

## **The Impact of Pharmacists' Interventions to Prevent Medication Errors at a Tertiary Hospital in Central Jakarta, Indonesia**

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**Abstract:** To promote safety and quality of pharmaceutical services are still an issue in Indonesia. One way of doing so is to implement pharmaceutical care standards and prevent medication errors. The aim of this study was to evaluate if the intervention that conducts before and after the socialization in the standard of pharmacy service could cause a decrease in medication errors. The study was conducted by using a quasi-experimental design without a control group in outpatient pharmacy services of a tertiary hospital in central Jakarta, Indonesia. A total of 7627 prescriptions were collected prospectively by the total sampling method in April and May 2016. The observation was conducted in two stages of prescribing and dispensing. A total of 2541 medication errors identified, error rates of 16% and 33.3% were found during the prescribing and dispensing stages before socialization (April 2016), respectively. After the socialization in May 2016, the error rates of 15.2% and 20.2% were found in the prescribing and dispensing stages, respectively. However, the differences pre- and post-socialization were not significant ( $p > 0.05$ ). The greatest decrease in medication error was found on drug labels, which fell from 721(21%) to 458 (11%). Observations on near-miss events based on a risk matrix showed that these were dominated by a low-degree of risk. Based on these results, it could be concluded that the intervention given to pharmacists could decline medication errors. Nevertheless, further study with a greater amount of time and better pharmacist socialization is required.

**Keywords:** Dispensing, intervention, medication errors, prescription.

### **1. INTRODUCTION**

Medication safety is currently a big concern for pharmacists who dispense and administer medication to patients and need to be especially concerned with preventing errors during preparation and dispensing. Medication errors can be defined as failures in the process of treatment that leads to or potentially harmful to the patient (Aronson, 2009). The U.S. Food and Drug Administration (FDA) has conducted a review on the drug name, labeling, packaging, product design, and prescribing that may contribute to medication errors (FDA, 2018). An intervention by a pharmacist is needed to detect these medication therapeutic treatment problems and improve the health care system (Al Rahbi, Al-Sabri and Chitme, 2014).

Research about medication errors reflects its wide variety and prevalence in different parts of the world. The study reported that around 12 % of all primary care patients could be affected by prescribing or monitoring errors, it was increasing to 38% in patients aged 75 years or older and 30% in patients who received poly-pharmacy service during a 12 month period (Avery *et al.*, 2012). However, In Indonesia, studies on medication safety are still very limited. A study of service failures in an Indonesian hospital that was conducted by Alfansi and Atmaja (2009), suggested that the quality of healthcare services in the country should improve their service process (Alfansi and Atmaja, 2009). It was also reported that 20.4% of prescriptions have incorrect drug doses and administration errors were the most frequent medication error identified (59%) in

Indonesia (Ernawati, Lee and Hughes, 2014). A systematic review reported the incidence of medication errors in southeast Asia that mostly occur at the administration stage (Salmasi *et al.*, 2015).

Medication errors come up through three main aspects of medication use, which come from prescription, dispensing, and administration. The regular evaluation process of prescription, dispensing and administration stages are suggested to be able to prevent medication errors. Medication errors that are stopped before any harm can occur are sometimes called “near misses”, or, more formally, “potential adverse drug events” through early detection (Aronson, 2009). The Government of Indonesia has paid attention to the protection of patient safety through the regulation of the Minister of Health number 35 of 2014 as a guideline of pharmacy care for pharmacists and pharmacy technicians to improve the quality of health services. For that reason consequently, all pharmacy teams must refer to the standards that have been set. However, these standards have not yet been fully implemented in most services. Pharmacists should play a central role to prevent medication errors.

A lack of training and communication failures was identified by the Joint Commission as an important cause of medication errors (Croteau, 2008). A tertiary hospital in central Jakarta, the hospital where the research was conducted has been an interesting focus on preventing medication errors and near-miss events. The prospective study was undertaken to determine whether the pharmacists, pharmacist assistants, and physicians through socialization on proper pharmaceutical standards by clinical pharmacists could cause a decline in medication errors during

## 2. MATERIAL AND METHODS

### 2.1 Design of Study

The study was carried out by using a quasi-experimental design without a control group in the outpatient pharmacy unit of a tertiary hospital in central Jakarta, Indonesia. All data were collected prospectively from April to May 2016 with a total of 7627 prescriptions. Ethical approval was obtained from the ethics committee from the Faculty of Medicine and Health Sciences of UIN Syarif Hidayatullah Jakarta. Pharmacists, pharmacist assistants, and physicians were included in the socialization of standards for pharmaceutical services with regulation by the Minister of Health number 35 of 2014. Clinical pharmacists performed direct intervention during prescribing and dispensing stage to prevent or resolve medication errors before and after the socialization of standards for pharmaceutical services

### 2.2. Inclusion Criteria

Inclusion criteria in this study were handwritten prescriptions that submitted in the outpatient pharmacy of a tertiary hospital in central Jakarta from 10:00 am until 2:00 pm in April - May 2016. The risk of medication errors increasing during peak hours while more than one hundred handwritten prescriptions daily. The exclude data in this study were hospital inpatients and non-medical prescribers.

### 2.3. Data Collection

Clinical Pharmacists who previously undertook training in a teaching hospital in Indonesia were the primary investigators of this research. The error classification system used in this study was based on the regulations set by the Ministry of Health Regulation number 35 from 2014 concerning the Standards of Pharmaceutical Services with slight

modifications. The direct intervention of patient care in the outpatient pharmacy service was conducted during the prescription and dispensing stages of drug administration before and after the socialization of standards for pharmaceutical services. The researchers as pharmacists and investigators identified prescribing and dispensing errors during pharmaceutical services. The errors found were communicated, confirmed and corrected to the prescribers, physicians, or pharmacist assistants. The operational definitions of this research are described as follows: a) Prescribing errors are defined as any errors in the process of prescribing the medication that leads to (or has the potential to lead to) patient harm (Aronson, 2009).

Prescribing errors can be classified in several aspects including incomplete name and medical record number, incorrect dosage form, an incorrect drug prescribed the incorrect time of administration, incorrect route of administration, incorrect dosage, and illegible handwriting. The investigator would clarify the prescriber regarding any fundamental errors encountered. Dispensing errors are defined as incorrect drug dispensed including incorrect medicine, incorrect drug strength, incorrect quantity, incorrect dosage form, incorrect drug labeling and the drugs not being available to the pharmacies. A simple statistical analysis was used to obtain the frequency of each error which was then subjected to bivariate analysis using paired T-test.

### 3. RESULTS AND DISCUSSION

In April, 3512 prescriptions were observed with 1359 near-miss events while in May 4115 prescriptions were observed with 1182 near-miss events. A total of 7627 prescriptions were observed, 2541 of which had errors. The study showed that

pharmacists intervened in 16% and 33.3% of cases during the prescribing and dispensing stages respectively before socialization in April, which can be seen in Figure 1. In May, pharmacists intervened in 15.2% and 20.2% of the cases during the prescribing and dispensing stages respectively. Although the intervention rates decreased, the difference between pre- and post-socialization was not significant ( $p > 0.05$ ), which could be attributed to the short length of this research.

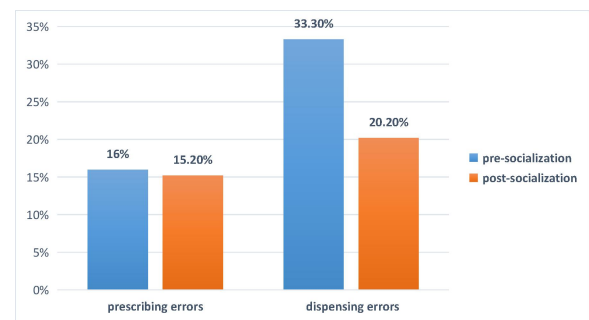


Figure 1: Prescribing and dispensing errors identified in pre and post socialization

The results showed that the frequency of medication errors was highest during the dispensing stage, which also showed the greatest decline after the socialization and the type of error that was the greatest decline was in incorrect drug labeling, which declined from 721 to 458 (Table 1). Even so, based on analysis by paired T-test, these results did not show any significant difference ( $p > 0.05$ ) between pre- and post-socialization. However, all types of errors, except for incomplete medical record numbers, declined after the intervention. Only an incomplete medical record number showed an increase which could be due to the lack of time to inform the drug prescribers.

Incorrect doses were the most frequent error that has a high risk of harm for patients. Over the course of this study, pharmacists prevented supratherapeutic doses of ramipril, candesartan, omeprazole, methylprednisolone, meloxicam,

diazepam, and amitriptyline. For example, a prescription was written for 20 mg of ramipril, while the maximum dose is 10 mg per day for hypertension (Dipiro, 2018). The pharmacists confirmed with the prescribing doctor and conferred with the patient's history, that the dosage was changed to 5 mg. Intervention by pharmacists also prevented subtherapeutic spironolactone dosage. The study could prevent five patients from receiving the incorrect route of administration. Incorrect dosage forms in prescriptions have also been corrected in this study, such as albumin and cefotaxime which were not available as a tablet. These same results, relating to the wrong dosage, strength, were found at practicing pharmacists (Al-Dhawali, 2011).

Table 1: Medication errors found in the pre and post socialization by pharmacists

Medication Errors Found	Pre-socialization (%)	Post-socialization (%)
<b>Prescribing stage</b>	561 (16)	627 (15.2)
- Incomplete name	17 (0.5)	8 (0.2)
- Incomplete medical record number	493 (14)	593 (14.4)
- Wrong dosage form	5 (0.14)	2 (0.04)
- Incorrect drug	7 (0.2)	4 (0.1)
- Incorrect time of administration	9 (0.25)	7 (0.2)
- Wrong route of administration	5 (0.14)	0
- Incorrect doses	17 (0.5)	11 (0.3)
- Illegible handwriting	8 (0.2)	2 (0.04)
<b>Preparation and Dispensing stage</b>	1171 (33.3)	832 (20.2)
- Incorrect drug dispensed	8 (0.2)	5 (0.1)
- Improper mixing	0	0
- Incorrect drug labelling	721 (21)	458 (11)
- Drugs not available in pharmacist	442 (12.6)	369 (9)
- Incorrect drug information	0	0

Direct intervention given to pharmacy assistants prevents errors in taking drugs that have similar appearance and names, namely "look-alike, sound-alike" drug names. This includes taking tranexamic acid when mefenamic acid was written in the prescription or, in another example, taking 10 mg

amlodipine when 5 mg was written. Errors in drug preparation mainly occurred because of inaccuracies, especially during rush hour, and this process of drug preparation and mixing must be thorough. Any mistakes must be quickly corrected by pharmacists and pharmacy assistants. During dispensing, work must be divided from reading the prescription, drug preparation, and delivery of medication to the patient. All these steps must be done by different people so that the prescription is checked multiple times and thus minimizing the risk of errors. Preparation and dispensing errors occur when the medication dispensed or delivered by the pharmacist is not compatible with the order written on the prescription by the prescriber (Cheung, Bouvy and Smet, 2009). About 21.6 % of drugs were not available in the pharmacy unit due to an empty stock. Drug shortages in pharmacies can be due to many reasons, including increased patients, incorrect calculations using manual or computer records, prescribers being inconsistent with hospital formularies, limited funds, the medicine being out-of-stock in the factories, and problems with administration payments. To avoid this, there should be better collaboration between the procurement of drugs, the warehouses, the hospital's finances, and the pharmaceutical sellers. Despite these errors, the results showed that the outpatient unit at a tertiary hospital, central Jakarta has relatively good service in terms of drug administration and delivering information to patients. Information given to patients includes, at the very least, how to use and store the medicine, the duration of the treatment, side effects, activities, and non-pharmacological information.

It found to be difficult in comparing reported rates of dispensing error across studies, or to differences in how the studies were designed. Nevertheless, incorrect dosage and incorrect labels were the most

common errors found in other studies. The risk of errors increased with a large number of drugs given each day in hospitals, for example, that patients get ten doses each day at least 1 and possibly 3 of those will have a mistake (Alldred *et al.*, 2016).

Data of this research indicated that intervention by clinical pharmacists to physicians, pharmacists and pharmacist assistants through proper training and socialization of pharmaceutical standards able to decrease the occurrence of medication errors. Evaluation of near-miss events based on a risk matrix showed that these were dominated by a low-degree of risk (we did not show the data). A systematic review summarises that the interventions led to improved identification and resolution of medication-related problems (Roque *et al.*, 2014). The intervention through education could change antibiotic prescribing behavior (Charles *et al.*, 2014). The implementation of a comprehensive computerized medication order system ten to provide a more comprehensive solution. Research in the late 1900s showed that Computerized Physician Order Entry (CPOE) able to reduce medication errors (Charles *et al.*, 2014). Nevertheless, recent evidence shows that CPOE has a potential contribution to other technical errors. This study has shown that medication errors can occur at every stage of the medication process. Interprofessional collaboration who disciplined in carrying out health service standards consistently would improve the culture of safety and the quality of health services.

#### 4. CONCLUSION

The intervention and socialization of proper pharmaceutical standards by clinical pharmacists could decrease the occurrence of medication errors. Future research should gather data using high-quality research designs and a longer time period

of research

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