Research Article
Sciences of Pharmacy

Evaluation of Medication Errors in Transcribing and Dispensing Processes of Outpatient E-Prescriptions at Persahabatan General Hospital

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Keywords: Medication error, e-prescriptions, Transcribing, Dispensing, Outpatient.

Abstract: Persahabatan General Hospital provides a variety of healthcare services, including outpatient care. Medication errors are errors in the prescribing, dispensing, and administration process that can be considered risk factors for patients. This study aims to evaluate medication errors in the transcription and dispensing phases of outpatient e-prescriptions at Persahabatan General Hospital during the period January - February 2024. This research is a descriptive observational study with a cross-sectional design. Data were collected through prospective observation and analyzed descriptively to determine the percentage of medication errors. Of the 363 e-prescriptions observed, the results showed no errors in the transcribing phase. However, in the dispensing phase, there were 50 (6.07%) incidents of incorrect preparing quantity of medicine, 8 (0.97%) incidents of incorrect medicine medical equipment, and 7 (0.85%) incidents of incorrect dosage. These findings suggest that although the implementation of e-prescribing is effective in reducing errors at the transcription phase, special attention must be paid to the dispensing phase to reduce the number of errors. There is a correlation between polypharmacy and medication errors in the dispensing phase, *p*-value <0.001. All of these errors are resolved before the medication is administered to the patient.

Introduction

Hospitals are institutions that provide comprehensive healthcare services, including inpatient, outpatient, and emergency care (1). Outpatient services include observation, diagnosis, treatment, rehabilitation, and other healthcare services without hospitalization (2). One of the crucial services of outpatient care is pharmacy services, involving the processes of prescribing and dispensing drugs. During these processes, medication errors may take place. It causes potential risks to patients. Medication errors can occur in several stages, including prescribing, transcribing, dispensing, and administration (3).

Research suggests that in the prescribing phase, errors often occur due to incomplete information on prescriptions (4). In the transcribing phase, errors can occur due to difficulty in reading prescriptions, incomplete information, or inappropriate abbreviations. Meanwhile, in the dispensing phase, errors can occur, such as providing the wrong medication, insufficient quantity of medication dispensed, or unclear or incomplete label writing. Data from research by Handoko at X Hospital in Indonesia (2023) indicate a high prevalence of medication errors during the prescribing stage. International studies support this concern. For example, the Institute of Medicine in the United States reports that medication errors result in approximately 7,000 deaths annually (5). Similarly, a study conducted at University Hospital Bern in Switzerland identified 288 cases of medication dosing errors among 24,617 patient treatments (6). Other research further emphasizes the severity of the issue, showing that medication errors are the third leading cause of death in the United States, accounting for an estimated 251,454 deaths annually (7).

In response to these risks, many hospitals are

transitioning to electronic prescribing (e-prescriptions) to reduce human error and improve accuracy (8, 9). However, while e-prescriptions can minimize prescribing errors, they are not immune to mistakes in the transcribing and dispensing stages. The urgency to evaluate the effectiveness and safety of e-prescription systems is increasingly critical, especially in high-volume outpatient settings (10).

This study aims to evaluate medication errors in the transcribing and dispensing phases of e-prescriptions for outpatient care at Persahabatan General Hospital. Through this evaluation, it is expected that solutions or improvements can be identified to reduce the risk of medication errors and enhance patient safety in medication use. This study also contributes valuable insights into the implementation of e-prescriptions in public hospitals in Indonesia, a topic that remains underrepresented in international research.

Methodology

Materials

This study used data extracted from e-prescriptions, which were recorded in Excel sheets, for patients in the outpatient department of Persahabatan General Hospital from January to February 2024. This study used a checklist form designed to identify medication errors and applied a descriptive, longitudinal observational method. The research's ethical approval was obtained from the Ethics Committee of Persahabatan General Hospital (Approval No. 161/LEPLP-RSUPP/12/2023).

Methods

Data collection was conducted prospectively at the Pharmacy Installation of Persahabatan General Hospital to identify medication errors in the transcribing and dispensing phases. This research is a descriptive longitudinal observational study without follow-up. The study population consisted of electronic prescriptions of outpatient care at the pharmacy services of Persahabatan General Hospital, with a sample of 363 prescriptions meeting inclusion. The total population consisted of 3,937 e-prescriptions, and the sample size was determined using Slovin's formula (1960) with a 5% margin of error, resulting in 363 e-prescriptions. Inclusion criteria were e-prescription outpatients from Persahabatan General Public Hospital. Data analysis was performed descriptively by calculating the percentage of medication error incidents in the transcribing and dispensing phases. Medication errors are assessed based on the procedural standards issued by Persahabatan General Hospital.

Analysis

The collected data were tabulated and analyzed as percentages of medication error incidents in each phase. Spearman test was used to evaluate the correlation between polypharmacy prescribing and medication errors in the dispensing phase using the IBM SPSS Statistics for Windows, Version 19.0 (IBM Corp., Armonk, NY, USA).

Result and Discussion

Patient Characteristic

This study was conducted at the outpatient care of Persahabatan General Hospital on 363 e-prescriptions. Observations were made by observing and documenting prescriptions and assessing their completeness in the transcribing and dispensing phases based on the checklist in the study form. The demographics of the patients based on gender, age range, and clinic are shown in **Table 1**.

Table 1. Patient demographics.

Category	Number (n)	(%)
Gender		
Female	211	58.13
Male	152	41.87
Age (years)		
0 – 5	3	0.8
5 – 11	4	1.1
12 – 16	7	1.9
17 – 25	24	6.6
26 – 35	31	8.5
36 – 45	29	7.9
46 – 55	84	23.1
56 – 65	87	23.9
> 65	94	25.9
Clinics Prescriptions		
Other clinics	95	26.2
Internal Medicine Clinic	75	20.7
Cardiology Clinic	41	11.3
Pulmonary Clinic	27	7.5
Neurology Clinic	26	7.2
Ear, Nose, and Throat Clinic	23	6.4
Skin and Venereal Clinic	19	5.2
Urology Surgery Clinic	17	4.7
Lung Oncology Clinic	15	4.1
Obstetrics Clinic	13	3.4
Digestive Surgery Clinic	12	3.3

The majority of patients were female, 58.13%, while male patients 41.87%. Analysis of respondent characteristics indicated that the internal medicine clinic was the highest treatment destination, with 75 patients (20.7%), of which 37 (10.2%) were elderly (60-90 years old). The high number of elderly patients in this clinic is due to the common decline in organ function among the elderly. This is consistent with

Sumandar et al.'s statement (2020), which indicates that the majority of elderly individuals experience physiological, psychological, and social function declines due to menopause (11).

Identification Medication Error

Medication Error at the Drug Preparation Phase

The transcribing phase focuses on the process of accurately copying or transferring the prescription information. The prescription used in this study is an e-prescription. Errors in the transcribing phase should be resolved; therefore, the results of this study showed no medication errors were made in the transcription phase.

Identification of medication error types was conducted using seven parameters: incorrect preparation of medicine or medical equipment, incorrect dosage, preparing the wrong amount of medicine, preparing medicine for the wrong patient, preparing the wrong dosage form, administering expired medicine, and dispensing the wrong medicine. **Table 2** shows that only three types of errors were identified out of the seven parameters assessed. No medication errors were observed during the transcribing phase.

Table 2. Distribution of medication error assessment results during the transcribing phase.

No	Assessment Parameter	Number of Incidents	%
1.	Incorrect preparation of medicine/medical equipment	8	0.97
2.	Incorrect dosage	7	0.85
3.	Preparing the wrong amount of medicine	50	6.07

Incorrect Preparation of Medicine/Medical Equipment

Table 2 shows that during the drug preparation phase (incorrect preparation of drugs or medical equipment), there were 8 incidents (0.97%) out of 363 prescriptions. Examples of errors in drug preparation include dispensing the wrong drug type, such as omeprazole instead of lansoprazole, lansoprazole instead of omeprazole, nitrocaf retard forte instead of nitrocaf R, and nitrocaf retard forte instead of the regular nitrocaf retard.

Incorrect drug preparation (mispreparation of drugs or medical equipment) often occurs due to the presence of look-alike sound-alike (LASA) drugs, also referred to as Similar Name for Drugs (NORUM). In addition, the high volume of prescriptions received by the pharmacy can make it challenging for pharmaceutical staff to retrieve the correct medications accurately. NORUM drugs are stored in accordance with regulations. These include separating similar-sounding drugs to prevent confusion and labeling medicine boxes using Tall Man Lettering. However, errors may still occur, often because pharmacists or pharmaceutical technicians do not fully adhere to the Standard Operating Procedure (SOP), which requires them to read and verify both the name and strength of the medication before selection.

These errors are typically identified during the final verification step when the pharmacist or technician checks the medications prior to dispensing them to the patient. When detected at this stage, the incorrect medicines are immediately replaced with the correct ones, as stated in the prescription. However, it is not fully applied, including storage of NORUM drugs only in tablet form, lack of specific labeling of NORUM drugs, lack of labeling of injectable drugs in the NORUM group, lack of facilities and infrastructure, and limited human resources (12).

This process includes checking the medication and its labeling, verifying the medicine with the patient, and ensuring that dispensing is based on the medication’s indication. Pharmacists are expected to implement evidence-based risk control measures, such as barcoding systems, when selecting drugs for dispensing. To prevent dispensing errors, pharmacists should also review the patient’s medical condition or diagnosis, referring to the available medical records whenever possible (13).

Incorrectly Prepared Medicine Dosage

Table 2 shows that there were 7 events (0.85%) out of 363 prescriptions related to incorrect drug dosage. Examples include incorrect codeine dosage from 10 mg to 20 mg, incorrect Symbicort dosage from 120 to 60, incorrect Gabapentin dosage from 100 mg to 300 mg, and incorrect methimazole dosage from 5 mg to 10 mg. Errors in drug preparation related to incorrect dosage can occur due to pharmacist oversight, often caused by similarities in drug packaging, which lead to selecting the wrong drug strength (14). Pharmacists need to implement risk control strategies to reduce the occurrence of medication errors. One effective measure is documenting alerts when errors are detected to help prevent recurrence. Additionally, collaboration among healthcare professionals is essential to share responsibility and improve medication safety systems (15). Double-checking and strictly following the standard operating procedures are also key solutions to minimizing errors during the preparation phase (14).

Preparing the Wrong Amount of Medicine

Table 2 shows that 50 events (6.07%) out of 363 prescriptions were related to errors in preparing the quantity of medication. Examples include: 2 tablets of furosemide 20 mg missing, 1 strip of gliquidone 30 mg missing, 1 tablet of gabapentin 300 mg missing, 6

extra strips of metformin, 1 item of N-acetylcysteine missing, 3 extra tablets of folic acid, 1 tablet of cetirizine missing, 1 tablet of cyanocobalamin missing, 1 item of fluticasone furoate missing, and 2 strips of metformin missing.

These findings suggest that while e-prescribing is effective in minimizing errors during the transcription stage, greater attention is needed during the dispensing stage to reduce the overall error rate. To enhance patient safety and improve pharmacy service quality, it is essential to implement strict procedures, integrate supportive technologies, and provide adequate staffing and training for pharmacy personnel.

Several common factors, namely high workload, inadequate staffing, NORUM drugs, similar packaging, NORUM drug storage systems, and environmental disturbances, cause medication errors at the medication preparation stage (16). The high workload factor is an imbalance between the workload and the human resources, the distraction of the work being interrupted by the ringing of the telephone (17).

Preparing the wrong amount of medication is a common medication error. In a study in China, 6 million prescriptions were submitted annually. A total of 45,000 errors at the drug delivery stage went undetected (18). About 10,600 errors can be potentially dangerous and have the potential to cause unwanted events (19). In Chalik's research (2020), at Labuang Baji Hospital, Makassar, the incidence of drug delivery errors in the category of inappropriate/incomplete number of drugs was 7% (n = 33). In Megawati's research (2021), the number of drug delivery errors was 9% (20).

The causes of errors in the drug preparation phase (specifically related to incorrect quantities of medication) at the pharmacy installation of Persahabatan General Hospital include several factors. Noise and distractions can reduce staff focus and comprehension, resulting in mistakes when dispensing the correct amount of medication as prescribed. Additionally, being overworked, a shortage of hospital pharmacists, and workplace stress can all contribute to errors during the medication preparation process (21).

Relationship Between Polypharmacy and Medication Errors

The Spearman test revealed a statistically significant relationship between polypharmacy and medication errors in the dispensing phase, with a *p*-value of less than 0.001. This result provides strong evidence that the likelihood of medication errors increases with the number of medications prescribed. The correlation coefficient of 0.477 further supports this, indicating a moderately strong positive relationship.

Polypharmacy, commonly defined as the use of five or more medications simultaneously, often leads to increased complexity in prescription handling, especially in high-volume outpatient settings (22). In the dispensing phase, pharmacists and pharmaceutical technicians must accurately interpret, select, and prepare multiple medications per prescription. As the number of prescribed items increases, so does the potential for confusion, mislabeling, incorrect quantities, and selection of the wrong drug form or strength. This finding is consistent with previous research showing that polypharmacy is a significant risk factor for medication errors across multiple stages, including dispensing (23, 24). The added cognitive and operational load placed on pharmacy staff when handling complex prescriptions, combined with factors such as staff shortages, distractions, or look-alike sound-alike (LASA) drugs, can increase the chance of human error.

Medication errors at Persahabatan General Hospital are partly attributed to a shortage of pharmacy staff. Currently, there are only 3 pharmacists and 16 pharmaceutical technical assistants. According to the Pharmaceutical Service Standards for hospitals, the recommended ratio of pharmacists to patients is 1:50 per day (25). Based on this standard, 3 pharmacists should handle no more than 150 patients daily, which is not always feasible in practice.

Table 3. Analysis of the relationship between polypharmacy prescribing and medication errors.

			Polypharmacy	**Medication Errors**
Spearman's rho	Polypharmacy	Coefficient correlation	1.000	0.477
		Sig (2-tailed)		<0.001
		N	363	363
	Medication Error	Coefficient correlation	0.477	1.000
		Sig (2-tailed)	<0.001	
		N	363	363

In this study, the evaluation was conducted before the medication was delivered to the patient during the final verification stage. As a result, the medication errors identified fall under the Type B 'no harm' category, which means the error occurred but did not reach the patient. In contrast, errors in the 'harm' category involve situations that prolong treatment, nearly result in death, or require additional medical intervention due to temporary adverse effects (26).

Conclusion

Among the 363 e-prescriptions reviewed, no medication errors were found in the transcribing phase. However, errors were identified in the dispensing phase, with the most common being incorrect quantities of medication, occurring in 50 cases (6.07%). A significant correlation was found between polypharmacy and medication errors in the dispensing phase, with a *p*-value of <0.001. All identified errors were resolved before the medications were administered to the patients.

Declarations

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Conflict of Interest

The authors declare no conflicting interest.

Data Availability

The unpublished data is available upon request to the corresponding author.

Ethics Statement

Research Ethical approval was obtained from the Ethics Committee of Persahabatan General Hospital (Approval No. 161/LEPLP-RSUPP/12/2023).

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Not applicable.

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