

Medication Reconciliation as a Tool to Reduce Medication Discrepancy

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ABSTRACT

Medication reconciliation is a system for identifying drug discrepancies at different point of transition to prevent medication errors and adverse drug events. This study aimed to identify discrepancies in patients receiving and not receiving medication reconciliation and to evaluate the effectiveness of the medication reconciliation process. This was an observational cohort study. Patients who transferred from the emergency room to pediatric and internal wards Dr. Margono Soekarjo Hospital (n = 224) were arbitrarily grouped to 1) patients receiving medication reconciliation, and 2) not receiving medication reconciliation. Both groups were followed to compare medication data and reconciliation process. The result showed that 185 discrepancies were found in 139 (62%) patients who received reconciliation. Of these, 78% discrepancies were resolved by reconciliation. Meanwhile, there were found 140 discrepancies in 85 (37.9%) patients who did not receive reconciliation. All of it could not be resolved. There was a significant difference of discrepancies ($p < 0.001$) before and after reconciliation. There was also a significant difference in a number of discrepancies ($p < 0.001$) between reconciliation and non-reconciliation group. Reconciliation is beneficial to reduce discrepancies. Selection criteria of patients should be made when the health professionals performing reconciliation are limited.

INTRODUCTION

Medication discrepancy is inconsistencies between two or more medication lists; can occur at the time of hospital admission or discharge (Cornish *et al.*, 2005; Stitt *et al.*, 2011). Discrepancies can lead to medication errors. A study found that at least 14% patients experienced one or more medication discrepancies at hospital discharge (Coleman *et al.*, 2005). Another study found that 23% patients also have ≥ 1 discrepancy at hospital admission (Unroe *et al.*, 2010).

Unintentional medication discrepancy is a risk to the patient. A study showed that 38% discrepancies had the potential to cause moderate to serious harm (Cornish *et al.*, 2005). This was confirmed by another study that denoted 29% unintentional discrepancies also had the potential to cause possible patient discomfort and/or clinical deterioration (Wong *et al.*, 2008).

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Medication discrepancy can reduce with medication reconciliation at all transition points of care (Stitt *et al.*, 2011). According to The Joint Commission, medication reconciliation is 'the process of comparing patient's medication orders to all the medications that the patient has been taking' (Sentinel Event Alert, 2006). This has been set as a part of ensuring National Patient Safety Goal in the US (The Joint Commission, 2017). In Indonesia, it is compulsory for the clinical pharmacist to perform medication reconciliation as a part of pharmaceutical care in a hospital (Ministry of Health Republic of Indonesia, 2014).

Despite many pieces of evidence proved that reconciliation can reduce discrepancy (Boockvar *et al.*, 2006; Mueller *et al.*, 2012; Unroe *et al.*, 2010; Wong *et al.*, 2008), evaluation of this system since it has been implemented in a regional secondary hospital in Indonesia has never been done. Therefore, we want to identify discrepancies in patients receiving and not receiving medication reconciliation, and to evaluate the effectiveness of the medication reconciliation process in Dr. Margono Soekarjo General Hospital, Purwokerto, Indonesia.

METHODS

This was an observational prospective study, conducted in two periods, 25 April–25 May 2016 in the internal ward and 11 January–11 February 2017 in the pediatric ward, at Dr. Margono Soekarjo General Hospital, a secondary hospital located in Purwokerto, Indonesia. All patients who transferred from emergency to the internal or pediatric wards and have a complete medication data were included in the period of this study. Patients were excluded if they were admitted less than 24 hours. This study has been approved by the research and education section of Dr. Margono Soekarjo General Hospital. All patients included in this study has been signed the informed consent form.

Reconciliation in this hospital has been implemented since 2015. This hospital pharmacists have developed a medication reconciliation form and was assigned to perform reconciliation for every patient at a transition point of care. These clinical pharmacists continued with their normal duties during the study. The pharmacists generally obtain a medication history from the medical record or physicians' prescription in an emergency, or by interviewing patients or their families, then compare with the latest medication history in the wards. The reconciliation process was recorded in reconciliation form.

Due to the limited number of pharmacists, reconciliation could not be performed for all patients. So that, we arbitrarily grouped patients to 1) patients receiving medication reconciliation, and 2) not receiving medication reconciliation. For patients who receive medication reconciliation, we follow the pharmacist in charge in the wards to record reconciliation process, medication charts, and medical records of patients. Medication discrepancies were defined as any differences between the medication of patients in emergency and internal/pediatric wards. Medication discrepancies then were categorized based on the lists by Wong (Wong *et al.*, 2008). Discrepancies were categorized into 3 groups: (1) drug, including omission, no indication, therapeutic duplication, inappropriate route, needs prescription to refill not addressed, inappropriate duration; (2) dose, including incorrect dose and not renally adjusted; and (3) incorrect frequency. We count the number of discrepancies, then categorized it into a type of discrepancy. For patients who did not receive reconciliation, we record medication history, both in emergency and internal/pediatric wards, then count the number of discrepancies and type of discrepancy.

Descriptive analysis was performed to describe characteristics of patients, using Microsoft Excel. The effectiveness of reconciliation was analyzed using Wilcoxon signed rank test. The number of discrepancies in two groups was compared using Mann-Whitney U test. A p-value of less than 0.05 was considered significant. We ensured confidentiality of all data and not disclose any individual or private information of the patient. Data was presented as part of the study results as a whole.

RESULTS AND DISCUSSIONS

During the period of this study, 224 patients were included. Characteristics of patients were summarized in Table 1. Mean age in the pediatric ward was 3.9 (SD \pm 3.9). It means that most patients in the pediatric ward were toddlers. In the internal ward, the mean age of the patient was 51 (SD \pm 13.7). Some of them (17.7%) were geriatric patients.

Table 1: Characteristics of patients.

Characteristics of patients	N (%) or Mean (SD)
Reconciliation	
Receive	139 (62.1)
Not receive	85 (37.9)
Age (mean, SD)	24.1 (25.2)
Pediatric ward	4 (3.9)
Internal ward	51.1 (13.7)
Gender	
Male	126 (56.3)
Female	98 (43.8)

Table 2: Day of reconciliation.

Day of reconciliation	N (%)
0	72 (51.8)
1	18 (12.9)
2	16 (11.5)
3	10 (7.2)
4	6 (4.3)
5	7 (5.0)
6	3 (2.2)
7	3 (2.2)
8	2 (1.4)
9	2 (1.4)
Mean (SD)	1.5 (2.1)

Day of reconciliation varies greatly from day-0 of transition to day-9 (mean day-1.5, SD 2.1) (Table 2). Ninety patients (64.7%) have their medication reconciled within 0-48 hour after the transition. Many standards have suggested for reviewing the medication history should be performed within 24-hour (Barnsteiner, 2008; WHO, 2007). Another study suggested in practice setting, time of reconciliation can be expanded 24-48 hours after admission (Olavo and Kaveh, 2012). The longer the review of medication performed, the greater possibility of medication errors occurred (Quélenec *et al.*, 2013). In this study, we found that reconciliation was done on the ninth day after the transition. This was due to lacking personnel's performing reconciliation. The responsible profession to perform reconciliation was a pharmacist, one pharmacist in each pediatric and internal ward. Though reconciliation has been done to most patients, it would result in less benefit if they were performed too long after the transition. We suggested the pharmacists pay attention at the time of doing reconciliation. Adding personnel to make reconciliation would also help to make reconciliation in time.

One hundred and eighty-five (78.1%) discrepancies were found in 139 (62.1%) patients who receive reconciliation (Table 3). Of these, 78% discrepancies were resolved by reconciliation. While there were found 140 discrepancies in 85 (37.9%) patients who did not receive reconciliation. All of it could not be resolved. The effectiveness of reconciliation process was significant ($p < 0.001$), by comparing the number of discrepancies before and after reconciliation. This means the reconciliation process has been proved to reduce discrepancies and pharmacist plays a great

role to prevent medication error. This result was consistent with previous studies (Boockvar *et al.*, 2006; Mueller *et al.*, 2012; Unroe *et al.*, 2010) where reconciliation by pharmacists could reduce discrepancies. Pharmacist-conducted reconciliation in the emergency department also increased compliance with the hospital's medication reconciliation policy for admitted patients (Hayes *et al.*, 2007). This study convinces hospital management to pay attention to a better system of medication reconciliation.

Table 3: Type and number of discrepancies both in patients receiving reconciliation and not receiving reconciliation.

Type of discrepancy	Patients received reconciliation		Patients did not receive reconciliation (N, %)
	N of resolved discrepancies (%)	N of unresolved discrepancies (%)	
Drug			
Omission	136 (57.3)	7 (2.9)	91 (65)
No indication	0	0	0
Therapeutic duplication	5 (2.1)	0	2 (1.4)
Inappropriate route	7 (2.9)	0	0
Needs prescription to refill not addressed	0	0	0
Inappropriate duration	1 (0.4)	14 (5.9)	8 (5.7)
Dose			
Incorrect	19 (8.0)	27 (11.4)	28 (20)
Not renally adjusted	0	0	0
Frequency			
Incorrect	17 (7.1)	4 (1.7)	11 (7.8)
Total	185 (78.1)	52 (21.9)	140 (100)

There was also a significant difference in a number of discrepancies ($p < 0.001$) between reconciliation and non-reconciliation group. This benefit of reconciliation showed in many studies. Gleason *et al.* proved that reconciliation by pharmacists decreased potential medication errors in admission point (Gleason *et al.*, 2004). A systematic review of hospital-based medication reconciliation also showed that in 17 included studies, there was a reduction in medication discrepancies and a reduction in potential adverse drug events (5 of 6 studies) (Mueller *et al.*, 2012).

Despite reconciliation process was effective ($p < 0.001$), there should be evaluated in the process of performing reconciliation. Firstly, the health professional who responsible performing reconciliation in this hospital was only pharmacists. In this study, there were 2 pharmacists performing reconciliation, each in the pediatric ward and internal ward. Another health professional was found to help pharmacist to do reconciliation was a nurse. In this study, there were four nurses performing reconciliation in the pediatric ward. However, their involvement in reconciliation was voluntary. Reconciliation should be done in collaboration with other health professionals (e.g., physicians and nurses). Pronovost *et al.* in their study involved nurses for identifying discrepancies, resulting in reducing nearly all medication errors (Pronovost *et al.*, 2003). Physicians played a great role in responding discrepancy (85.9%) to review the drug regimen and add monitoring (Boockvar *et al.*, 2006). The previous study also found that a multidisciplinary approach

by nurses, pharmacists, and physicians can decrease the mean number of discrepancies during admission and discharge (Varkey *et al.*, 2007). We suggested to the hospital management to extend the responsibility of performing reconciliation to another health professional, i.e. nurse and physician so that all patients in the transition of care could receive reconciliation.

Secondly, due to the limited number of health professionals who could perform reconciliation, there should be screening criteria for selecting patients. Patients with high-risk, including a number of prescribing physicians before admission, number of medications (four or more medication prescription), and high-alert medication or unclear history could be the priority (Etchells *et al.*, 2009; Gleason *et al.*, 2010). Patients prescribed more than 10 medications also tend to have medication discrepancy compared to those with fewer medications (Trompeter *et al.*, 2014). Muller *et al.* defined high-risk patients as older patients (with age threshold from 55-80 years old), polypharmacy (4 to 13 medications), and have greater than 3 comorbid conditions (Mueller *et al.*, 2012).

Thirdly, evaluation of the reconciliation form should be made. Reconciliation form that pharmacist should fill in only consisted of the name of the drug, number of drugs, the direction of use, continue the drug after admission, and continue the drug after discharge. There was no information whether the discrepancy, if any, has been confirmed to the prescribing physicians or not; or information for internal transfer; or obtaining best possible medication history (BPMH) of the patient. We suggested revising the medication reconciliation form to be more structured so that there would be no ambiguity if they have read by other health professions. Redesigning reconciliation into a computerized or information technology-based medication reconciliation would also be an option. This system has been proven to decrease unintentional medication discrepancies with the potential to patient harm (Schnipper *et al.*, 2009).

The type and number of discrepancies were shown in Table 3. The most common discrepancy was the omission of drug ($n = 234$, 62.1%), e.g. ranitidine, furosemide, ketorolac, and paracetamol being used in an emergency but stopped when transferred to the wards. This usually due to condition improvement of patients. Of these, 136 discrepancies have been resolved by reconciliation. At least, every patient has a chance to have discrepancies 0.86 times (SD 1.3) when transferring from emergency towards. This result was consistent with another study where omission of drug (46.4%) was the most identified discrepancy (Cornish *et al.*, 2005). While other study stated that the omission of the drug as the second most common discrepancy (22.9%) (Wong *et al.*, 2008). Identifying type of discrepancy is important to get a better understanding of physicians to prevent them (Wong *et al.*, 2008). A study found that even the omission of medication was a common occurrence, the physician often does not have adequate information on the reasons for changes (Akram *et al.*, 2015). If it was the case, pharmacists should be the one who is responsible to clarify the discrepancy to the prescribing doctors.

The second common type of discrepancy in this study was incorrect dose. Cornish *et al.* confirmed in their study that discrepant dose was also the second most common type of discrepancy (Cornish *et al.*, 2005). The number of unresolved discrepancies in this type was quite high (27 discrepancies, 11.4%) when compared to another type of discrepancies. Of these, 26

unresolved discrepancies were found in the pediatric ward. In this ward, pharmacist together with nurses performed reconciliation. Pharmacists and nurses might have different perceptions about medication reconciliation. So, we then test the difference between the number of resolved discrepancies in pharmacist group and nurses group using Mann-Whitney U-test and found that there is no significant difference between them (p-value 0.343). This might be due to both pharmacists and nurses failed to identify dose discrepancies in pediatric patients. The pediatric patient would need adjustment dose based on the child's age, weight, or clinical response (O'Hara, 2016). Failure to identify this discrepancy may cause harm to patients. We suggested to pharmacists and nurses to pay more attention to the alteration of dose in a transition point.

Medication reconciliation should be done at every transition of care in which new medications are written, including hospital admission, the transition of care setting, or discharge (Sentinel Event Alert, 2006). The limitation of this study was we only observe discrepancies in transition between emergency and wards. Previous studies found that discrepancies occur more frequently on hospital discharge than admission (Pippins *et al.*, 2008, Varkey *et al.*, 2007). Therefore, we suggested further study to include another reconciliation setting, i.e. admission and discharge.

In this study, we only observed a number of discrepancies, while we did not make any categorization whether the discrepancy is actual or potential. We assumed that all of the discrepancies were unintentional. All patients in this study were observed their medication record until they were admitted to the pediatric or internal wards. In patients, which discrepancies could not be resolved by reconciliation, we did not track whether they experienced an actual adverse event or not. As well as in patients, which discrepancies could be resolved, we did not predict the potential medication errors or adverse drug event. Further study was suggested to follow patients to investigate the number of actual or potential adverse event.

CONCLUSIONS

Reconciliation is beneficial to reduce discrepancies. The structured reconciliation form should be revised to ensure patient safety. Selection criteria for patients should be made when the health professionals performing reconciliation are limited.

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