; Ibrahim et al., 2020; Gebre et al., 2021; Shrestha & Ramanath, 2023). The results from this study highlight the need for hospital management to implement regular and continuous education for the healthcare team on new medications, safe prescribing practices, and potential drug interactions. In addition, encouraging a culture of transparency and learning can foster an environment where healthcare personnel can comfortably report prescription errors without fear of rejection or punishment. Furthermore, because pharmacists are trained to detect potential prescription errors,

involving them in the medication management process can provide valuable insights into medication management, adding a layer of safety to the process.

Regarding the drug classes that demonstrated the most prescription errors, antibiotics accounted for the most errors (44, 23.2%). The detection of errors in antibiotic prescriptions at the hospital could significantly impact antibiotic resistance, adverse drug reactions, ineffective therapy, increased healthcare costs, and patient trust. Ensuring improved antibiotic prescribing practices can reduce the risks of antibiotic resistance and improve patient outcomes. Another drug class with higher instances of prescription errors was antihypertensive with 16.3% (31). Errors in prescribing antihypertensive drugs could lead to significant uncontrolled blood pressure, adverse drug interactions, increased treatment costs, and patient non-adherence to medications. Non-adherence can further complicate treatment outcomes and general patient health conditions. Detecting and minimizing prescription errors can, therefore, improve antihypertensive prescribing practices while ensuring adverse reaction risks and better patient therapy outcomes. Deficiency of knowledge has been reported to be the greatest reason for prescription errors, especially in the case of antibiotics and antihypertensive medications (Husaini et al., 2019; Husaini et al., 2020; Martínez-Domínguez et al., 2022). In a recent study, Zirpe et al. (2020) reported antibiotics and antihypertensives as the most common medications prone to medication in India. Non-steroidal anti-inflammatory drugs (22, 11.6%), and anti-ulcer agents (22, 11.6%) prescriptions were detected with errors. Different classes of drugs have been reported as frequently prescribed with errors. For instance, anticoagulants, used to prevent blood clotting, are frequently implicated in medication errors. Errors related to dosing, monitoring, and interactions can occur with anticoagulant prescriptions (NHS Resolution, 2023). In addition, opioid medications are another class of medication prone to prescription errors, such as dosing errors, inadequate monitoring, and potential misuse, which contribute to opioid-related incidents (NHS Resolution, 2023; NIDA, 2023). Similarly, while antibiotics are commonly prescribed, errors in their use can lead to adverse effects with incorrect dosing, inappropriate selection, and failure to adjust based on patient factors contribute to these errors (NHS Resolution, 2023).

Furthermore, antidepressants essential for mental health, are complex and can lead to mistakes, such as dosing errors, drug interactions, and inadequate monitoring are common issues with these classes of drugs (NHS Resolution, 2023). Finally, anticonvulsants used to manage seizures and other neurological conditions are prone to prescribing errors, such as errors in dosing, titration, and monitoring can occur with anticonvulsant prescriptions (NHS Resolution, 2023). The findings of this study resonate with previous studies, indicating the need for corrective action. Regardless, healthcare professionals are crucial in minimizing prescribing errors through vigilance, education, and collaboration.

Finally, the study findings indicated the percentage of pharmacist interventions (Table 4) appears to be significant in avoiding catastrophic patient harm or injury. The prescribers accepted 98.4% of the interventions made by the pharmacists, whereas 1.1% of them were not accepted, citing the medical conditions and other circumstances as reasons for non-acceptance. The accurate assessment, evaluation, and intervention of the pharmacists could perhaps express the higher acceptance rate observed in the study, suggesting the clinical relevance of the pharmacists in preventing potential prescription errors and their possible consequences. Additionally, the higher number of prescriptions and the possibility of the physicians not having sufficient pharmacotherapeutics overview of the patients may have significantly contributed to the acceptance rate, further suggesting the critical role of pharmacists for patients with polypharmacy. Finally, the ability of the pharmacists to communicate effectively and respectfully discuss the prescription errors may further explain the physician's decision to accept the pharmacist's interventions to prevent drug-related problems that may have arisen. In a recent study, Zaal et al. (2020) reported physicians' higher acceptance rate of pharmacists' medication order interventions, corroborating the findings of this study. Prescribing errors have been reported as a common cause of morbidity, increased cost of therapy, and mortality in hospital and community practice. Pharmacists play a crucial role in minimizing and preventing PEs. In a recent retrospective study conducted in a tertiary care hospital in Riyadh, Saudi Arabia, Alzahrani et al. (2021) documented pharmacists' interventions related to reported PEs over a six-month period. The researchers reported 2,564 pharmacist interventions related to PEs impacting 1,565 patients. Furthermore, the most encountered PEs were wrong doses (54.3%), anti-infectives for systemic use (49.2%), unauthorized prescriptions (21.9%), and alimentary tract and metabolism medications (18.2%) as the most frequently reported in the study. Finally, the findings of the study indicated that the most reported pharmacist interventions included therapeutic duplications (11%), restricted medication approvals (21.9%), and dose adjustments (44.0%). These interventions were critical

in preventing possible medication-related harm to patients. Prioritizing patient safety through quality improvement endeavors at all healthcare levels is critical (Alzahrani et al., 2021).

Practical and effective strategies to reduce prescription errors include prescriber education, which occurs in continuous education for healthcare professionals, should focus on safe prescribing practices. In addition, computerized alert systems should be utilized to provide effective alerts at the clinical interface. Similarly, guidance tools provide evidence-based guidelines to inform practice. Finally, multidisciplinary teams should be formed to collaborate with pharmacists to optimize medication safety (Keers et al., 2013; Husaini et al., 2021). It is recommended that vigilance, collaboration, and evidence-based practices are crucial in minimizing prescription errors and ensuring patient well-being. Incorporating the "Pharmacists' Intervention Form" (Table 1) as a standard procedure can help in identifying areas for improvement and add a layer of checking to significantly decrease prescription errors, thereby circumventing dangerous medication outcomes for patients.

There is a need for regular clinical meetings where different healthcare personnel come together to discuss patient care, especially pharmacotherapeutics. A team-based approach to patient care can significantly minimize PEs, enhance communication and foster team spirit. Effective communication among healthcare professionals will ensure collaboration in medication management and patient care. The need to double-check prescriptions and verify patient information cannot be overemphasized at every step of the medication process (prescribing, dispensing, and administration). Health care professionals must be vigilant and be conversant with potential drug interactions. Regular and continuous monitoring of patients for medication effectiveness and adverse drug reactions aids in timely medication errors detection and correction. Finally, to ensure patients receive the safest and most effective pharmacotherapies, evidence-based clinical guidelines emanating from cutting-edge research findings should be implemented. In addition, evidence-based expert recommendations and clinical studies that aid in developing and adhering to standardized prescribing and administration protocols should be utilized to minimize prescription errors and medication-related problems.

Limitations

The results of this study need to be interpreted cautiously because the data collected was preliminary and not cross-sectional. The results cannot be generalized to the entire patient population in Belizean hospitals. In addition, the overwhelming traffic of patients due to admission and discharge with the few medical personnel might have put pressure on the team, leading to errors. Furthermore, since the study included patients admitted to a single hospital, generalization of findings cannot be concluded for all the hospitals in the country since only some of the hospitals have all the units studied. Finally, the data was only collected over four months, thereby not giving sufficient time to examine more prescriptions. Despite these limitations, to our knowledge, this is the first reported prescription error in the country, hence, lends to the study's strengths. Furthermore, despite these limitations, the current study findings could provide initial added value to the hospital's pharmacy services, especially considering that pharmacists are not integrated within the hospital's medical teams. The lack of inclusion would decrease the pharmacist's role in reducing medication-related errors and challenges.

Conclusion

In this study, we aim to examine prescription errors and provide pharmacists with interventions to minimize the errors. Six thousand nine hundred eighty-eight prescriptions were reviewed and documented from five different hospital units, with 189 prescription errors detected, representing an average of 0.03 errors out of the total prescriptions reviewed. Most prescription errors occurred at general medical wards and during accident and emergency unit admission. The most encountered error types identified were inappropriate (wrong) frequency, inappropriate (wrong) dose, and a drug prescribed without a dose. The drug classes with the highest prescription errors were antibiotics, hypertensives, non-steroidal anti-inflammatory, and gastrointestinal anti-ulcer agents. The prescribers accepted 98.4% of the interventions made by the pharmacists, and 1.1% of them were not accepted, citing the medical conditions and other circumstances as reasons for non-acceptance. It is recommended that vigilance, collaboration, and evidence-based practices are crucial in minimizing prescription errors and ensuring patient well-being.t is important that you write for a general audience. It is also important that your work is presented in a professional fashion. This guideline is intended to help you achieve that goal. By adhering to the guideline,

you also help the conference organizers tremendously in reducing our workload and ensuring an impressive presentation of your conference paper. We thank you very much for your cooperation and look forward to receiving a professional looking, camera-ready version!

Declarations

Consent for publication

Not applicable

Availability of data and material

All data generated or analyzed during this study are included in this article.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest concerning this article's research, authorship, and/or publication.

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