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Identification of Medication Error Indicators at a Private Hospital in Yogyakarta, Indonesia

Irma Risdiana, *Erna Kristin[1], Adi Utarini[2]
PKU Muhammadiyah Hospital,
[1]Department of Pharmacology and Therapy,[2]Department of Public Health,
[1,2]Faculty of Medicine, Universitas Gadjah Mada, Yogyakarta, Indonesia

Abstract

A private hospital in Yogyakarta has created Patient Safety Committee to prevent error occurrence. Despite their optimal work, there are still many under reported and unprevent error incidents, one of them is medication error. The study aimed to identify the appropriate indicators to measure the medication error incident rate in a private hospital in Yogyakarta. Study design was qualitative study with action research design, involving research subjects in identifying the indicators. Data were obtained by observation, focus group discussions, group interviews and Delphi method. Medication errors were frequently occurred in a private hospital in Yogyakarta, and there has been no adequate prevention and reporting system. The hospital managers have agreed to choose medication use system with modification as indicator framework and to choose the indicators based on literature. Twenty-three indicators were proposed to the experts with Delphi method, and eighteen were agreed. Sixteen of the indicators were able to be measured technically. In the Evaluation stage, these indicators were also declared appropriate to be used. Sixteen indicators were acknowledged to be appropriate to measure medication error incident at a private hospital in Yogyakarta, Indonesia.

Key word: medication error, medication error indicators, qualitative study, action research design

INTRODUCTION

Medical error events occur in various health service units, particularly in the hospital. Medication errors are the most common cause of patient harm; it is one of the most serious errors, which often ends with irreversible damage to the health status of the patients affected.[1] In United Kingdom, prescribing error is estimated to occur in 134 prescriptions per week, and 34 of that total have the potential to cause serious events.[2] A private hospital in Yogyakarta has 207 beds. It was reported that there were adverse events (AE).[3] Most AEs were adverse drug reactions due to allergy, poly-pharmacy, and errors in the process of dispensing, such as the error in labelling, error in administration, and error in prescription transcribing.[4]

Based on this background, and considering the importance of prevention of medication error and implementation of indicators suitable for conditions and settings of health care, and the high rate of prescription service (around 500-600 prescriptions per day), we were interested to study the indicators of medication error applicable for the hospital.

OBJECTIVE

To identify the indicators suitable for measuring the medication error rate in a private hospital in Yogyakarta.

METHOD

It is a qualitative study with action research design. Data collection was conducted with several methods: observation, focus group discussion (FGD), group interview, and Delphi method. Each stage in this study might use more than 1 data collection methods.

The study was divided into 4 stages: diagnosing, planning action, taking action, and evaluating action. Each stage used more than 1 data collection methods.

Diagnosing stage was aimed to probe the potential of and the rate of medication error occurring in drug use. Data collection was conducted through the study of drug-related problems in outpatient prescriptions, and FGD with pharmacy staff and nurses.

Planning action stage was aimed to prepare a framework, identification of candidate indicators until they were chosen as indicators, and preparation of measurement guide. Data collection was conducted through group interview, Delphi method, literature searching, and observation.

Measurement of the indicators was conducted in taking action stage. Aside from measuring the event rate based on the chosen indicators, a study on various technical issues needs to consider while doing the measurement, including testing the technical feasibility of each indicator, was also conducted in this stage.

In evaluation action stage, technical indicators measured in the previous stage were evaluated using a series of requirements to assess the quality of the indicators, and through group interview with data collection staff. Instrument for the evaluation was a semi-open questionnaire developed from The Organisation for Economic Co-operation and Development (OECD) The Health Care Quality Indicator.[5]

RESULTS

1. DIAGNOSING STAGE

This study was started with the Diagnosing stage, which is a stage to understand the perspective of the stakeholders.[6] This stage was useful to observe the baseline situation.

Potential of medication error events in prescribing aspect was studied on 7706 outpatient prescriptions. The

prescriptions were analyzed using Drug-Related Problem analysis, and 435 (5.64%) drug-related problems were found.[7,8]

Results of drug-related problem study showed that 5.4% prescriptions had potential to cause problems. This is higher than the results from the American study which showed the value of 3%.[8] Various studies on patient drug use-related problems in the hospitals in Australia during 1988-2001 showed the event rate between 0.5-7.8%.[9] Therefore, based on other studies, drug-related problem events in this private hospital was quite high.

Medication error events also occurred in the practice of drug dispensing, supported by evidence from the results of FGD with pharmacy staff and nurses. Almost all participants of FGD have ever conducted or observed medication error events, in the form of the error of taking the drugs, the error in drug dispensing/administration to the patients, the error in dose calculation, the error in total number and duration of drug, the error in dissolving the drug, the error in dose, not doing skin test which caused drug adverse effects, and other events. Furthermore, results of FGD also showed that, in general, there was no standard procedure published by the hospital to manage the error, and there was a need to develop a prevention system.

Diagnosing stage was also supported with FGD with the nurses and pharmacy staff. All participants taken from various units in nursing and pharmacy with various work experience showed that they had ever conducted an error with a potential to cause danger to the patient safety. This supported the opinion that the work duration of the nurses are not related to medication error rate.[10]

2. PLANNING ACTION STAGE

The application of indicators was started with the determination of indicator framework through group interview with the vice head of management related to the policy of drug use in the hospital. The flow of medication use system with modification was agreed as the indicator framework.[11]

These candidate indicators were assessed with two-stage Delphi method, involving 13 experts. The compotitions of experts were: clinical pharmacologists (2), manager of patient safety (1), clinical pharmacists (3), pharmacy managers (5), and professional nurses (2).

Stage I Delphi method was conducted through the distribution of questionnaire, and we received response from 11 experts (84.6%), who agreed on 19 of 23 candidate indicators suggested. Agreed indicators consisted of 8 indicators of prescribing error, 5 indicators of dispensing errors, and 6 indicators of administration errors.

Stage II Delphi method received response from 10 experts (76.92%). Participation rate of experts in Stage II Delphi method showed a decrease from the previous stage. There were 18 indicators agreed on to continue to the next stage, consisted of 7 indicators of prescribing errors, 5 indicators of dispensing errors, and 6 indicators of administration errors.

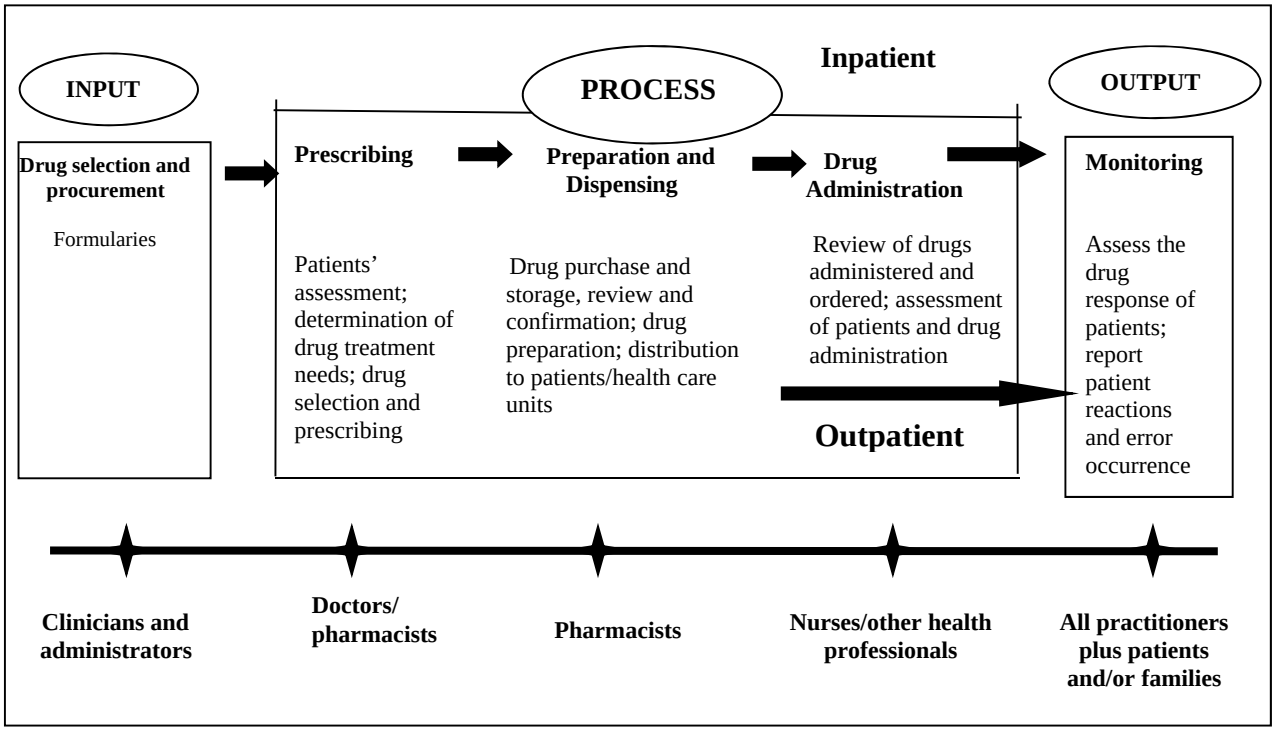

Figure 1. Indicator framework of the medication error (Nerich *et al.*, 2010)

Table 1. List of Indicators Chosen in Planning Action Stage

Indicator Group	Name of Indicator
Indicator of Prescribing Error	Average number of drug items in prescription
	Total event number of wrong drug prescription (wrong drug: inappropriate dosage form, contraindication present, condition refractory to the drug, do not indicated for condition).
	Total event number of drug prescription with too low dosage
	Total event number of drug prescription with too high dosage
	Total event number of drug prescription with 2 or more potentially interacted drugs (potential drug interaction)
	Percentage of error related to the incompatibility (pharmaceutical issue)
	Percentage of error in prescribing or vagueness in prescribing
Indicator of Dispensing Error	Percentage of error in drug taking
	Percentage of error in drug labelling
	Percentage of error in drug preparation
	Percentage of error in drug dispensing to patients
	Percentage of error in the copy writing of the prescriptions
Indicator of Administration Error	Total number of error in giving the drug to patients (wrong medication)
	Total number of error in drug dosage administered (wrong dose)
	Total event number of forgetting to give the drugs to patients
	Total number of error in choosing injection solvent (wrong diluent)
	Total number of error in determining the rate in administering the drug (wrong rate)
	Total number of incompliance to the aseptic technique (process error associated with poor aseptic technique)

Afterwards, a manual was developed as the guideline for measuring the indicators based on the indicator manual format developed by The Australian Council of Healthcare Standards with several modifications.[12] This format was chosen due to its simple technical applicability. This guide includes informations on: the name of indicators, dimension of quality, rationale, the objectve of the indicators, operational definitions and terminologies used, numerator, denominator, and data source.

The content of the guide was developed based on the literatures referred from where the indicator source was obtained. Field observation was also needed in the development of the guide for issues related to the technical aspect of drug preparation and administration practice, and technical aspect of field measurement, including the data source.

For Delphi method, response obtained in this study has exceeded the pre specified threshold, that is, more than 45-50% in Delphi method for experts with homogenous backgrounds.[13] Similar study showed higher response from experts compared to this study.[14] Furthermore, from two-stage Delphi method, 18 chosen indicators were agreed and measured in the next stage after the measurement manual was developed.

In Planning Action stage, it was agreed that medication use system[11] was appropriate as the indicator framework. Several studies also used the flow as indicator framework.[15]

3. TAKING ACTION STAGE

There were 18 indicators, as shown in Table 1, measured in Taking Action stage, involving 6 staff, consisted of staff from pharmacy units and nurses. After the measurements, there were only 16 indicators technically feasible and specific to measure. Two indicators failed in this stage, that is, percentage of error related to the incompatibility (pharmaceutical issue), and percentage of error in the copy writing of the prescriptions. Below, the results of this measurement and various technical issues related to the measurement is described and explained according to the indicator group.

There were 6862 outpatient prescriptions obtained for the measurement of the indicator of prescribing error. The results are shown in Table 2.

Table 2. Results of measurements of Indicator of Prescribing Error

Indicator of Prescribing Error	*Results*
Average number of drug items in each prescription	9.61 items/prescription
Percentage of wrong drug prescription	5.75%
Percentage of drug prescription with too high dosage	2.83%
Percentage of drug prescription with too low dosage	5.07%
Prescription of 2 or more potentially interacted drugs	4.08%
Error in prescribing or vagueness in prescribing	4 events

High total number of items in one prescription was found in compounded prescriptions and in prescriptions contained combination drugs in one single drug name. High total number of items was also found in the prescriptions of patients with chronic diseases, such as renal failure. Prescriptions from Pediatric Polyclinic and Hemodialysis Unit were the top contributor of the high total number of drug items in a prescription.

Total event number for the Indicator of errors in prescribing or vagueness in prescribing was quite high, but the measurement was difficult. Main obstacles in the measurement of this indicator was the discipline in recording by the staff.

The indicator of percentage of error related to the incompatibility (pharmaceutical issue) was not adequately specific to measure, difficult to record, inadequately

significant in doctor's prescribing, and this indicator was failed to measure.

In the perspective of dispensing error events, empirical experience of FGD participants showed a high fatality rate occurred when there were errors in injection drug taking and administration, and related aspects related to the service volume and condition, or work situations affecting the dispensing error. This opinion appears to support that work organization is a cause, but there were other contradictive results which stated that there was no association between service volume and the incidents.[16]

Results of the measurement of the indicator group of prescribing error are shown in several tables below.

Table 3. Results of the measurements of the Indicators of Dispensing Error

Indicator Name	*Total Event*
Total number of error event in drug taking	7
Total number of error event in drug labelling	4
Total number of error event in drug dispensing to patients	4

Table 4. Results of the measurements of the Indicator of Percentage of error in drug preparation

Type of Drug Prepared	*% error in preparation*
Pulveres	76.6%
Capsule	80.0%
Ointment	16.7%

In the measurement of the indicator of error in the copy writing of the prescriptions, there was no report on the events, due to technical difficulties in measurement. The involvement of patients to report the error event due to the error in copy writing of the prescriptions was also difficult. Therefore, this indicator was not included in the indicator of dispensing error.

In summary, the results of measurement of several indicators of administration error are shown in Table 5.

Table 5. Results of measurement of the Indicator of Administration Error

Indicator	Total number of events	Duration of measurement	Location
Wrong medication	8	3 months	All wards
Error in drug dosage administered	1	3 months	Pediatric wards
Forget to give the drugs to patients	29	14 days	Female wards (3rd class)
Error in choosing injection solvent	0% (30)	7 days	3rd class wards, 2nd class wards, and Babies Ward
Wrong rate error	83.3% (25/30)	7 days	3rd class wards, 2nd class wards, and Babies Ward

Indicator of administration error measured through observation using a checklist was the rate of compliance to the aseptic technique in preparation and administering the drugs to inpatients. Results of the measurement is shown in Table 6.

Table 6. Results of measurement of Indicator of Incompliance to Aseptic Technique

Type of Nurse Activities	% incompliance of procedure
Infusion installation	63.4%
Administration of bolus intravenous drug	90.9%
Administration of intravenous drug through infusion line	76.6%
Administration of intramuscular drug	100.0%

In Taking Action stage, in general, the results of indicator measurement showed higher event rate compared to those of several previous similar studies. Prescribing error events in this study were still in the event range of those in America and still in the event tolerance level in Australia.[6,7] For dispensing error and administration error rates, this study showed higher number compared to similar studies conducted in other locations.[17,18]

4. EVALUATING ACTION STAGE

Stage I evaluation was conducted with questionnaire filled out by Vice Director of Medical Support/Head of pharmacy therapeutics committee (PTC), Head of hospital patient safety committee, Secretary of PTC, Head of Hospital Pharmacy Unit, Head of Nursing Unit, and Head of Nursing Committee.

First requirement of qualified indicators, which is the importance of the measured indicator, or also referred to as relevance aspect, consists of the impact of indicator measurement, relevance to the policy, and the possibility of intervention, was shown to have an averagely good score.

Evaluation from the aspect of scientific soundness included the validity, reliability, and accurate evidence from the data measured. The score for this aspect was quite good. The last evaluation aspect was related to the feasibility of measured indicator, assessed by the availability of prototype, the easy data access, and the cost of measurement. In this aspect, the score needed doesn't have to be high nor too low. The results showed that in average, subjects were undecided (score fairly good) whether there was a prototype for each indicator.

Stage II evaluation was conducted and the data collectors generally did not find any difficulties during the measurement. Group interview results are summarized below:

a. The easiest indicator to measure is those indicators using checklist-based observations, such as for the indicator of error in drug preparation and the indicator of incompliance to the aseptic technique.
b. Indicators which need discipline in event recording and document searching were considered to be quite difficult to measure.
c. The most difficult indicator to measure is indicator group of prescribing error, due to the longer time needed to measure the indicator and the need of analytical ability with the latest literature support.

Table 7. Results of Indicator Evaluation

Evaluation Aspect		Indicator Group		
		Indicator of Prescribing error (n: 6)	**Indicator of Dispensing error (n: 6)**	**Indicator of Administration error (n: 6)**
Relevance	**Impact/Risk**	5.5 (agree) 0.5 (undecided)	6 (agree)	6 (agree)
	Relevance	5.7 (agree) 0.3 (undecided)	6 (agree)	5.8 (agree) 0.2(undecided)
	Intervention	5.7 (agree) 0.15 (not agree) 0.15 (undecided)	6 (agree)	6 (agree)
Scientific soundness	**Validity**	6 (agree)	6 (agree)	5.8 (agree) 0.2 (undecided)
	Reliability	4.8 (agree) 0.17 (undecided) 1.03 (not agree)	6 (agree)	4.97 (agree) 1.03 (undecided)
	Evidence	6 (agree)	5.8 (agree) 0.2 (undecided)	5.5 (agree) 0.5 (undecided)
Feasibility	**Prototype**	0.7 (agree) 5.3 (undecided)	6 (undecided)	6 (undecided)
	Data access	4.8 (agree) 0.5 (undecided) 0.7 (not agree)	5.5 (agree) 0.5 (undecided)	2.5 (agree) 2.8 (undecided) 0.7 (not agree)
	Cost of measurement	6 (agree)	6 (agree)	6 (agree)

Note: average value of the results of each type of indicators

DISCUSSION

This study was started with the diagnosing stage, which is a stage to understand the perspective of the stakeholders.[19] Besides, this stage was useful to observe the baseline situation.

Results of drug-related problem study showed that 5.4% prescriptions had potential to cause problems. This is higher than the results from the American study, which showed the value of 3%.[20] Various studies on patient drug use-related problems in the hospitals in Australia during 1988-2001 showed the event rate between 0.5-7.8%. Therefore, based on other studies, drug-related problem events in this private hospital was quite high.

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For dispensing error and administration error rates, this study showed higher number compared to similar studies conducted in other locations.[27,28]

CONCLUSION

Based on the results of this study, it can be concluded that medication error events, both potential and factual, occurred in a private hospital in Yogyakarta. Medication use system with modification might be applied as indicator framework, and 16 indicators were chosen, consisted of 6 indicators of prescribing error, 4 indicators of dispensing errors, and 6 indicators of administration error.

Results of indicator evaluation showed that three evaluated aspects of each indicators showed good results in the aspect of relevance and scientific soundness, while the feasibility aspect was only evaluated as fairly good. This evaluation results showed that the chosen indicators have fulfilled the pre specified requirements

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