Original Article

Pharmacology

An Observational Study to Evaluate The Factors which Influence The Dispensing Errors in The Hospital Pharmacy of A Tertiary Care Hospital

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ABSTRACT

Introduction: Dispensing errors are any discrepancies between the written instructions which are found on the prescription order form and the accomplishment of these instructions by the pharmacy, when the drug is dispensed to the wards or hospital services.

Objective: The hospital pharmacy of a tertiary care hospital in southern India has four satellite pharmacies and has more than 7900 medicine brands in its formulary. These pharmacies handle more than thousand prescriptions per day. There are chances of errors during the dispensing of the medications. Based on this, the present study aimed to study and evaluate the rate of occurrence of the dispensing errors and the factors which contributed to the dispensing errors.

Materials and Methods: A prospective observational study was carried for a period of eight months, at two pharmacies of the hospital (out-patient/ in-patient pharmacy), at various stages of dispensing and time schedules.

Results: A total of 160 dispensing errors were found in 12,340 prescriptions that were monitored, out of the 57,109 prescriptions which were received in both the pharmacies during the study period. The overall rate of the dispensing errors which was found in both the pharmacies was 1.29%. It was seen that 11am-3pm was the peak time at the hospital, when the maximum numbers of errors occurred. The stage of the dispensing process where the maximum numbers of dispensing errors occurred was at the filling stage. It was observed that the maximum number of errors occurred in the in-patient pharmacy, in comparison to the out-patient pharmacy. The different types of dispensing errors that were observed during the study were drug omission, wrong quantity of the drugs, wrong drugs, wrong strength of the drugs and wrong dosage form of the drugs.

Conclusion: This study concludes that during peak hours, an insufficient number of pharmacists was found to be the most important factor which contributed to the dispensing errors. This also shows the need for a sufficient number of pharmacists to be posted during the peak hours at the filling section and in the in-patient pharmacy to minimize the dispensing errors.

Key Words: Dispensing Errors, Factors influencing, Pharmacists, Time, Inpatient Pharmacy, Dispensing stages

KEY MESSAGE

- Dispensing plays an integral role in maintaining the quality use of the medicines.
- Minimizing the dispensing errors improves the integrity of the dispensing.
- Dispensing is a challenging task for the pharmacist and it is also a connecting step with the patients; It is also helping in providing an optimized care.

INTRODUCTION

Mistakes are unfortunately a part of every human activity, including health care. Throughout the course of any drug therapy, medication mishaps can occur at different stages of the process, such as prescribing, dispensing, administering or monitoring [1]. The goal of drug therapy is the achievement of defined therapeutic outcomes that improve a patient's quality of life, while minimizing patient risk. There are inherent risks which are known and unknown, which are associated with the therapeutic use of drugs and other pharmaceutical agents. The incidents (or) hazards that result from such risks have been defined as adverse drug misadventures and they include adverse drug reactions and adverse errors. But at times, harm to the patient may occur due to errors in the prescribing, dispensing and the administration of the drugs. These errors are known as medication errors. They are not inevitable and can be prevented [2].

A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer. Such events may be related to the professional practice, health care products and procedures and systems, including prescribing, order communication, product labeling, packaging, nomenclature, compounding, dispensing, distribution, administration, education, monitoring and use [3].

A dispensing error is defined as the discrepancy between the written order in a medical prescription and the following of this order. These errors are made by the pharmacy staff (including the pharmacist) when dispensing to hospital units [4, 5, 6].

Dispensing is an integral part of the quality use of the medicines and together with the patient counselling, form the core professional

activities of a pharmacist. Many prescription errors are made during the various phases of medication usage in the hospital environment; dispensation is one of the most sensitive phases of the process. Safe, organized and effective dispensing systems are therefore, fundamental to ensure that the drugs will be properly dispensed according to the prescription order forms and to reduce the possibility of errors. In a study which was carried out in 1994 in the US, it was demonstrated that the transcription and administration of drugs could be responsible for 50% of the medication errors, considering that 39% of the errors involved prescription errors and 11% involved dispensing errors [7].

Today, there are different drug dispensing systems in hospital units and a different expectation of errors is associated with each of them. It is known that in American, British and Canadian hospitals where the unit dose [UD] system is used, the rate of medication errors has been reduced from one error/patient/day to two or three errors/patient/week [7]. It has been observed that the rates of drug dispensing errors in work environments with high leads of interruption, distraction, noise and overload are higher (3.23%) as compared to environments with lower levels of these aspects (1. 23%) [8].

The published literature is limited in the number of studies which evaluate medication errors that occur during the dispensing stage or in non-hospital pharmacy settings such as community or ambulatory care. Observational studies which were performed in the community or ambulatory care settings found error rates that occurred between 1%- 24%. Other studies determined that the rate of potentially harmful errors ranged from 1.5-4% [9].

Based on this, the present study aimed at finding out the factors which contributed to the dispensing errors so that a necessary action could be advised to reduce the same.

METHODS

This study was conducted in the hospital pharmacy of Kasturba Hospital, Manipal, which is located in southern India. Kasturba Hospital is a 2200 bedded super specialty, tertiary care, teaching hospital, having main and satellite pharmacies. A prospective observational study was carried out for a period of eight months [October 2008 to May 2009]. The sources of the data were the patients' prescription forms, indent forms and the pharmacy bills. A dispensing error documentation form was prepared, based on a standard reporting form that was obtained from Dr. Cheng Chi Man on the common dispensing errors which were experienced in clinical settings and necessary changes were made to suit the study. It included the different types of errors which occur at the different stages of dispensing. In order to study and understand the dispensing errors, the Main Pharmacy and the Satellite Pharmacy were selected for the study. The Main Pharmacy mainly handled the out-patient prescriptions and the timing of this pharmacy was from 9am-5pm. Nearly 800 prescriptions were dispensed from this pharmacy per day. The Satellite Pharmacy handled the in-patient prescriptions and it was a 24hr service outlet. The number of prescriptions which were dispensed per day from this pharmacy was approximately 2000. The number of pharmacists working at both the pharmacies together was 36.

For the present study, three areas in the pharmacy were selected to study and evaluate the dispensing errors. The three areas were selected so as to observe at which area the maximum number of errors would occur. The three areas which were chosen were the billing area where the prescriptions were received and billed, the filling area where the medications were taken from the shelves according to the prescriptions and the dispensing area where the medications were dispensed to the patients. The study areas were divided into different time slots in order to study the correlation between the time and the occurrence of the dispensing errors. Approximately 20% of the total prescriptions were checked and evaluated at each area of both the pharmacies at different time schedules.

The investigator, who was a clinical pharmacist, was posted to evaluate the prescriptions and medications intensively, as per the following schedules, in both the pharmacies at different areas. In the Main Pharmacy, at the billing area, the investigator checked and evaluated the prescriptions that were received by the pharmacist, to find the errors. The prescriptions were evaluated before and after they were billed. The errors which are found after billing the prescriptions are known as dispensing errors.

At the filling area, each pharmacist who was filling the prescriptions was followed to analyze whether the filling process was done correctly i.e. taking medications from the shelves according to the prescriptions, billing them and keeping them ready for dispensing.

At the dispensing area, the investigator checked the prescriptions and medications that were filled by the pharmacist. If an error was found and the dispensing pharmacist supplied the medications to the patient, the investigator would tell the pharmacist about it and make an intervention.

Similarly, in the Satellite Pharmacy, the three areas were intensively monitored by the investigator as per the schedules. In addition, the indents that were received from the wards were analyzed by going to the respective wards and checking whether the medications which were dispensed to the wards by the pharmacy were correct.

If any errors occurred at different areas of both the Main pharmacy and Satellite pharmacy, they were documented in the documentation form which was developed for the study purpose and were evaluated for the following parameters: rate of occurrence of the dispensing errors, impact of time/area/pharmacy (out-patient/ in-patient) on the dispensing errors and the types of dispensing errors.

RESULTS

During the study period, the prescriptions and the medications at various stages of the dispensing process, that is billing, filling and dispensing in both the Main as well as the Satellite pharmacies, were intensively monitored. In the 12,340 prescriptions that were viewed at both the pharmacies, a total of only 160 dispensing errors were identified.

The overall rate of the dispensing errors that were found in both the Main and the Satellite pharmacies during the study period was 1.29%. Out of the 160 dispensing errors, 53 (33.1%) were found in the Main Pharmacy and the number of the dispensing errors which were found in the Satellite Pharmacy were 107 (66.9%).

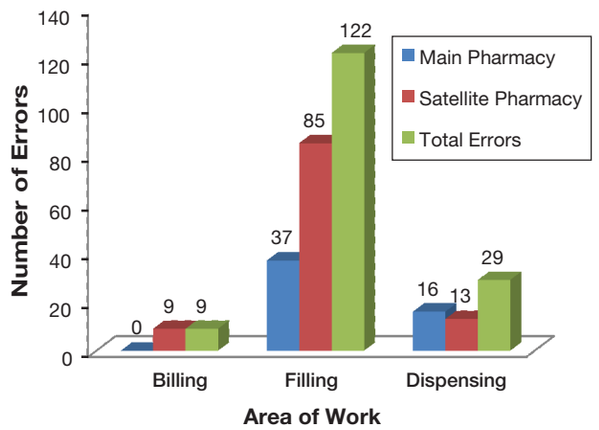
Both the Main and the Satellite pharmacies were screened at different areas such as billing, filling and dispensing, in order to find out at which stage of the dispensing process, the maximum number of errors occurred. The maximum number of errors was found to occur at the filling stage. The overall rate of the dispensing errors which was found at the billing area was 0.16%, while the rate of the dispensing errors which was found at the filling area was 0.42%.

In the Main Pharmacy, a total of 2709 prescriptions were monitored in the billing area and no errors were found. At the filling area, in the 771 prescriptions which were monitored, a total of 37 [4.7%] errors were found. In the dispensing area, 1508 prescriptions were monitored. In these 16 [1.06%] errors were found.

In the Satellite Pharmacy, around 2751 prescriptions were monitored at the billing area and 9 [0.32%] errors were detected. A total of 85 [4.1%] errors were found at the filling area, in the 2057 prescriptions that were monitored. In the dispensing area, 2544 prescriptions were monitored and 13 [0.5%] errors were found, which has been represented in [Table/Fig 1].

On the evaluation of the impact of the timings on the dispensing errors, it was found that the errors were more in number between 11am -3pm of the day. The total number of errors which were found at both the pharmacies between 9am-11am were found to be 28 (17.5%), while the number of errors which were found between the time period from 11am-1pm were 51 (31.9%). The number of errors which were found between 1pm-3pm were 52 (32.5%), whereas the number of errors which were found between the time period from 3pm-5pm were 29 (18.1%), as shown in [Table/Fig 2].

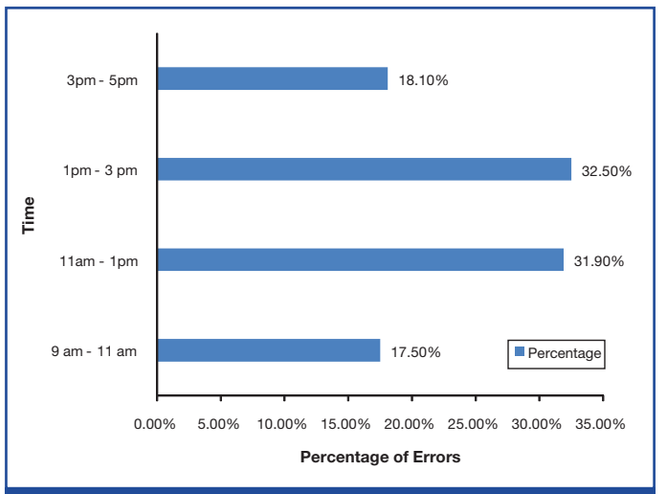
Next, the 160 dispensing errors which were found at both the pharmacies during the study period were classified into, drugs not taken- 51 (31.9%), wrong quantity taken -45 (28.1%), wrong drug taken -15 (9.4%), wrong quantity given -12 (7.5%), wrong strength taken- 11 (6.9%), wrong strength given- 9 (5.6%), wrong drug given -5 (3.1%), drug not printed- 4 (2.5%), wrong dosage form given- 2 (1.3%), wrong strength printed- 2 (1.3%), wrong dosage form printed- 2 (1.3%), wrong quantity printed- 1 (0.63%) and drug not given -1 (0.63%). The types of errors which were not found were, wrong drug printed, double entry, wrong dosage form taken, expired drugs taken, double dispensing, wrong label information, expired drugs issued and wrong patient given, which are shown in [Table/Fig 3].



[Table/Fig-1]: Area Wise Dispensing Errors

DISCUSSION

One of the objectives of the present study was to find out the rate of the dispensing errors. In the 12,340 prescriptions which were viewed, 160 dispensing errors were identified at both the pharmacies. The overall rate of the dispensing errors was found to be 1.29%. Among these, 53 (33.1%) dispensing errors were found in the Main Pharmacy and in the Satellite Pharmacy, there were 107 (66.9%) dispensing errors.



[Table/Fig-2]: Time-wise distribution of dispensing errors at both the pharmacies

Type of Errors	No. of Errors	%
Drug not taken	51	31.9
Wrong quantity taken	45	28.1
Wrong drug taken	15	9.4
Wrong quantity given	12	7.5
Wrong strength taken	11	6.9
Wrong strength given	9	5.6
Wrong drug given	5	3.1
Drug not billed	4	2.5
Wrong dosage form given	2	1.3
Wrong strength printed	2	1.3
Wrong dosage form printed	2	1.3
Wrong quantity printed	1	0.63
Drug not given	1	0.63
Wrong drug printed	0	0
Double entry	0	0
Wrong dosage form taken	0	0
Expired drug taken	0	0
Double dispensing	0	0
Wrong label information	0	0
Expired drug isued	0	0
Wrong patient given	0	0

[Table/Fig 3]: Types of dispensing errors found at both the pharmacies (n=160)

This observation was found to be consistent with those of the study which was conducted by Dominica MG [10] et al. on the analysis of the prescription, transcription and the dispensing quality, through the information which was gathered in a pharmacy service, in which it was found that the overall rate of the dispensing errors was 0.7% and that the rate of the prescription errors was found to be 4.1%. The dispensing error rate was found to be more in the present study, which may be due to the shortage of pharmacists working at the pharmacies and increased workload. The study also showed that in the Satellite Pharmacy which handled in-patient prescriptions, a high rate of dispensing errors occurred, in comparison to the Main Pharmacy which handled only out-patient prescriptions.

Another major observation of this study was, finding out at which stage of the dispensing process the maximum errors would occur. In the Main Pharmacy, a total of 2709 prescriptions were viewed

in the billing area and no errors were found. At the filling area, in the 771 prescriptions which were viewed, a total of 37 [4.7%] errors were found. In the dispensing area, 1508 prescriptions were viewed. In these, 16 [1.06%] errors were found. In the Satellite Pharmacy, around 2751 prescriptions were viewed at the billing area and 9 [0.32%] errors were detected. 85 [4.1%] errors were found at the filling area, in the 2057 prescriptions that were viewed. In the dispensing area, 2544 prescriptions were viewed and 13 [0.5%] errors were found. In both the pharmacies, the area or the stage of the dispensing process at which the maximum numbers of errors occurred was the filling area. This may be due to lack of space and the arrangement of the medication in the shelves. Another reason for the occurrence of the errors was the shortage of staff.

This observation was found to be consistent with that of the study which was carried out by Darren MA [11] et al. which was a prospective study of the incidence, nature and the causes of the dispensing errors in community pharmacies, in which 125, 395 prescribed items were dispensed during the study period and 330 incidents were recorded, of which the selection errors were more common [199 (60.3%)].

This study also evaluated the occurrence of the dispensing errors, based on the time schedules. The total number of errors which was found at both the pharmacies between 9am-11am was found to be 28 (17.5%), while the number of errors which was found between the time period from 11am-1pm was 51 (31.9%). The number of errors which was found between 1pm-3pm was 52 (32.5%), whereas the number of errors which was found between the time period from 3pm-5pm was 29 (18.1%). The maximum errors that occurred at both the pharmacies were during the time period from 11am-3pm, which were considered to be the peak hours of our hospital pharmacy.

This observation was found to be consistent with that of the study which was carried out by Kistner UA [12] et al. on the accuracy of dispensing in a high volume, hospital based out-patient pharmacy, which showed that error peaks were noted during the lunch hour. In the Main pharmacy, the patients would come to the OPD at around 9am and by the time the prescriptions were received at the pharmacy, it would be 11am. Similarly, in the Satellite pharmacy, the doctors would go for their daily rounds at 8am and if there was a change in the therapy, the nurses would give the prescription to the patient party or directly sent it to the pharmacy at 11am. During this time, the pharmacists would have more workloads as compared to those during the non-peak hours and the chances of the dispensing errors would be more.

The types of errors which occurred at various stages of the dispensing process were evaluated. Drug not taken -51 (31.9%), wrong quantity taken -45 (28.1%), wrong drug taken- 15 (9.4%), wrong quantity given- 12 (7.5%), wrong strength taken- 11 (6.9%), wrong strength given- 9 (5.6%), wrong drug given- 5 (3.1%), drug not printed -4 (2.5%), wrong dosage form given- 2 (1.3%), wrong strength printed -2 (1.3%), wrong dosage form printed -2 (1.3%), wrong quantity printed -1 (0.63%) and drug not given -1 (0.63%) were the different types of dispensing errors which were found in both the pharmacies at different stages of the dispensing process.

In a study which was conducted by Dominica MG [10] et al. on the analysis of the prescription, transcription and the dispensing quality through the information which was gathered at a pharmacy service, the types of transcription errors which were found were drug omission (6.4%) and wrong dosage form (1.2%). This study was found to be consistent for wrong dosage form, but in the case of drug omission, the above mentioned study showed a higher percentage of errors when compared with the present study.

A study which was carried out by Cina JL [13] et al. on how many hospital pharmacy medication dispensing errors went undetected, showed that the most common filling error types were wrong quantity (59%), wrong strength (11%) and wrong medication (11%), which were found to be more than in the present study.

Our study showed that the overall rate of the dispensing errors that were found in both the Main and the Satellite pharmacies during the study period was (1.29%). While assessing the factors which contributed to the dispensing errors, it was observed that in the Satellite Pharmacy which handled the in-patient prescriptions, more errors occurred as compared to the Main Pharmacy which handled the out-patient prescriptions. It was found that among the stages of the dispensing process, the filling area was the stage at which the maximum numbers of errors had occurred, as compared to the billing and dispensing stages of the dispensing process. This study also showed that the peak hours (11am -3pm) was another factor which was assessed, that was the timing at which more numbers of errors had occurred, as compared to the non-peak hours (9am-11pm and 3pm-5pm).

CONCLUSION

Dispensing errors are a part of the medication errors which play an integral role in maintaining the quality use of medications. The different types of dispensing errors that were observed during the study were drug omission, wrong quantity, wrong drug, wrong strength and wrong dosage form. Since the hours from 11am-3pm are considered to be the peak hours of our hospital pharmacy, the administrator should post more pharmacists during these hours, so as to minimize the occurrence of the dispensing errors, which in turn will help in better patient care. Also, it is necessary to post more number of pharmacists at the filling area of the dispensing process and at the In-patient pharmacy (satellite pharmacy), to reduce the workload of the pharmacists and thereby, to reduce the occurrence of the dispensing errors.

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