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Research Article

The Role of the Pharmacist in Decreasing Discharge Medication Discrepancies for Cancer Patients in Qatar: A Prospective Cohort Study

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Abstract

Pharmacy medication reconciliation during admission or at discharge is a crucial step for an error-free patient safety environment. Outpatient Pharmacist (OP) play a lead role in detecting medication-related problems, this urges the need to translate their qualitative values into quantitative measures.

Objectives: To investigate the impact of OP intervention during Discharge Reconciliation (DR), in reducing medication errors and discrepancies. In addition, to detecting the most common medication-related problems.

Methods: This is a prospective observational study, conducted at the main tertiary cancer hospital (National Centre for Cancer Care and Research) in Qatar. All discharged inpatient that have valid prescriptions were included in the study over a duration of 10 months. A form was generated to be filled by OP in case they encountered a discrepancy or error. The data inputs were collected and categorized into a medication error or discrepancy. A statistical analysis was performed using STATISTICA 11.0 and descriptive statistics.

Results: A total of 591 discharged prescriptions with 4293 medications orders included in the study; 278 (47%) prescription required pharmacist intervention. A sum of 190 medication discrepancy and 122 medication errors were detected. The most common medication-related problems were the incomplete orders and restricted medication (34% and 29%, respectively), followed by wrong dose and need of additional drug (18% and 24%, respectively). OP played a significant role in preventing medication errors in a rate of (69/1000 orders) of incomplete orders, (37/1000 orders) of wrong dose and 22/1000 orders of extra doses.

Conclusion: The outpatient pharmacist has a significant role towards detecting and reducing medication errors and discrepancies upon patient discharge. However, despite their effective interventions, most of these medications related problems are preventable. We assume that by an improved quality process and awareness, we can create a safe and efficient environment for both patients and healthcare providers.

Keywords: Discharge Medications; Medication Reconciliation; Medication Errors; Pharmacist Interventions; Outpatient Pharmacist

Background

Medication reconciliation is the process of creating the most accurate list possible of all medications a patient is taking, including; drug name, dose, indication, dosage form, frequency and route of administration, and comparing it against the list of admission, transfer, and/or discharge orders [1].

Medication reconciliation is a formal process in which healthcare professionals partner with patients to ensure accurate and complete medication information transfer at interfaces of care. It involves a systematic process for obtaining a medication history and then comparing that information with the medication orders at transitions in order to identify and resolve discrepancies, with the purpose of preventing lack of clinical benefit and adverse drug events.

To be effective and sustainable; this process is a shared responsibility of a team of interprofessional practitioners, including phy-

sicians, pharmacists, nurses, technicians and other healthcare professionals, in collaboration with patients and their caregivers [2].

In some institutes including our institute; medication reconciliation starts with the clinical pharmacist upon admission and ends with the outpatient pharmacist upon discharge. The outpatient pharmacist has an important role in preventing and correcting discharge medications discrepancies. A study published by the American Society of Health-System Pharmacists (ASHP) regarding the role of the pharmacist in preventing discharge errors, reported that the percentage of patients who were discharged with medication errors declined from 76% to 47% by implementing pharmacists reconciliation and counseling program. Additionally, this led to a decrease in the average number of medication errors per patient; from 2.5 to 1.8 which was clinically significant [3].

Hospital discharge is a critical interface where patients are at a high risk of discrepancies. The goal at discharge is to reconcile the medications the patient was taking prior to admission and those initiated in hospital, with the medications they should be taken post-discharge, to ensure that all changes are intentional and those discrepancies are resolved. This should result in avoidance of therapeutic duplications, omissions, unnecessary medications and confusion. The best possible medication discharge plan is the most appropriate and accurate list of medications the patient should be taking after discharge (Wong., *et al*. 2008). It should account for a number of factors, including new medications started in the hospital or upon discharge, discontinued medications, adjusted medications, unchanged home medications to be continued, medications put „on hold" while the patient was in the hospital [2].

Medication reconciliation at hospital admission and at discharge is two very distinct processes. Admission medication reconciliation requires a straightforward comparison of a comprehensive list of a patient's preadmission medications with admission orders. In comparison, discharge medication reconciliation requires multiple comparisons between different pieces of information, including medications on the best possible medication history, medications prescribed in the hospital (adjusted, new, discontinued), unchanged home medications, and medications to be started at discharge, which makes this process complex. The process of discharge reconciliation on a general medicine service is exceptionally critical taking into consideration the complex needs of the patients involved (e.g., multiple comorbidities and medications). Few studies have focused on discharge medication reconciliation. The main limitations of the discharge medication reconciliation focused studies include a small sample size, not focused on the general medicine patient population, did not delineate unintentional discrepancies, and did not measure the potential clinical impact [4].

As per American Society of Hospital Pharmacists (1993), ASHP Guidelines on preventing medication errors in hospitals medication; errors include prescribing errors, dispensing errors, medication administration errors and patient compliance errors. A potential error is a mistake in prescribing, dispensing, or planned medication administration that is detected and corrected through intervention (by another health-care provider or patient) before actual medication administration [5]. Prescribing errors definition is: Incorrect drug selection (based on indications, contraindications, known allergies, existing drug therapy, and other factors), dose, dosage form, quantity, route, concentration, rate of administration, or instructions for use of a drug product ordered or authorized by physician (or other legitimate prescriber); illegible prescriptions or medication orders that lead to errors that reach the patient.

According to Lehnbom., *et al*. 2012, there are some definitions listed below:

- **Medication discrepancies definition:** A difference between the medications recorded as prescribed for a patient and the current medications reported by a patient.
- **Intentional medication discrepancies definition:** a doctor makes a decision to change a patient's medication regimen, hence what was recorded as prescribed and what medications are being taken by a patient are different.
- Unintentional medication discrepancies definition: any unexplained differences between what was recorded as prescribed and what medications are being taken by a patient [6].

Medication discrepancies occur commonly on hospital discharge. Understanding the type and frequency of discrepancies can help clinicians better understand ways to prevent them. Structured medication reconciliation may help to prevent discharge medication discrepancies [7].

There are also two types of discrepancies when dealing with a discharge prescription: intended discrepancies, where a dose changed, add new medication, a medication omission and change route of administration, and unintended discrepancies, which include omission of a medication, changed in dose and inappropriate duration [2].

The role of pharmacists has expanded over the years to include patient counseling, therapeutic management, and providing education to health-care professionals. This review evaluates the impact of outpatient pharmacists' non-dispensing roles on outcomes for patients and health-care professionals. A total of 43 studies were included, of which 36 related to pharmacist interventions targeting patients and seven to pharmacist interventions targeting health-care professionals. In most studies, the interventions resulted in improvement in clinical outcomes, although statistical significance was not achieved in all cases. The studies suggest that pharmacists can play a supporting role in providing medication, managing the therapeutic process, counseling patients, and providing education to health-care professionals.

Most included studies supported the role of pharmacists in medication/therapeutic management, patient counseling, and providing health professional education with the goal of improving the patient process of care and clinical outcomes, and of educational outreach visits on physician prescribing patterns. There was great heterogeneity in the types of outcomes measured across all studies. Therefore a standardized approach to measuring and report clinical, humanistic, and process outcomes for future randomized controlled studies evaluating the impact of the outpatient pharmacist is needed. Heterogeneity in study comparison groups, outcomes, and measures makes it challenging to make generalized statements regarding the impact of pharmacists in specific settings, disease states, and patient populations [8].

The outpatient pharmacy can be described as a diverse clinical practice environment. Most pharmacists in the outpatient setting provide multiple roles ranging from dispensing and counseling to medication therapy management (MTM) services and transition of care. The environment provides patients with the opportunity to speak one-on-one with a pharmacist and schedule MTM services and/or disease management services. The outpatient pharmacy can be primary care–based or disease-specific services. For example, outpatient clinics can focus on HIV/AIDS, immunizations, lipids, diabetes, and other areas. The unique aspect of the environment is access to the patient's medical record and the multidisciplinary approach where pharmacists work in teams with other healthcare providers [9].

In NCCCR, when a physician decides to discharge the patient, he has to write a prescription that includes all medications which should be continued after discharge. During this process, prescriptions should be reviewed by a senior physician or/and a clinical pharmacist. Then, the prescription will be sent to the outpatient pharmacy with the patient himself or his relatives. There are four counters for outpatient pharmacists at NCCCR out-patient pharmacy to provide privacy during reconciliation and education process for each patient. Upon receiving the prescription by the outpatient pharmacist he/she checks the completeness of the prescription. If it is complete, the pharmacist starts to feed this prescription into the electronic Pharmacy Medication System (PMS).

The primary objective of our study is to assess outpatient pharmacists' interventions during discharge reconciliation and to determine their impact on discharge prescribing errors and discrepancies. The secondary objective is to detect the most common types of medication errors in discharge prescriptions and the rate of errors prevention by out-patient pharmacists.

Methods

The study was conducted at the National Center for Cancer Care and Research (NCCCR)); a 62-bed hospital and the main tertiary care teaching hospital specialized in oncology and hematology diseases treating all adult cancer patients in Qatar. The duration of the study was 10 months –(from April 2014 to January 2015).

Inclusion criteria

All discharged patients during the weekdays (Sunday through Thursday) from NCCCR inpatient wards which include ward 1, ward 2 and palliative care unit. All discharge prescriptions should fulfill all the eligibility criteria to be accepted (2 patient's identifiers, complete orders/ prescription, date, time, and stamped by a privileged physician. Ways to identify the discharge prescriptions: resident stamp and/or clinical pharmacist stamp in medication prescription and to check bed number from electronic Pharmacy Medication System (PMS).

The exclusion criteria

All transferred patients from NCCCR to other hospitals. Patients discharged from the other hospitals and patients who died during admission. Patients discharged from daycare (short stay) and urgent care units.

In our study, the pharmacists compared between the medications listed in the received prescription with patient history before and during admission. The comparison included medication name, dose, route of administration and frequency. All discovered discrepancies were verified with the clinical pharmacist following the patient. Then the recommendations were communicated to the pre-

scribing physician who accepts or decline the order, then orders were processed accordingly. All the outpatient pharmacists' interventions were documented in the data collection sheet indicating the acceptance/ rejection of the recommendations.

Outpatient pharmacists' interventions in our study were classified into errors and discrepancies. Types of errors listed in the study were as follows:- Weight based dosing, calculation errors, extra doses given, writing trade/ brand name, wrong medication, wrong dose, wrong interval/rate, wrong route, incomplete orders, unclear orders and others.

Types of discrepancies listed in the study were as following: prescribing without privilege, inaccurate home dosing, an additional drug required, untreated condition, duplication therapy, alternative therapy, medication use without indication, inappropriate duration, appropriate laboratory test required and others.

Analysis

Descriptive analysis was used to summarize patients' demographic and other prescriptions and admission related parameters. Association between two or more qualitative variables was analyzed using Chi-square test. P-values < 0.05 was considered as statistically significant. Statistical analysis was completed using excel 2010 and STATISTICA 11.0 Version.

Result

The total number of Patients/ prescriptions included in our study was 591 with a total number of 4293 medications orders. Patients demographics are summarized in table 1.

The patients had a mean age of 51.79 ± 16.34 years and (56%) were men. The majority of discharged patients were oncology patients 433 (73%) vs. hematology 158 (27%). The mean of the length of stay was 12.62 ± 20.03 days and the mean number of medications orders per prescription was 7.27 ± 3.96.

A total of 278 (47%) prescriptions included interventions by the outpatient pharmacists as shown in figure 1. The total number of prescriptions with an error was 122/591 representing around 21% of total prescriptions. Incomplete Order represented the highest percentage of errors (42/122) 34%, and then the wrong dose comes next (22/122) 18%. Different types of errors and distribution are shown in table 2 and figure 2.

Patient characteristics n = 591	
Age at discharge (Years)	N (%)
Mean ± SD	51.79 ±16.34
<65	481 (81%)
65-74	76 (13%)
75-84	25 (4%)
>84	9 (2%)
Gender	
Male	331 (56%)
Female	260 (44%)
Nationality	
Qatari	114 (19%)
Non-Qatari	477 (81%)
Primary disease	
Hematology	158 (27%)
Oncology	433 (73%)
Number of medications per prescription (n)	
Mean ± SD	7.27 ± 3.96
Length of stay (days)	
Mean SD	12.62 ± 20.03
1--3	133 (23%)
4--6	175 (30%)
7--9	85 (14%)
>10	198 (33%)

Table 1: Patient characteristics.

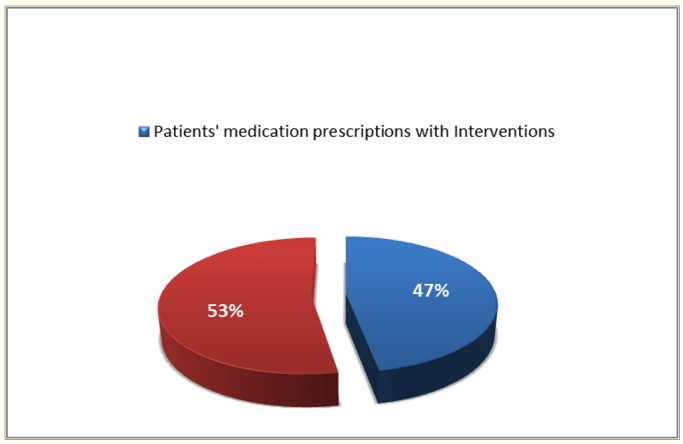

Figure 1: The percentage of prescription with interventions vs prescription without interventions.

Types of medications errors	Number of errors (%)
Incomplete Order	42 (34%)
Wrong Dose	22 (18%)
Extra Doses Given	13 (11%)
Wrong Interval/Rate	13 (11%)
Wrong Medication	8 (7%)
Trade Name	4 (3%)
Weight-Based Dosing	2 (2%)
Calculation Errors	2 (2%)
Unclear Order	2 (2%)
Wrong Route	0 (0%)
Others	14 (11%)
Total	122 (100%)

Table 2: Distribution of medications Errors by types.

Types of medications discrepancies	Number of discrepancies (%)
Prescribing without privilege	56 (29%)
Additional Drug Required	45 (24%)
Alternative Therapy	33 (17%)
Inappropriate Duration	14 (7%)
Duplication therapy	9 (5%)
Untreated Condition	8 (4%)
Medication Use Without Indication	3 (2%)
Inaccurate Home Dosing	3 (2%)
Dose Missed	3 (2%)
Appropriate lab recommended	2 (1%)
Others	14 (7%)
Total	190 (100%)

Table 3: Distribution of Discrepancies by types.

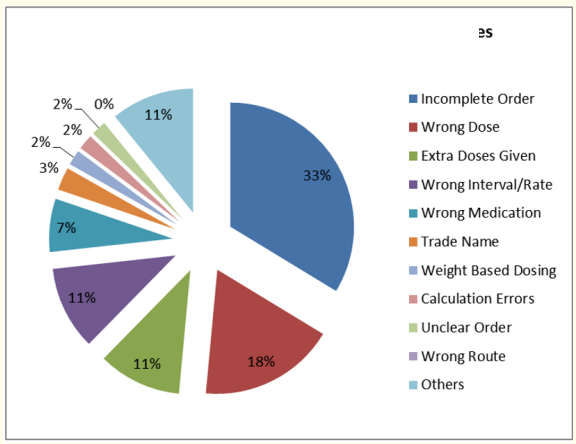

Figure 2: The percentage of prescription with interventions vs prescription without interventions.

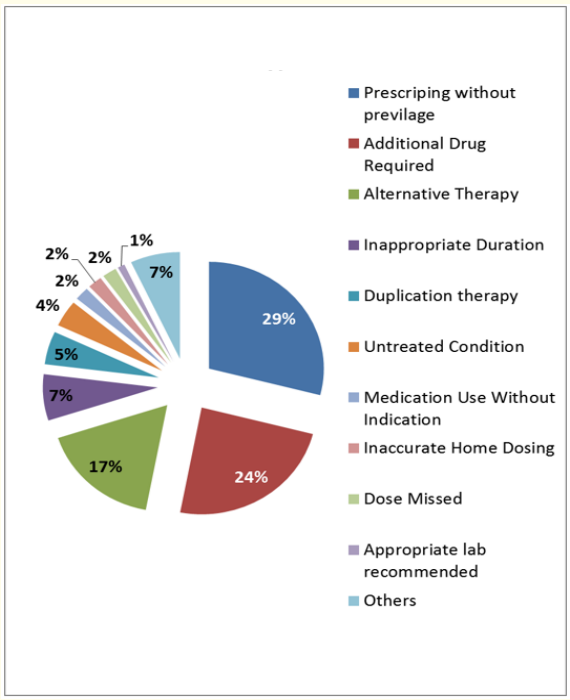

Figure 3: Distribution of discrepancies by types.

The total number of prescriptions with discrepancies was 190/591 representing around 32% of total prescriptions. Prescribing without privilege represented the highest percentage of discrepancies (56/190) 29%, and then Additional Drug Required comes next (45/190) 24% and Alternative Therapy (33/190) 17%. Different types of discrepancies and distribution are shown in table 3 and figure 3.

The majority of errors 80(66%) and discrepancies 139(73%) were found in residents if compared with specialists and consultants. However, this was not statistically significant (P-value = 0.36). Furthermore, there was no statistically significant relationship between the number of discharge medications, age group and categories of errors table 4.

Detection of discrepancies in discharge prescriptions by pharmacists resulted in the prevention of medication errors. It was observed that incomplete order was the most common medication that was detected and prevented by the pharmacists (69/ 1000 orders) then the wrong dose comes next (37/1000 orders). Whereas, Extra Doses Given and Wrong Interval/Rate came after and presented 22/ 1000 orders. Further data are shown in table 5 and figure 4.

	Medications errors	Discrepancies	P-value
Doctors categories			
Resident	80(66%)	139(73%)	The chi-square statistic is 2.0427. The P-Value is 0.360103. The result is not significant at $p < 0.05$.
Specialist	33(27%)	40(21%)	
Consultant	9(7%)	11(6%)	
Age-band			
<65	82(67%)	143(75%)	The chi-square statistic is 2.8464. The P-Value is 0.415916. The result is *not* significant at $p < 0.05$
65-74	29(24%)	31(16%)	
75-84	9(7%)	13(7%)	
>84	2(2%)	3(2%)	
No of Discharge Medications			
1--5	27(22%)	50(26%)	The chi-square statistic is 3.3304. The P-Value is 0.504131. The result is *not* significant at $p < 0.05$.
6--10	48(39%)	76(40%)	
11--15	36(30%)	54(28%)	
16--20	11(9%)	9(5%)	
21--25	0(7%)	1(1%)	

Table 4: Association between medication errors and Discrepancies with selected variable (doctor's categories, age-group, and number of discharge medications).

Medications errors prevented by the pharmacist	Number (%)	Rates per 1000 orders Mean ± SD (18 ± 20)
Weight-Based Dosing	2 (2%)	3
Calculation Errors	2 (2%)	3
Extra Doses Given	13 (11%)	22
Trade Name	4(3%)	6
Wrong Medication	8(7%)	12
Wrong Dose	22 (18%)	37
Wrong Interval/Rate	13(11%)	22
Wrong Route	0(0%)	0
Incomplete Order	42(34%)	69
Unclear Order	2(2%)	3
Others	14(12%)	23
Overall	122(100%)	200

Table 5: Types and frequency of medication error prevented by pharmacists.

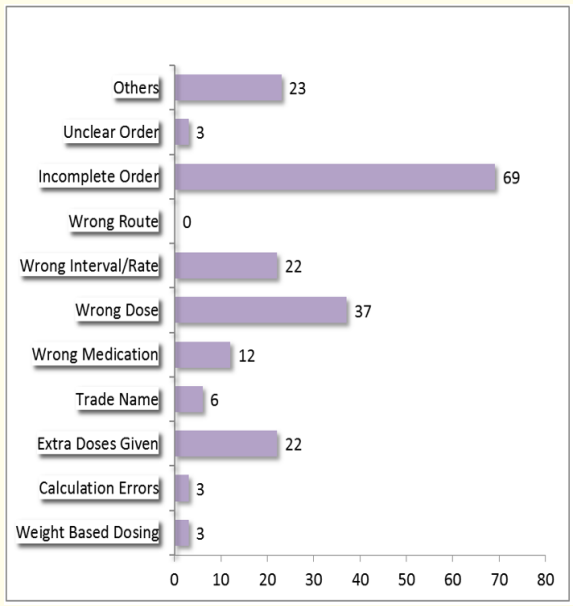

Figure 4: Rate of prevented error per 1000 orders.

Discussion

Pharmacy medication reconciliation during admission and/or at discharge process is a crucial step for an error-free patient environment [1]. In this study we investigated the impact of outpatient pharmacists' interventions on discharge prescriptions errors and discrepancies in the main cancer hospital in Qatar.

In correspondence with that (Lisby M., *et al.*) investigated errors in the medication process considering: frequency, type, and potential. The study concluded that the most common types of error during the mediation process were: lack of drug form, unordered drug, the omission of drug/dose, and lack of identity control [10].

In our study, the pharmacists detected and resolved 321 prescriptions with medication errors/discrepancies out of 591 discharge prescriptions. The most common medication error type documented and corrected by the outpatient pharmacists was incomplete orders in 42 (34%) prescriptions. This included; missing information e.g.: no duration, no physician stamp, no patient addressograph and no medication dose/route/frequency. On the other hand, the most common discrepancy was restricted medications being prescribed without privilege; as 56 (29%) prescriptions required a special stamp. In addition, 45 (24%) prescriptions required the addition of needed medication.

Our subcategory analysis was made. Prescriptions were identified by the ordering physician, into three categories; those were written by a resident, specialists or a consultant. These findings showed that junior physicians (residents) make more prescribing errors than those with more experience.

Furthermore, in this study, the relationship between clinical pharmacists and their impact on prescription-related problems were analyzed. Results revealed that, those prescriptions reviewed by a clinical pharmacist before the actual patient discharge have a reduction in both medication errors and discrepancies, 19% and 22% respectively if compared with 85% errors and 89% discrepancies in prescriptions that were not revised by a clinical pharmacist. This is an expected finding since clinical pharmacists are much involved in patients' care. Therefore, they can identify each patient's accurate medication and needs. A descriptive study was carried out in a Swedish hospital, concluded that clinical pharmacist conducting medication reconciliation have a great potential to prevent and correct errors upon admission or discharge [11]. Another study that aimed to investigate the effect of a clinical pharmacist discharge service on medication discrepancies and prescribing errors [12]. Both studies support each other and our findings.

The American Institute of Medicine (IOM) has recognized the alleviation of medication errors as a top national priority. Pharmacists' interventions play an essential role in preventing medication errors [13]. In our study, out-patient pharmacists attributed to decreasing medication errors (by mean of 18 per each1000).

Limitations and Recommendation

The fact that data developed from this study was based on input obtained from a wide range of outpatient pharmacists, with variable backgrounds and approaches. This can provide a more subjective approach and affect data accuracy. We tried to overcome this limitation by providing a standardized form to be filled and an extensive review was performed before including any data for analysis.

A second limitation, the form used, did not capture the actual amount of time required to resolve each problem and how did that affect workload and patient waiting time. An approximate estimation was done with a minimum of 8 min, between calling the physician and the actual correction of the prescription and this estimation was supported by Bates D., *et al*. study [12].

Conclusion

In conclusion, the outpatient pharmacist has a significant role towards detecting and reducing medication errors and discrepancies upon patient discharge. However, despite their effective interventions; most of these medications related problems are preventable. We assume that by an improved quality process and awareness; we can create a safe and efficient environment for both patients and healthcare providers.

The fact that this study was conducted in a single out-patient pharmacy in a specialized cancer hospital disqualifies generalizing the results obtained to a larger population. We believe, however, the findings obtained from this study offers important preliminary data for future research. A more extensive analysis is required on methods to prevent and improve discharge prescriptions.

Acknowledgement

This study was partially presented as an abstract in the 9th Annual European Pharma Congress in June 26-28, 2017 in Madrid, Spain [14].

Ethical Approval

The study was approved by the Medical Research Center at Hamad Medical Corporation.

Author disclosure of potential conflicts of interest

The author declared no potential conflicts of interest.

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