

## IMPACT OF MEDICATION RECONCILIATION DURING PATIENT ADMISSION

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Received: 13 Apr 2013, Revised and Accepted: 01 Jun 2013

## ABSTRACT

Medication reconciliation is a tool used to identify discrepancies in drug regimens prescribed to a patient at interfaces of care. This tool has been shown to reduce medication error by identifying discrepancies of drugs prescribed to a patient. Objective: This study was performed to identify the benefits of using medication reconciliation during admission in the local setting compared to standard medication history taking. Methods: It was performed prospectively in a local tertiary hospital with ethical approval. Results: A total of 92 patients were identified in the study. A total of 584 medications were identified during the study period. From this study population, both intended (n=196) and unintended discrepancies (n=161) were identified using the medication reconciliation tool on admission compared to no discrepancies during the standard medication history taking. In this study population, discrepancies identified were mainly errors in drug omission (94.4%), frequency error (2.6%), dosing error (1.2%) and drug interaction (1.2%). Discrepancies positively correlated with number of indication (R=0.3, p=0.0001) and number of medications (R=0.48, p=0.0001). All intended discrepancies were resolved within 24 hours. Approximately half of the unintended discrepancies were resolved within 24 hours. There was a significantly higher number of discrepancies resolved within 24 hours compared to unresolved discrepancies (p=0.0001). Conclusion: This study demonstrated that medication reconciliation allowed medications to be reviewed more thoroughly and was able to reduce medication errors more effectively than standard medication history taking.

**Keywords:** Medication reconciliation, Medication error, Hospital, Pharmacy, Discrepancy.

## INTRODUCTION

Medication reconciliation is an important tool which identifies discrepancies in drug regimens. This is performed by obtaining a complete and accurate list of a patient's medication prescribed in different care settings or at different time points [1]. It is performed with the aim in reducing the incidence of medication errors during patient care [1]. Medication error is a common occurrence in hospitalized patients. Furthermore, the average patient has at least one medication error per day with a medication error occurring every 22.7 hours during admission [2, 3, 4]. The most common type of medication errors encountered includes wrong dose, prescribing error, omission, unauthorized drug use, wrong patient, duplication, wrong drug preparation, wrong time, wrong administration technique, wrong route and wrong dosage form [5, 6, 7]. Moreover, medication error in hospitals cost an average of \$ 8,000 per incident [4, 7]. This translates to approximately \$17 billion - \$29 billion annually in the United States [4, 7].

If unresolved, medication errors can potentially cause significant harm to the patient. At least 20% of errors in medication are believed to result in patient harm with an estimated 7000 deaths each year caused by medication errors [8, 9]. One of the main concerns of medication errors is the occurrence of patient injury, clinical deterioration or adverse drug effects [2, 6]. Adverse drug events is one of the leading causes of injury in hospitalized patients and the fifth leading cause of death in the United States [7, 10]. Interestingly, a high number of medication errors that occur in the hospital are related to dispensing errors [4]. This was related to the wrong drug or wrong strength given to a patient. Another concern is the lack of drug information which is transferred to the prescriber which could potentially lead to prescribing errors [11]. Other medication errors that occur frequently during patient care which could potentially cause patient harm are performance deficit, inaccurate transcription, omitted documentation, communication and workflow disruption [6].

Medication reconciliation allows medication errors to be identified between transitions of care [7, 12]. Interfaces of care includes during admission, transfer and discharge from hospital. Approximately 46% of medication errors have been demonstrated to occur during patient transition from a clinical unit or hospital [13]. Previous work has also demonstrated that 60% of hospitalized patients have at least one error prior to admission, 22% of patients have at least one error during admission and 59% of patients have at least one error during discharge

[7, 14, 15]. The significant number of medication errors identified during each transition of care demonstrates the need to thoroughly monitor and screen patient medication between interfaces of care.

Medication reconciliation has successfully reduced medication errors in many health care organizations. It is also vital in bridging the communication gap between healthcare professionals [6]. However, there is a lack of data in the local setting. This work aims to use the medication reconciliation process in identifying common errors during patient admission and compare effects of the process with a control setting. Using the medication reconciliation process, the effect of reducing medication errors and discrepancies are highlighted in the local setting.

## MATERIAL AND METHODS

This study was performed prospectively for 8 months in a tertiary hospital. Ethical approval was obtained from the local Medical Research and Ethics Committee. Patients more than 18 years of age and newly admitted into the hospital were included in the study with informed consent. Patients were interviewed within 24 hours of admission. Those that were admitted with at least one drug and were able to communicate were interviewed to obtain a complete medication history. Information such as past medication history, diagnosis and other data relating to drug use were also identified in patient medical records.

This work was performed by subjecting the same group of patients in the normal standard clinical care, as well as the medication reconciliation process. A pharmacist is involved in providing standard care. The standard care involves identify all medication taken prior to admission through medication history taking. All medications taken prior to admission are noted. Patients are then ordered a set of medication as required by the prescriber.

Using the medication reconciliation tool, patients or caregiver will be interviewed within 24 hour of admission to gain a complete medication history [6]. This is performed by a different pharmacist. During the medication reconciliation process, community pharmacist, primary health care clinic or doctors are contacted if necessary during this time. A period of twenty four hours was then given for clarification of any discrepancies of admission orders identified. This is to permit a normal process of care in order to obtain the full medication history of the patient prior to admission [6, 7, 16, 17, 18]. From this complete list of patient past medication history, the current medication prescribed during admission is compared. Any discrepancies identified were

recorded by a pharmacist. Discrepancy is defined as any difference between the medication use before and during the admission to the hospital [16, 17, 18]. The identified discrepancies are then intervened by the pharmacist. Another 24 hours is given for prescribers to update and rectify any concerns identified during the medication reconciliation process. The medication list is then reviewed to identify any changes.

The identified discrepancies were then grouped into intentional and unintentional discrepancy [6]. Intentional discrepancy was defined as an intentional choice to add, omit or change a drug but which was not clearly documented. Unintentional discrepancy was defined as a decision to add, change or omit a drug but which was not intentional by a healthcare provider.

#### Data analysis

All data were analyzed using Statistical Package for the Social Sciences (SPSS) version 17 using appropriate inferential and descriptive statistics. Continuous variables were analysed using parametric tests whereas categorical data were analysed using non parametric tests. A p-value of less than 0.05 was considered significant.

#### RESULTS

A total of 92 patients were included in the study (Table 1). The majority of the patients in the study population were female (n=55,

59.8%). There were 63% (n=58) Malays, 16.3% (n=15) Chinese, 15.2% (n=14) Indians and the rest were of other races. Mean age of patients in the study population was 26.3 years with a range of 19-88 years. Amongst the patients in the study, 31.84% had hypertension, 26.46% was diagnosed with asthma, 8.52% was diagnosed with ischemic heart disease, 8.07% diagnosed with chronic obstructive pulmonary disease and 4.48% of the study population was diagnosed with stroke.

The same number of medications was identified when using both the standard care provided as well as the medication history taken during the medication reconciliation process. There were a total of 584 drugs taken by the patients with an average 6.35 medications per patient. Of the total drug taken, 509 were prescription drugs, 53 were supplements and 22 were over the counter medication.

During the standard care of medication history taking, no discrepancies were identified. However, when using the medication reconciliation tool, discrepancies were identified in the majority (n=85, 92.4%) of patients. A total of 357 discrepancies were noted during medication reconciliation on admission. Of the discrepancies identified during the medication reconciliation process, 196 (55%) were intended and 161 (45%) were unintended discrepancies (Table 2). The discrepancies identified were mainly errors in drug omission (94.4%), frequency error (2.6%), dosing error (1.2%) and drug interaction (1.2%).

**Table 1: Demographic data of the study population during the medication reconciliation process and correlation with the number of discrepancies identified (n=92).**

Characteristic	N=92	p-value
Age, mean (range)	26.73 (19-88)	<sup>a</sup> >0.05
Gender, n (%)	37 (40.2)	<sup>b</sup> >0.05
Male	58 (59.8)	<sup>b</sup> >0.05
Female	58 (63.0)	<sup>a</sup> 0.0001
Race, n (%)	15 (16.3)	<sup>a</sup> 0.0001
Malay	14 (15.2)	
Chinese	5 (5.4)	
Indian	2.4 (1-5)	
Others	6.35 (1-8)	
No. of indication, mean (range)		
No. of medication, mean (range)		

<sup>a</sup>Pearson correlation R; <sup>b</sup>Chi-squared analysis. A p-value of <0.05 is considered significant

**Table 2: Types of discrepancies identified during the medication reconciliation process involving 92 patients during the study duration.**

Discrepancy	Frequencies (n=357)	Percentage (%)
Intended	196	55
Unintended	161	45

An association of demographic factors with number of discrepancies identified during the medication reconciliation process. There was no significant association between numbers of discrepancies identified during medication history taking with demographic characteristics. Interestingly, there was a positive correlation between identified discrepancies and number of indications (R=0.3, p=0.0001) as well as number of medication (R=0.48, p=0.0001) (Table 1).

Intervention was proposed in all discrepancies identified during the medication reconciliation process. All intended discrepancies were resolved within 24 hours. However only 84 (52.2%) of unintended discrepancies were resolved within the 24 hour time frame. The remaining 77 unintended discrepancies were noted as outcome unknown. The total number of resolved discrepancies was significantly higher than unresolved discrepancies (p=0.0001) (Table 3).

**Table 3: The number of resolved and unresolved discrepancies identified during the medication reconciliation process (N=357).**

Discrepancy	Resolved (n)	Unresolved (n)	p-value
Intended	196	0	<sup>c</sup> 0.0001
Unintended	84	77	

<sup>c</sup>Fisher's exact test, p-value < 0.05

#### DISCUSSION

The main focus of this current work to identify the effect of medication reconciliation during patient admission in the local setting was achieved. Medication reconciliation during admission provides a thorough review of medication taken prior to admission as well as medication prescribed on admission into the hospital. Although medication history taking is a routine service provided on admission, the medication taken prior to admission is rarely compared with drugs prescribed in the ward. This could lead to confusion in patients newly admitted as drugs prescribed during admission could most likely be changed, duplicated or omitted. More importantly, the possibility of unidentified medication error prior to admission could lead to further error during admission. Indeed, using the medication reconciliation tool, there were a higher number of discrepancies identified during the medication reconciliation process compared to standard care of medication history taking provided by a pharmacist. Therefore, here we provide evidence that the medication reconciliation process is a valuable tool which allows medication errors to be reduced in the local setting.

Discrepancies in medication have been shown to occur frequently in admitted patients [6, 7]. During a thorough review of the medication reconciliation process, these errors are identified during

confirmation with carers and other healthcare personnel involved in the patients medication before admission. During this time, any drugs prescribed on admission are also compared to identify any differences in drug taken before and during admission. Clearly, this process allows a more detailed review of medication in the attempt to reduce medication errors. In this study, an average of 3.9 discrepancies per patient was identified during the study duration. Interestingly, the most common discrepancy was omission of a drug taken by a patient prior to admission into the hospital. Drug omission has also been found to occur frequently in previous work [7, 16], which further supports current findings. Failure to detect a drug taken by a patient could mainly be due to a lack in communication between prescribers and other healthcare personnel [19], an area medication reconciliation is able to bridge.

Most interesting was the correlation between the number of indication and medication with the number of discrepancies identified in this study population. Previous work has identified that the number of medication increases with indication [20]. Clearly, the higher number of medications leads to a higher possibility of medication error [21, 22]. Patients in this study population were identified to have an average of 2.4 indications per patient. Interestingly all patients were diagnosed to have at least one chronic disorder. Patients of this particular group are known to consume a higher number of prescribed medications as well as supplements and over the counter remedies. Examples of other non-prescribed drugs taken prior to admission were multivitamins, ascorbic acid, glucosamine, ginkgo biloba and herbal supplements for general well being. The high number of medication taken increases the likelihood of an error [21, 22], similarly portrayed in this present work.

Of the discrepancies identified, approximately half were intended discrepancies. Intended discrepancies are changes in medication that are not clearly noted. A change in dose or drug should be clearly noted to ensure other prescribers are aware that changes were intentional. All intended discrepancies were able to be rectified during the medication reconciliation process within 24 hours. On the other hand, unintended discrepancies were similarly intervened. However, only 52.2% were able to be rectified during the 24 hour period. Unintended discrepancies have the potential to cause more harm to a patient than intended discrepancies [23, 24]. The omission or change in drug could potentially de-stabilize a patient's condition. Therefore, it is paramount the unintended discrepancies are identified and intervened in a prompt manner.

Indeed the process of medication reconciliation during admission allows a more thorough review in an attempt to reduce medication errors. A significant reduction in discrepancies, both intended and unintended was able to be addressed within a 24 hour window. Although the process of reconciliation on admission has been performed within 36 hours [7, 16], our strict criteria was to allow any serious discrepancies to be addressed promptly. This allowed approximately 80% of discrepancies identified to be rectified within the first 24 hours. Furthermore, identifying discrepancies reduces the risks involved with medication errors such as increased healthcare cost and patient harm [25]. Thus, this tool adds further value to standard pharmacy care [26] and proves beneficial in promoting pharmacy services.

In conclusion, this work allowed an insight into the benefits of medication reconciliation on admission in the local setting. This is especially true in patients with chronic diseases whom are prescribed multiple drugs. The process of medication reconciliation on admission allows a structured system to be performed on patients to reduce errors in medication prescribing. To that end, further work needs to be performed at other interfaces of care such as during transfer of wards and during patient discharge. This is to allow standardized care is given to a patient to ensure medication errors are minimized.

#### ACKNOWLEDGEMENTS

Ethical approval was obtained from Medical Research Ethics Committee.

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