Clinical Relevance of Prescription Omissions and Dosing Inconsistencies in Patients Transferred Between Emergency and Inpatient Care

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Abstract

Transition from the emergency department to the inpatient unit is a risky process where prescriptions can get overlooked or changed unintentionally; however, the clinical significance of such discrepancies has been inadequately described. The aim of the current research was to establish how often and clinically significant were medication omission and dosage differences in transferred patients. The novelty of this research is that both types of discrepancies were scored together with regard to the potential harm and connected with short-term outcomes. This was a retrospective, hospital-based, cross-sectional analytical study of 312 adult patients transferred from the emergency department to medical and surgical units of the tertiary teaching hospital. Medication history, verified by pharmacists, was compared with prescriptions of the emergency department and inpatient orders made within 24 hours after admission to the ward, and discrepancies were scored with respect to their potential harm by a clinical panel. Chi-square and multivariate logistic regression analyses were conducted in SPSS version 27. At least one unintentional discrepancy was detected in 189 out of 311 patients (60.6%), including 412 discrepancies, with 264 (64.1%) being medication omissions and 148 (35.9%) being dosing issues. A total of 241 discrepancies (58.5%) were categorized as moderate or major, and 134 patients (42.9%) had at least one clinically significant discrepancy. The independent risk factors for clinically significant discrepancies were polypharmacy (adjusted OR = 2.93; 95% CI: 1.71–5.02) and no pharmacist reconciliation in the emergency department (adjusted OR = 2.41; 95% CI: 1.43–4.06). Clinically significant discrepancies were found to be linked with clinical instability during the first 72 hours (adjusted OR = 3.12; 95% CI: 1.52–6.40) and a longer hospitalization (7.9 ± 3.6 days compared to 5.6 ± 2.9 days; $p < 0.001$).

Keywords: Prescription Omissions, Dosing Inconsistencies, Medication Reconciliation, Transitions of Care, Emergency Department, Inpatient Care, Patient Safety.

1 INTRODUCTION

1.1. Background of Medication Safety During Care Transitions

The patients arriving through the emergency department will move through many clinical settings in a short period of time and the process of managing their medications will be shared among many different teams. The prescribing done by the emergency physicians will generally take place under considerable time constraints with limited patient history while the inpatient physicians rely on the information provided at the time of the handover (Cornish et al., 2005). Transitions are known to be one of the times when clinical information gets missed or distorted and according to the World Health Organization, medication safety during these transitions has become a key area for them since they can cause significant preventable harm (Coleman & Berenson, 2004; Charlson et al., 1987). The prescription omission and dosage inconsistency are two of the most common types of discrepancies reported.

1.2. Prescription Omissions and Dosing Inconsistencies as Sources of Harm

Failure to administer an anticoagulant, anti-epilepsy drug, insulin, or beta-blockers could result in the development of thromboembolism, seizures, hyperglycemia, or tachycardia (Boockvar et al., 2004). An unexpected rise in dose of an antihypertensive or a sedative would give rise to the conditions of hypotension and falling (Bates et al., 1995). However, many adverse drug events among in-patients occur during prescription stage, which introduces errors related to selection, dosage, and continuation of the medication (Tam et al., 2005). Nevertheless, all of these errors do not necessarily produce an adverse effect on health of the patient.

1.3. Research Gap

The majority of discrepancy studies are focused either on admissions from the community or discharges, with the exception that most studies measure only the frequency of discrepancies and do not evaluate their clinical significance. The transition from the emergency department to the inpatient setting has been investigated much less than the above-described transitions despite the fact that patients who belong to such groups are sick and are prescribed medication by different physicians in a matter of hours.

1.4. Aim and Objectives

In order to assess the incidence and impact of prescription omissions and dosing errors in the transfer of patients from the ED to inpatient wards.

1. To determine the prevalence of prescription omissions and dosing errors and their distribution by medication category.
2. To classify the clinical significance of each discrepancy according to a severity scale.

3. To assess the demographic and process variables that are significantly associated with clinical significance of a discrepancy.
4. To evaluate the relationship between clinically significant discrepancies and clinical deterioration, care escalation, and hospital length of stay.

2 REVIEW OF LITERATURE

2.1. Medication Discrepancies at Hospital Admission and Transfer

In a systematic review of medication history errors during hospital admission, it was noted that a large percentage of patients had experienced some kind of error, of which failure to record a regular medication was the most common (Tam et al., 2005). In a prospective cohort of patients admitted to the general medicine service, it was seen that more than half of these patients had at least one unintended discrepancy between the preadmission history and the admission orders, and it was also observed from a multicenter analysis that the burden of reconciliation errors rose with an increase in home medications (Gleason et al., 2010).

2.2. Classification of Clinical Severity of Discrepancies

Due to the high number of discrepancies, many researchers rate them based on the potential harm they may cause using the independent judgment of clinicians and pharmacists on the possibility of the patient suffering from either moderate or severe distress or deterioration.

2.3. Risk Factors and Process Determinants

Patient determinants for inconsistencies in medication reconciliation are age, multiple medications, and multimorbidity, increasing the complexity of the regimen and the risk of under-documentation (Gleason et al., 2010; Hellström et al., 2012). Process determinants are the lack of a structured medication history and lack of communication between the prescribing physicians.

2.4. Reconciliation Interventions and Remaining Evidence Gaps

The systematic review regarding the practice of reconciliation in hospitals stated that almost all interventions decreased the number of discrepancies but did not provide evidence concerning patient outcomes (Mueller et al., 2012). According to the Cochrane review, the quality of evidence about the link between reconciliation and its outcomes was low. The programs based on the work of pharmacists were linked to fewer unintentional errors during the transitions of care (Mekonnen et al., 2016). Nevertheless, few researchers have focused on studying the problem of omissions and dose inconsistencies at the emergency-inpatient transition level.

3 METHODOLOGY

3.1. Study Design, Setting, and Participants

A retrospective, cross-sectional analytical study was carried out in a tertiary care hospital that is a teaching institution. Adult patients aged 18 years and above who were admitted from the emergency department into the medical or surgical wards between January and December 2025 and had taken one regular medication prior to the admission were the inclusion criteria. Direct admissions into the intensive care units and operating theaters, discharges, and deaths within 24 hours of arrival at the wards and patients with missing information were exclusion criteria. Sample size was calculated as a minimum of 267 patients for a single proportion based on 50% prevalence, 95% confidence level, and 6% absolute precision, while 307 patients were taken due to 15% missing data, and a total number of 312 patients were taken. The study was approved by the Institutional Ethics Committee and informed consent was waived as anonymized information was used.

3.2. Medication Data Sources and Definition of Discrepancies

Three types of medication information sources were compared per patient: the Best Possible Medication History (BPMH) recorded by a clinical pharmacist based on at least two sources, such as interview, dispensing records, and discharge summary; prescriptions written at the emergency department; and ward medication orders recorded within 24 hours of arrival at the ward. A prescription omission was considered to be any regularly taken medication that appeared in the BPMH or the emergency department, but was not ordered at the ward level, unless there was an explicit medical reason for that omission. Dosing inconsistencies were defined as any medications that appeared in both of the medication information sources with the dose, frequency, or mode of administration different from that recorded elsewhere, without any justification. The overall rate of discrepancies was calculated in terms of the percentage of entries reviewed for the medications equation (1).

$$MDR\ (\%)\ = \frac{N_O\ +\ N_D}{N_M} \times\ 100 \quad (1)$$

Equation (1) states the medication discrepancy ratio (MDR) to be the sum of the number of missing prescriptions (NO) and dosing errors (ND) divided by the total number of medication entries examined (NM) times 100.

3.3. Assessment of Clinical Relevance and Outcomes

Each unintentional discrepancy was independently assessed for the potential for harm by a clinical pharmacist and a physician using a three-level rating scheme modified from an earlier classification system. An unintentional discrepancy was rated minor if it did not have the potential to cause discomfort or deterioration; moderate if it could cause discomfort or deterioration in treatment response; and severe if it could cause serious deterioration or even death. Inter-rater disagreements were settled by a third assessor, and inter-rater reliability was measured with Cohen's kappa ($\kappa = 0.82$). All moderate and

severe discrepancies were deemed clinically significant. Deterioration was described as an adverse drug event, a drug-associated alteration in vital signs and/or lab values requiring therapy, documented in 72 hours after admission to the ward. Escalation of care (rapid response team activation or referral to an intensive or high dependency unit) and length of hospital stay were additional outcomes. The following independent variables were collected: age, gender, Charlson score, number of pre-admission medications, admitting specialty service, time of transfer, and pharmacist-conducted medication reconciliation.

3.4. Statistical Analysis

The data were analyzed with the SPSS software (version 27 for Windows, IBM Corp.). Continuous data were expressed as mean ± standard deviation or median and interquartile range (IQR), depending on the distribution verified with the Shapiro-Wilk test, and categorical data were expressed as frequency and percentage. The relationship between categorical data was evaluated by chi-square test or Fisher's exact test and continuous data were compared using independent samples t-test. Potential factors associated with at least one clinically relevant discrepancy were found through multivariable binary logistic regression and the corresponding adjusted odds ratio (AOR) with 95% confidence interval (CI). Another adjusted model for age, comorbidity, and number of medications was constructed to explore the potential relationship with clinical deterioration. Two-tailed $p<0.05$ was considered statistically significant.

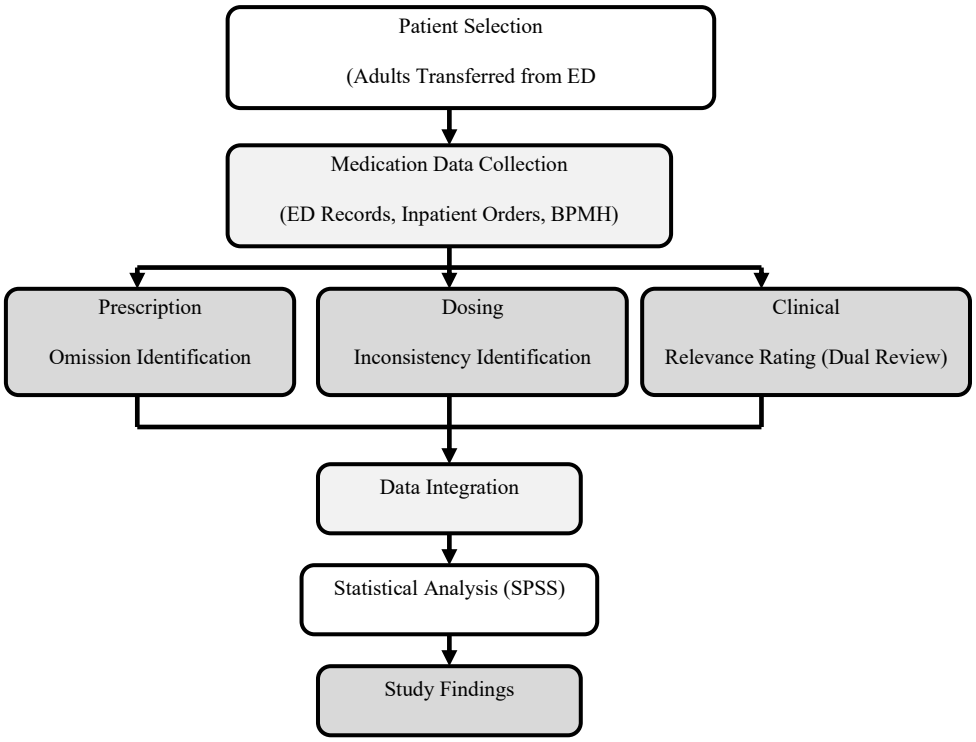


Figure 1: Methodological Architecture of the Study

Figure 1 illustrate the information related to the drugs of the patients who had been transferred was gathered from the records of the emergency room, inpatient orders, and best possible medication history

created by the pharmacists. Three separate processes were then done namely identification of drug omission, dosing inconsistency, and clinical relevance assessment.

4 RESULTS

4.1. Patient Characteristics and Medication Profile

Table 1 shows total of 312 patients were enrolled in the study. The average age was 63.8 ± 16.9 years; 171 (54.8%) of the participants were men, while 164 (52.6%) were 65 years old or above. The median number of medications before admission was 6 (IQR 4-9), with 207 (66.3%) patients having polypharmacy exposure, which is five or more prescribed medicines. There were 2,184 medications listed altogether, averaging at 7.0 ± 3.4 per patient. Pharmacists' medication reconciliation in the emergency room involved 118 patients (37.8%).

Table 1: Patient Characteristics, Discrepancy Profile, Clinical Relevance, and Outcomes

Characteristics	Category	n (%)
Demographic and clinical profile		
Age	18–44 years	54 (17.3)
	45–64 years	94 (30.1)
	≥65 years	164 (52.6)
Sex	Male	171 (54.8)
	Female	141 (45.2)
Charlson comorbidity index	≥3	128 (41.0)
Pre-admission medications	≥5 (polypharmacy)	207 (66.3)
Transfer process		
Time of transfer	Day (07:00–19:00)	173 (55.4)
	Night (19:00–07:00)	139 (44.6)
ED pharmacist reconciliation	Performed	118 (37.8)
Discrepancy profile (patients)		
Any unintentional discrepancy	Present	189 (60.6)
Prescription omission	≥1 omission	156 (50.0)
Dosing inconsistency	≥1 inconsistency	98 (31.4)
Clinical relevance (discrepancies, n = 412)		
Minor	No or minimal potential harm	171 (41.5)
Moderate	Potential for discomfort or altered response	168 (40.8)
Severe	Potential for serious deterioration	73 (17.7)
Clinically relevant (moderate + severe)	Patients with ≥1 such discrepancy	134 (42.9)
Outcomes		
Clinical deterioration within 72 h	Present	45 (14.4)
Escalation of care	Present	26 (8.3)
Hospital stay (days)	Mean ± SD	6.6 ± 3.4

4.2. Frequency and Pattern of Discrepancies

Unintentional discrepancies were found in at least one patient in 189 cases (60.6%). Intentional discrepancies were found in 96 cases and excluded from the study, resulting in 412 unintentional discrepancies, medication discrepancy rate of 18.9% of 2,184 medication entries and a mean number of 1.32 discrepancies per patient (2.18 discrepancies per affected patient). Prescription omissions represented 264 discrepancies (64.1%), while dosing inconsistencies – 148 (35.9%). Omissions occurred in at least one patient in 156 cases (50.0%), while dosing inconsistencies occurred in at least one patient in 98 cases (31.4%), both omissions and dosing inconsistencies were present in 65 cases (20.8%). Among the dosing inconsistencies, the alteration of dose represented the most common type of change (88 out of 148; 59.5%).

The distribution according to medication classes is presented in figure 2. The largest number of discrepancies was associated with cardiovascular agents (107; 26.0%), followed by antithrombotic agents (62; 15.0%) and antidiabetics (61; 14.8%). Omissions exceeded dosing inconsistencies in each class, while the difference was the smallest in the case of antidiabetics (33 vs. 28).

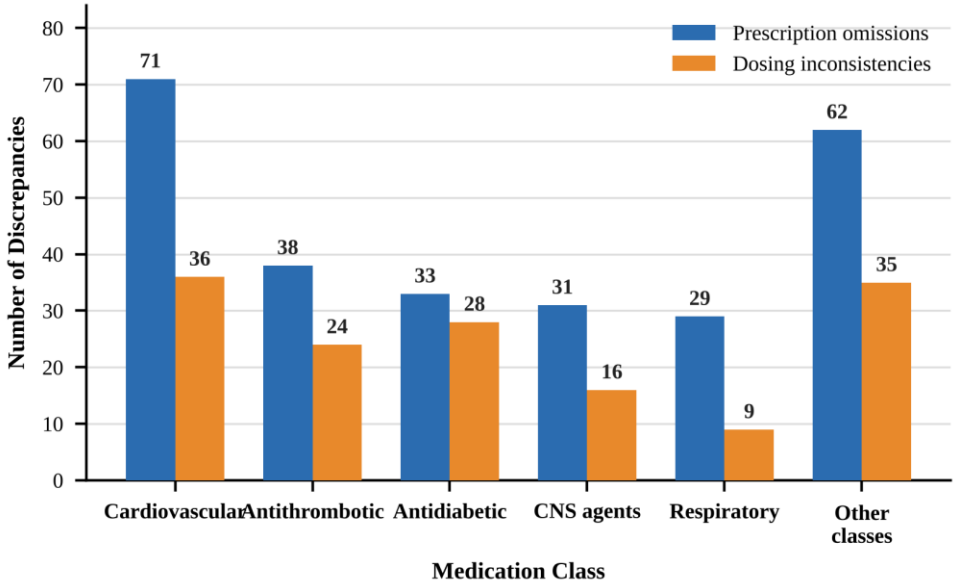


Figure 2: Distribution of Prescription Omissions and Dosing Inconsistencies by Medication Class

As illustrated in figure 2, the cardiovascular drugs ranked first with regard to the number of omissions (71) and drug administration inconsistencies (36), whereas the antithrombotic and antidiabetic drugs together caused 123 inconsistencies (29.9%).

4.3. Clinical Relevance of Discrepancies

Of the 412 discrepancies, 171 (41.5%) were classified as minor, 168 (40.8%) as moderate, and 73 (17.7%) as severe so that 241 discrepancies (58.5%) were deemed clinically relevant. In terms of patients, 134 patients (42.9% of the total sample and 70.9% of those with any discrepancy) had at least

one clinically relevant discrepancy. Omissions tended to be clinically relevant more frequently than dosing inconsistencies (164 of 264; 62.1% vs 77 of 148; 52.0%; $\chi^2 = 3.98$, $p = 0.046$) while there was no significant difference between the proportion classified as severe (51 omissions; 19.3% vs 22 dosing inconsistencies; 14.9%; $p = 0.26$). The proportion of clinically relevant was greatest for antithrombotics (44 of 62; 71.0%) followed by antidiabetics (38 of 61; 62.3%) and cardiovascular drugs (66 of 107; 61.7%) and lowest for others (47 of 97; 48.5%) although there was no significant difference between classes ($\chi^2 = 9.96$, $p = 0.076$).

4.4. Factors Associated with Clinically Relevant Discrepancies

Discordances occurred more often in polypharmacy group patients (145 out of 207; 70.0%) compared to those who took less than 5 medications (44 out of 105; 41.9%; $\chi^2 = 23.10$, $p < 0.001$). The presence of the intervention in form of pharmacist's medication reconciliation in the emergency department was associated with a lower prevalence of discordances (52 out of 118; 44.1%) compared to its absence (137 out of 194; 70.6%; $\chi^2 = 21.66$, $p < 0.001$). In multivariable analysis, factors independently associated with at least one clinically relevant discrepancy were: polypharmacy (adjusted OR = 2.93, 95% CI 1.71-5.02, $p < 0.001$); lack of medication reconciliation in the emergency department performed by pharmacist (adjusted OR = 2.41, 95% CI 1.43-4.06, $p = 0.001$); Charlson index of 3 or higher (adjusted OR = 1.98, 95% CI 1.15-3.41, $p = 0.014$); night time transfer (adjusted OR = 1.84, 95% CI 1.10-3.07, $p = 0.020$); and age of 65 years or older (adjusted OR = 1.72, 95% CI 1.03-2.88, $p = 0.039$).

4.5. Association with Clinical Outcomes

Deterioration during the first 72 hours was experienced by 45 patients (14.4%). Deterioration was common in the group that had at least one clinically significant discrepancy (31 of 134 patients; 23.1%) as compared to the group without any clinically significant discrepancy (14 of 178 patients; 7.9%; $\chi^2 = 14.44$, $p < 0.001$), even after adjusting for age, comorbidity, and number of medications (adjusted OR = 3.12, 95% CI 1.52-6.40, $p = 0.002$). In addition, care escalation was required in 18 patients (13.4%) with a clinically significant discrepancy as compared to 8 (4.5%) without clinically significant discrepancy ($\chi^2 = 8.00$, $p = 0.005$).

5 DISCUSSION

5.1. Interpretation of Major Findings

Unintentional discrepancies were found in 60.6% of patients, omissions constituted almost two-thirds of all discrepancies (64.1%), and 58.5% of discrepancies were graded as either moderate or severe. Omissions were more frequently clinically significant compared to dosing discrepancies (62.1% compared to 52.0%) due to the fact that the complete discontinuation of chronic medication eliminates the therapeutic effect of the treatment while changes in dosage usually result in partial loss of control. The high number of clinically significant discrepancies among anticoagulants, antidiabetics, and

cardiovascular drugs suggests the disproportionate contribution of drug classes with a narrow therapeutic index to possible adverse outcomes.

5.2. Comparison with Previous Studies

The frequency of discrepancies found in this study is in line with the frequency found at admission, where the most frequent discrepancy was the omission of a frequently taken drug. The relation with the frequency of the medication use is consistent with prior studies, and the relation of medication reconciliation done by pharmacists with lower discrepancy rates is consistent with prior review studies about pharmacy-led programs, even though the effect of medication reconciliation on patient outcome has been characterized as limited.

5.3. Clinical Implications and Study Limitations

The emergency-to-inpatient transition must be regarded as a separate point of reconciliation. Proactive compilation of medication history by pharmacists and standardized transfer of the verified medication list, as well as the ward-level reassessment within 24 hours of admission, take care of process factors identified, whereas targeting resources to polypharmacy, multimorbidity, older age, and nighttime transfer will help allocate scarce resources to high-risk individuals.

Several limitations need to be mentioned. The retrospective and single-center design does not allow generalization and causal inference, and residual confounding by illness severity cannot be ruled out. Clinical significance was determined from the viewpoint of possible harm, but not all discrepancies would affect patients. Adverse outcomes were defined for 72 hours after admission and registered in the chart.

6 CONCLUSION

In this study, it can be noted that the problem of unintentional medication discrepancies during transfer from the emergency room to inpatient setting is one of the serious challenges related to patient safety. Out of 312 patients examined, 189 (60.6%) had at least one such discrepancy which included 264 instances of prescriptions omission (64.1%) and 148 dosing discrepancies (35.9%). Out of total 412 discrepancies, 241 (58.5%) were considered as having moderate or severe possible clinical outcomes. Multivariate analysis revealed polypharmacy (adjusted OR = 2.93; 95% CI: 1.71–5.02; $p < 0.001$) and lack of emergency department pharmacist-reconciliation (adjusted OR = 2.41; 95% CI: 1.43–4.06; $p = 0.001$) as two significant independent variables. Other significant variables were the presence of a higher number of comorbidities (adjusted OR = 1.98; $p = 0.014$), nighttime transfers (adjusted OR = 1.84; $p = 0.020$), and age over 65 years (adjusted OR = 1.72; $p = 0.039$). Clinical inconsistencies were linked to increased rate of clinical deterioration in 72 hours after transfer (adjusted OR = 3.12; 95% CI: 1.52–6.40; $p = 0.002$) and longer duration of hospitalization (7.9 ± 3.6 vs. 5.6 ± 2.9 days; $p < 0.001$). These results confirm the implementation of structured medication reconciliation facilitated by pharmacists at the time of patient transfer. Identification of patients at risk and

enhancement of communication among health care providers might prevent medication errors and improve continuity of care. Future studies should be conducted to confirm these measures.

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