

PREVALENCE AND PREDICTORS OF MEDICATION DISCREPANCIES UPON DISCHARGE AMONG ADULT PATIENTS: A PROSPECTIVE STUDY FROM MALAYSIA

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Abstract

Keywords

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Medication discrepancy is the constant problem being encountered in healthcare settings world wide. This prospective observational study involved internal medicine wards in Queen Elizabeth Hospital, Malaysia in order to investigate the prevalence of the medication discrepancy upon discharge and identify the predictors for it. Results showed that out of 65 discharges, 33 (49%) were found to have medication discrepancy. Twenty six patients (40%) were discharged with at least one unintentional medication discrepancy also known as medication error. The only identified predictor for medication discrepancy upon discharge and medication error was number of discharge medication (adjusted OR 1.435, CI 1.147-1.797, $p = 0.002$ and adjusted OR 1.198, CI 1.026-1.399, $p = 0.022$ respectively). The most common type of medication error was omission (42.5%), followed by incomplete prescription (20%). Nutrition and blood was the therapeutic class that most involved in medication discrepancy upon discharge (37%), but 60.9% of it were intentionally made by prescriber.

Introduction

The transition of care including hospital admission, transfer or discharge is a fragile period which prone to medication discrepancy especially medication error.(Cornish et al., 2005, Forster et al., 2005, Vira et al., 2006)Studies were conducted in many countries with the intention to describe the problem, identify the types, causes of medication discrepancies, and ways to reduce their impact on patients' clinical outcomes. Two studies reported that the percentage of patients with at least one unintentional medication discrepancy upon discharge was higher as compared to admission, 41% vs. 38% and 84.2% vs. 33.7%, respectively.(Vira et al., 2006, Knez et al., 2011) Hence, the process of medication reconciliation upon

discharge is of utmost importance to identify medication discrepancy. This process has been recommended by Institute for Healthcare Improvement (IHI), United States and Ministry of Health, Malaysia.(Midelfort, 2004, Knez et al., 2011) A local study investigating the perceptions of general medical practitioners towards implementation of medication reconciliation program for patients who had been discharged from hospitals in the state of Penang, Malaysia showed that 97.7% of the respondents believed that an accurate up-to-date list of the patient's medications history will be useful towards rational prescribing process.(Hassali et al., 2012) According to a Spain study, medication discrepancies were found in 87.2% out of a total of 954 discharges.(Herrero-Herrero et al., 2011) However, when the denominator was

the total number of medication in the discharge prescription, the percentage of medication discrepancy ranged from 25.7% to 75.8% according to other two studies. (Knez et al., 2011, Wong et al., 2008) Overall, the large variations in percentage of total medication discrepancy upon discharge (MDUD) are mainly due to the variation in terminology and methodology used in the studies. Therefore, the definition of medication discrepancy must be reviewed and the measurement of the percentage must be considered when interpreting the results.

Unintentional medication discrepancy also known as medication error could lead to clinically important impact on patient's outcome such as rehospitalisation rate, if it is not properly addressed. (Vira et al., 2006, Cornish et al., 2005, Wong et al., 2008, Coleman et al., 2005) Knez et al. found that the proportion of unintentional medication discrepancies upon discharge for internal medicine patients was high (65.2%). (Knez et al., 2011) Similarly, Bandres et al. reported that the percentage of unintentional medication discrepancies was 93.2% out of total medication discrepancies detected during admission and discharge. (Allende Bandres et al., 2013) One of the most common types of unintentional MDUD was omission of medication which had an incidence rate of 22.9% to 45%. (Vira et al., 2006, Allende Bandres et al., 2013, Wong et al., 2008, Knez et al., 2011)

Previous study had showed that the total number of medication received at admission, total number of discharge medication, experience of doctor, and multiple comorbidities were the leading causes for medication discrepancy upon discharge. Besides, length of stay in hospital and the accuracy of medication reconciliation upon admission were also found to have contributed to the MDUD. (Cornu et al., 2012, Cornish et al., 2005, Geurts et al., 2013, Herrero-Herrero et al., 2011, Grimes et al., 2011)

Currently, little is known about the prevalence of medication discrepancy upon discharge, common types of medication discrepancies and its predictors in the Malaysian healthcare setting. This study was to investigate the magnitude of the MDUD problem and the result on predictor(s) will help in optimizing patient's health outcomes by finding ways to resolve such problems.

Definition of operational terms

Medication Discrepancy upon Discharge, MDUD: (Herrero-Herrero et al., 2011) Any difference between preadmission medication list, active inpatient medication chart, and written discharge prescription. It can be subdivided into two types:

- a. Intentional: justified discrepancy or adjustment, guided by the patient's new clinical condition decided after confirming with prescriber
- b. Unintentional: unjustified discrepancy or medication reconciliation error after confirming with prescriber, it is considered as a medication error

Hospital Discharge: Discharge from the hospital is the point at which the patient leaves the hospital and return home.

Types of medication discrepancies:

- a. Omission: (Herrero-Herrero et al., 2011) Failure to prescribe an active medication upon discharge without clinical explanation
- b. Therapeutic duplication: (Wong et al., 2008, Herrero-Herrero et al., 2011) Multiple agents from the same therapeutic class or as a result of automatic substitutions
- c. No Indication: (Wong et al., 2008) Medication no longer required but was reordered on hospital discharge prescription by attending prescriber
- d. Incomplete prescription: (Herrero-Herrero et al., 2011) Medication listed in the discharge prescription without dosage, frequency or duration of treatment

Methods

Study Design and Settings

A prospective observational study was conducted at Queen Elizabeth Hospital, a tertiary hospital in the west coast of Sabah, Malaysia. Five internal medicine wards (general medical wards, respiratory ward, gastro-hepatology ward and nephrology ward) were selected and data was collected prospectively from February 2015 until March 2015 or until sample size reached, whichever comes first.

Study Population

All adult patients aged more than 18 years old who are discharged from the hospital to home with the presence of clinical pharmacist during discharge was recruited. Patients who are discharged during non-office hours (conventional office hours: 8- 5pm) in view of the absence of clinical pharmacist for medication reconciliation upon discharge and patients who leave the hospital against medical

advice or are transferred to other healthcare centre or nursing home are excluded from the study.

Sample Size

Sample size was calculated by using the sample size calculator for prevalence studies. Using a 2-tailed t- test, with $\alpha = 0.05$ and $\beta = 0.20$, the required sample size was 66 patients with the precision, d level of 10%.(Naing, 2006)

Data collection

Clinical pharmacist in the selected wards (internal medicine discipline) was informed if there was any patient discharge before proceeding to dispense patient's discharge medications in accordance with the Guidelines for Inpatient Pharmacy Practice, Ministry of Health, Malaysia. Medication reconciliation was carried out by comparing the written discharge prescription, preadmission medication list and active inpatient medication chart. Any detected difference between these three documents was considered as a medication discrepancy. Each medication discrepancy was discussed by the clinical pharmacist with the attending prescriber to determine the intention of the medication discrepancy. Appropriate medication changes were made at the prescriber's discretion and resulted in the final discharge medication list. Final step in the process of patient discharge was the bedside dispensing of medications. All related information was documented in the Data Collection Form by the clinical pharmacist. The forms were collected by the researcher on a biweekly basis from the clinical pharmacists acting as data collectors. A code rather than the patient's name was used during data collection to maintain confidentiality.

Data analysis

All data were processed and analysed using SPSS® version 16.0 (SPSS Inc., Chicago, IL). Results were considered statistically significant at a level of $p < 0.05$. The primary endpoint was to determine the prevalence of MDUD and the secondary endpoint was to identify the predictors of MDUD by using multivariate binary regression analysis. Besides, the therapeutic classes of discrepant medication were categorized according to British National Formulary(British Medical Association et al., March- Sept 2014), and the types of MDUD were presented with descriptive statistic by using Microsoft Excel® 2013.

Ethical consideration

The study was registered with National Medical Research Register Malaysia with the registration ID of NMRR-15-78-24214. Ethical approval from National Institute of Health (Institute of Health Management) and Medical Research and Ethics Committee (MREC) were obtained.

Results and Discussion

A total of 65 patients were recruited into the study and approximately one- third of the patients (35%) were from nephrology ward, following by respiratory ward (28%) and other internal medicine wads. The median age of the patients was 61 years old (ranging from 17 to 91 years old) with female predominance (66.2%). Twenty three patients (28%) were admitted due to infection- origin diagnosis, followed by 20% of renal failure patients. (Refer Table 1).

Table 1: Baseline Characteristics of Patients (n= 65)

Characteristic	Value*
Age (year)	61 (25.5)
Gender, number (%)	
Female	43 (66.2)
Male	22 (33.8)
Length of stay (day)	6 (10.0)
Number of co- morbidities	2 (2.0)
Number of discharge medication, mean (SD)	6.69 (SD=3.5)
Number of admission medication	5 (7.0)
Patients' origin according to ward, number (%)	
Nephrology	23 (35.4)
General Medical	20 (30.8)
Respiratory	18 (27.7)
Gastro-Hepatology	4 (6.2)
Principal diagnosis, number (%)	
Infection	18 (27.7)
Renal failure	13 (20.0)
Chronic obstructive pulmonary disease, COPD	6 (9.2)
Hypertension	4 (6.2)
Gastrointestinal bleed	2 (3.1)
Stroke	2 (3.1)
Diabetes mellitus	1 (1.5)
Asthma	1 (1.5)
Heart failure	0 (0)
Others	18 (27.7)

* Data are given as median (IQR) unless otherwise indicated.

Out of 65 discharges, a total of 62 medication discrepancies were identified. Thirty two

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patients (49%) were detected with at least one MDUD and mostly were made with unintentional purposes (65%). Twenty six patients (40%) had at least one unintentional MDUD, however, only 7 patients (10.8%) discharged with both types of MDUD. The mean total number of discharge medication was significant higher in patients with MDUD as compared to patients without MDUD (5.36, SD=3.45 vs. 8.06, SD=3.15, $p = 0.002$). Six predictors for MDUD were analysed by using univariate binary logistic regression. (Refer Table 2) The number of discharge medication was the only predictor which showed significant association with MDUD (crude Odds Ratio, OR 1.277, CI 1.083- 1.507, $p = 0.004$). MDUD found to have no statistical significant association with all other predictors which were: age, length of stay, number of comorbidities, number of admission medication and experience of doctor (in the number of weeks of working experience in the respective ward). Furthermore, the multivariate binary logistic regression analysis found that the number of discharge medication was remained significant in the model (adjusted OR 1.435, CI 1.147-1.797, $p = 0.002$). Additionally, a separate multivariate binary regression analysis was used to identify predictors unintentional MDUD (medication error). Number of discharge medication was the only predictor found to have significant association with medication error upon discharge (adjusted OR 1.198, CI 1.026-1.399, $p = 0.022$).

Table 2: Logistic Regression Analysis of Predictors for Medication Discrepancies upon Discharge and Medication Error (n = 65)

	Medication Discrepancy upon Discharge #		Unintentional Medication Discrepancy/ Medication Error^	
Predictors	Adjusted OR (95% CI)	p value	Adjusted OR (95% CI)	p value
Age	*	*	*	*
Length of stay	*	*	*	*
Number of comorbidities	*	*	*	*
Number of discharge medication	1.435 (1.147:1.797)	0.002	1.198 (1.026:1.399)	0.022

on				
Number of admission medication	*	*	*	*
Experience of doctor (in weeks)	*	*	*	*

The most common type of medication discrepancy was "omission of medication during discharge" (40%, 25/62 MDUD). The second most frequent type of medication discrepancy was "no indication for medication listed in discharge prescription" (18%), followed by "incomplete prescription" (13%), "inappropriate or incorrect dose" (11%), and "inappropriate duration" (8%). Total of 62 discrepant discharge medications (14.3%) were involved and we found that only 40 of it were classified as medication error (9.2% of discharge medications). (Refer Table 3)

Table 3: Type of Medication Discrepancy upon Discharge by Intention

Type of Discrepancy	Intention of Discrepancy, n (%)*	
	Unintentional	Intentional
Omission	17 (3.9)	8 (1.8)
Incomplete prescription #	8 (1.8)	0 (0)
Inappropriate/incorrect dose	5 (1.1)	2 (0.5)
Therapeutic duplication	0 (0)	0 (0)
No indication	0 (0)	11 (2.5)
TOTAL	40 (9.2)	22 (5.1)

The most common therapeutic class of drug that involved in MDUD was nutrition and blood (37%, 23/62 MDUD). However, 61% (14/23) of them were intentionally made. The most common unintentional MDUD involved cardiovascular drug (14.1%), followed by gastrointestinal (14.5%) and nutrition & blood class (14.5%) respectively. (Refer Table 4)

Table 4: Medication Discrepancy upon Discharge by Therapeutic Classes*

Therapeutic Classes	Intention of Discrepancy, n (%)*
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	Unintentional	Intentional
Cardiovascular	10 (16.1)	2 (3.2)
Nutrition & blood	9 (14.5)	14 (22.6)
Gastrointestinal	9 (14.5)	1 (1.6)
Respiratory	5 (8.1)	2 (3.2)
Skin	2 (3.2)	2 (3.2)
Infection	1 (1.6)	0 (0)
Endocrinology	1 (1.6)	0 (0)
Malignant disease & Immunosuppression	1 (1.6)	0 (0)
Musculoskeletal & joint	0 (0)	1 (1.6)
Central Nervous System	0 (0)	0 (0)
O&G & Urinary disorder	0 (0)	0 (0)
Others	2 (3.2)	0 (0)
TOTAL	40 (64.5)	22 (35.5)

* Therapeutic classes according to BNF chapters

Percentage calculated over the total of 62 discrepant discharge medications

DISCUSSION

Prevalence of medication discrepancy upon discharge

Medication reconciliation at admission is a complex and time consuming process to be taken for every patient admitted to the hospital. The reconciled components include over- the counter product, traditional complementary medicine, supplement and prescribed medication from healthcare professional. With the extension of pharmacy services, clinical pharmacist is the key personnel in implementing the medication reconciliation programme at most of the tertiary hospitals. However, there are still a lot of medication discrepancies especially unintentional medication discrepancies (for instance, medication errors) been identified and rectified before the patient discharge to home.(Herrero-Herrero et al., 2011, Knez et al., 2011) These discrepancies can potentially or cause actual impact on patients' clinical outcome if they are not addressed. This study involved older population with the median age of 61 (IQR 25.5) and the mean number of discharge medication of 6.69, SD=3.6.

We reported 49% (32/65 discharges) of the patients had MDUD. This was consistent with the findings of previous overseas studies which were carried out at the internal medicine wards and reported the percentage of MDUD ranging from 39.6% to 87.2%.(Knez et al., 2011, Cornu et al., 2012, Herrero-Herrero et al.,

2011, Ann Nickerson et al., 2005)The portion of unintentional MDUD was 65% and this finding was similar to the study by Knez et al. (65.2%) and slightly lower than the finding by Wong et al (86%).(Knez et al., 2011, Wong et al., 2008)This may due to the difference in definition for unintentional medication discrepancy. For example, preadmission warfarin was discontinued during admission and unsure when to reinitiate on warfarin. Upon discharge, if the warfarin was not prescribed in the discharge prescription, this medication discrepancy was considered as intentional discrepancy if attending prescriber decided on discontinuation. However, Wong et al. considered it as potential confusion for patient due to unclear documentation and categorized it as potential unintentional discrepancy.(Wong et al., 2008)

A total of 40% (26/65 discharges) of our patients was discharged with at least one unintentional medication discrepancy. The finding was in agreement with Vira et al. which reported 41% of their patient had at least one unintentional medication discrepancy.(Vira et al., 2006) However, the reported percentage was lower when compared to other studies (ranging from 70.7%to 84.2%)(Knez et al., 2011, Wong et al., 2008)but higher than the percentage reported by Herrero et al. (5.4%). The possible reason could be the latter study was conducted by medical specialist and was reviewed retrospectively for medication discrepancy which may prone to detection bias as compared to the present prospective study. Besides, the presence of incomplete list of preadmission medicines was a criteria to exclude the cases for evaluating the medication discrepancies.(Herrero-Herrero et al., 2011)Therefore, the definition of medication discrepancy for aforementioned study was built on the assumption that the discharge medication list was the summarized medications received during hospitalization and preadmission medications. These possible reasons may lead to less discrepancy been identified and the percentage of MDUD was low. In addition, Knez et al. excluded patient discharged within three days from admission. Hence, the likelihood of more complicated or chronic diseases was higher and indirectly increased the percentage of MDUD.(Knez et al., 2011)

The present study revealed that 14.3% of discharge medications were involved in medication discrepancy when compared to

other studies which reported the percentage ranging from 25.7% to 75.8%.(Wong et al., 2008, Knez et al., 2011) Our result showed lower percentage as we included not only the patient with chronic disease, but patient with no known medical illness and they were discharged without chronic medications or less medications, which decreased the likelihood of experiencing MDUD. Furthermore, clinical pharmacists in the selected wards were involved in the study as data collector which subsequently may expose them to detection bias. The rounding pharmacists were able to intervene and update the attending prescriber regarding the latest medication list prior to discharge and this may lead to the lower occurrence of MDUD. However, this study involved only discharges with the presence of clinical pharmacist. The percentage may not be the true reflection of total MDUD because some of the non-recruited discharges may carry the medication discrepancy but were not identified or vice versa. As showed by Mark Fok et al., pharmacists' workload was negatively affected by the prescription-related problem. The mean duration for resolving a prescription-related problem was 20.1 minutes and accounted for 2 hours for a clinical pharmacist to solve the estimated 4 problematic orders per 8hours shift.(Fok et al., 2002)On the other hand, the mean time spent by a pharmacist per discharge process was 25 minutes in order to complete the medication reconciliation and may help in reduce hospital readmission rates.(Monica Lee et al., 2013) To the best of our knowledge, most of the clinical pharmacists in Malaysia are loaded with few portfolios at the same time such as involvement in Medication Therapy Adherence Clinic (MTAC), administrative work (statistic reporting, and certain hospital committee meeting), qualitative work (antibiotic usage review and audit), in-house training for Provisional Registered Pharmacist, and some out-source training such as invited lecturer for Post Basic Programme for other healthcare professionals. This heavy workload may increase the stress level and indirectly affect the capabilities and reduce the availability of the clinical pharmacist in the wards as the final line of double checking system on medication discrepancy upon discharge. This theory was extrapolated from the study by Malone et al. which showed that the pharmacist workload was the factor significantly related to the increased risk of dispensing a potential drug-drug interaction.(Malone et al., 2007)Besides, Tully et al. found that increment in

pharmacists' workload could reduce the prescribing errors identification rate (OR 0.60, CI: 0.54-0.67; 40% less errors identified on defined busiest day compared to other times) and for every additional drug chart checked above a mean number of 27 per pharmacist per day, the likelihood of identifying a prescribing error fell by 1.9% (OR 0.981, CI: 0.977-0.984).(Tully et al., 2009)Further study with different methodology to determine the prevalence of MDUD and investigate the issue of workload of clinical pharmacist is warranted.

Predictors for medication discrepancy upon discharge and medication error

The number of discharge medication was found to be a significant predictor for MDUD in univariate binary logistic regression model. This finding was in agreement with the study by Cornu et al. (crude OR 1.15, $p < 0.05$). (Cornu et al., 2012)On the other hand, the insignificant predictors found from our study were similar to some previous studies such as age of the subjects.(Cornu et al., 2012, Herrero-Herrero et al., 2011)Nevertheless, Marti et al. study showed that age was the significant predictor for MDUD (crude OR 1.05, $p < 0.05$). (Climente-Marti et al., 2010) Besides, our study found experience of prescriber was not the predictor for MDUD ($p > 0.05$) as found by other study.(Seden et al., 2013) Until now, these factors remain controversial for predicting the occurrence of MDUD. Multivariate binary logistic regression was used to further identify the real significant predictors for MDUD by taking the consideration of confounding factors. The number of discharge medication was again found as the only predictor for MDUD. This finding was not consistent with the result from Cornu et al. study.(Cornu et al., 2012) However, the main reason that makes direct comparison become almost impossible was the large variation in terminology and methodology approaches for studies as mentioned before. For example, Grimes et al. found the number of medications at discharge was one of the predictor for medication non-reconciliation (OR 1.26, CI 1.21-1.31, $p < 0.001$), but the intentional and non-intentional components was included for the definition of non-reconciliation, whereas the present study defined separately for intentional and unintentional components for medication discrepancy.(Grimes et al., 2011)On the other hand, total number of discharge medication was identified as significant predictor for unintentional discrepancy (for instance,

medication error). Patient discharged with an additional medication was associated with 1.2 times of chance to have medication error. This is important because the negative clinical impact on patient's outcome was deemed to cause by the medication error.(Lehnbom et al., 2014, Wong et al., 2008) This result was not in agreement with Herrero et al., which found that the number of permanent admission medication was the predictor for medication error.(Herrero-Herrero et al., 2011) However, the baseline characteristics of patients in the Herrero et al. study were difference from the present study which in turn may lead to different occurrence of MDUD. For example, the subjects in Herrero et al. study were older (mean age 80.7 vs. 61 years old), have more co-morbidities (6.6 vs. 2) and higher number of pre- admission medications (6.3 vs. 5) as compared to the present study.

The final model was considered as fair model in predicting the MDUD because the overall correctly classified percentage and the area under the ROC curve were 58.5% and 71.1% respectively. According to Swiss Cheese model of system accident, for instance, medication discrepancy, in order to have an accident, the system approach and person approach must be bypassed. System approach includes defences, barriers, and safeguards mechanism to prevent an accident, whereas person approach focuses on unsafe acts or errors by individual that lead to an accident.(Reason, 2000) By referring to the modified Reason's model of accident causation by Tim et al., there are other confounding factors that were not investigated in the present study such as error- producing factors including working environment, team, individual, patient and task factor.(Dornan et al.) These factors played important role in prescribing error as described by few studies.(Dornan et al., Ryan et al., 2014) Therefore, the present study could not rule out the influences by these confounding factors. Further study with improved methodology is needed to identify more predictors for MDUD.

Types of medication discrepancy upon discharge (MDUD) and the therapeutic classes involved in MDUD

Omission of medication during discharge was the most common type of unintentional MDUD (42.5%) and this result was consistent with the percentage reported by previous studies (ranging from 22.9% to 45%)(Vira et al., 2006, Allende Bandres et al., 2013, Wong et al., 2008)A study showed that the omission

error during hospitalization was caused by the inaccuracy of history taking during admission but it did not investigate the cause of omission during discharge.(Tam et al., 2005)The assumption of comprehensive review on patient pharmacotherapeutic plans and performed best at medication reconciliation by clinical pharmacist during admission in this study may lead to the omission error during discharge when extrapolate the theory from previous study. The other possible reason that results in omission error during discharge was because the junior doctors who were responsible to prescribe discharge medication had inadequate experience and training on the discharge procedure. For example, the junior doctors did not update the latest discharge medication list by referring to the inpatient medication chart and medication history assessment form. A usual practice of junior doctors was to list down only main treatment for primary diagnosis in the case note. Thus, when they transcribe to discharge prescription, omission error was more common. Besides, we reported 20% of unintentional MDUD was contributed by incomplete prescription (included incomplete dose, frequency and duration) which have been reported in various previous studies (4% to 80.6%).(Wong et al., 2008, Vira et al., 2006, Allende Bandres et al., 2013)The most frequent therapeutic class of discrepant medications involved in this study was nutrition and blood (37%). However, 60.9% of the discrepancy was justified and intentionally planned by the prescriber. The majorities of the patients recruited in this study were end stage renal disease patient from nephrology ward. As these patients mostly needed vitamin supplements, the chances of prescribing these medications were higher than other wards. In view of supplement purposes, the prescribers may intent to prescribe upon discharge and therefore become intentional medication discrepancy. The second common therapeutic class of discrepant drug was cardiovascular drug (19%) followed by gastrointestinal drugs (16%) regardless of the intention. The finding was not in agreement with previous studies because our study involved subspecialty wards such as nephrology and gastro-hepatology ward which narrow down the choice of drugs being used and the MDUD were more prone to certain therapeutic classes as compared to other studies in which they included general internal medicine wards only.(Lehnbom et al., 2014, Grimes et al., 2011, Allende Bandres et al., 2013)

Limitations

Involvement of selected medical wards results in limited generalizability. Unblind clinical pharmacists were involved in the study and this may lead to detection and selection bias. In addition, the assumption that clinical pharmacist did a comprehensive review on patient pharmacotherapeutic plan and performed best at medication reconciliation in order to identify medication discrepancy possess the risk of overlook the medication discrepancies.

Conclusion

Magnitude of the medication discrepancy problem at discharge was one of the main concerns in treatment process. The present study showed 49% of the discharges were detected with at least one medication discrepancy and 40% were discharged with at least one unintentional medication discrepancy, for instance, medication error. The most common type of medication error was "omission" (42.5%), followed by "incomplete prescription" (20%). The only predictor for medication discrepancy upon discharge was the number of discharge medications (adjusted OR 1.435, CI 1.147-1.797, $p = 0.002$). Number of discharge medication also the only predictor for medication error (adjusted OR 1.198, CI 1.026-1.399, $p = 0.022$). Every additional discharge medication increased the likelihood of experiencing medication error by 20%. Presence of clinical pharmacist for medication reconciliation during discharge helps in detecting the discrepancy and may prevent negative clinical outcome on patients.

Future perspectives:

Stratified sampling method is suggested to prevent the uneven data contribution from different wards may affect the data presentation and limit the generalizability. Independent research pharmacist as data collector warranted to reduce selection and detection bias. More extensive study, qualitative study or subsequent interventional study is suggested to investigate other predictors such as comfortable working environment, well-trained prescribers, clinical pharmacists' workload and proper supervision to junior prescriber in order to improve patient safety.

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