STUDY OF MEDICATION ERRORS BY PROSPECTIVE OBSERVATIONAL APPROACH IN WARANGAL HOSPITALS

SHIVANI RAVULA1, AKHLA JANGA2, RAJASEKHAR POONURI3*

1Department of Pharmacy Practice, St. Peter’s Institute of Pharmaceutical Sciences, Warangal, Telangana, India. 2Department of Pharm D, Rohini Multispecialty Hospitals, Warangal, Telangana, India. 3Department of Pharmaceutics, St. Peter’s Institute of Pharmaceutical Sciences, Warangal, Telangana, India. Email: yuppiera@gmail.com

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ABSTRACT

Objective: The objective of the study was to determine the prevalence of medication errors occurring in a multispecialty hospital in Warangal.

Methods: A prospective observational study was conducted in Rohini Superspeciality Hospital, Hanamkonda, Warangal, from October 2018 to March 2019, to study the prevalence of medication errors.

Results: In this study, 500 patients were selected, of which 160 were identified with medication errors. Two hundred and seventy-one medication errors were identified among these patients, of which 100 (60.63%) patients were male and 24.37% of patients were female.

Conclusion: This present study manifests that medication errors were predominant in males than in females and also the common age group was 50–60 years.

Keywords: Medication errors, Prospective approach, Observational study, Medication error reporting systems.

INTRODUCTION

Medication error reporting systems are an internationally recognized tool for health-care professionals that are very promising in sharing serious medication errors occurring at places of medical practice. Drugs prescribed for various ailments can be given alone or in combinations and improper discharge of drugs can lead to medication errors which might elevate the risk potential of a therapy [1]. Efficacy which is measured as the level of benefit to patient and toxicity which is recognized as risk always happen collectively. Medical errors are preventable when proper assessment of their use is done. As per Leape’s medication, error is an unintended act or an act that does not achieve its intended outcome. International studies had established that the medication error rate in observational studies ranges from 9 to 12% [2]. Indian patients were in palliative care for more than 2 decades, but tools to minimize medication errors are still to be explored [3].

Study procedure

During the study, data collection forms were collected and inpatient case records were reviewed, which includes patient’s case history, diagnosis, physician medication order sheets, nurse medication administration records, and progress chart and laboratory investigations. This information was documented in the patient profile form and assessed for medication errors such as omission errors, wrong time errors, unauthorized drug error, improper dose error, wrong dosage form error, wrong drug preparation error, wrong administration technique, and other errors. Case records were followed from the date of admission till the date of discharge of the patient and observed medication errors were transferred to medication error reporting form and analyzed for the following parameters such as age and gender, number of medication per prescription, and type of medication errors.
Statistical analysis
Percentage analysis was used and tables and graphs were designed according to the values observed.

RESULTS
From the study conducted by Zakharov et al., the error rate was 39.1%. During the study period, a total of 500 patients were reviewed in all wards in Rohini Superspecialty Hospital. One hundred and sixty patients out of 500 patients were identified with medication errors. Among them, 271 medication errors were identified in 160 patients. Of the data collected from 160 patients, 100 (60.63%) patients were male and 60 (24.37%) patients were female.

Age distribution
One hundred and sixty patients with medication errors according to their age and number of errors in that particular age group were distributed.

Highest number of medication errors was found in 50–60 age group patients, 44 (27.50%) with number of patients being 69 (25.46%) errors. Among 40–50 age group patients, 43 (26.87%) patients were reported with 67 (24.72%) errors.

Number of medication errors
More than 1 error in each patient is identified. It includes prescription error, transcription error, dispensing error, and administration error. Patients with any one type of error considered as one error which leads to more errors were assessed as two, three, and four errors.

Out of 160 patients, 123 (76.87) patients with one error, followed by patients with two errors 30 (18.75%) and patient with three errors 5 (3.12%) and patients with four errors 2 (1.25%) as shown in Fig. 1.

A total 1952 medication doses are observed in 160 patients and number of errors in doses is found to be 381. The frequency of medication error was identified using the following formula.

\[
\text{Frequency of medication error} = \frac{\text{No. of errors in doses}}{\text{Total no. of doses in patients with medication errors}} \times 100
\]

Frequency of medication error = No. of errors in doses / Total no. of doses in patients with medication errors. The error frequency rate was found in our study as \(381 / 1952 \times 100 = 4.16\%\).

Administration errors were noted 136 (50.18%) making it the top most medication errors, followed by prescription error 94 (34.68%), transcription error 19 (7.01%), and dispensing error 22 (8.11%) as shown in Fig. 2 and Fig. 3.

Distribution of prescription errors
According to Krithi Malhotra, due to lack of concentration (41%) and because of many customers (53%), the practitioner tends to fail in knowing the complete patient information which leads to prescription errors [19]. Out of 271 medication errors, prescription errors were found to be 94 and these prescription errors were assessed and classified into their subtypes:

1. Drug-drug interactions 81 (86.17%) and
2. Incomplete information 13 (4.79%).

Distribution of transcription errors
Out of 271 medication errors, transcription errors were identified to be 19 and these prescription errors were assessed and classified into wrong time, wrong dosage form, wrong preparation, wrong frequency, and wrong drug errors.

Out of 16 transcription errors, omission error contributes the highest transcription errors 7 (38.84%), followed by wrong frequency, wrong dose 4 (25%), wrong drug, wrong dosage form and wrong preparation, and wrong time 1 (6.25%) were found to be the same.

Distribution of dispensing errors
Out of 271 medication errors, dispensing errors were found to be 22 and the same were assessed and classified into wrong dose, wrong ward, wrong dosage form, and wrong drug.

Out of 22 dispensing errors, wrong ward was noted 19 (86.3%) making it at the top most medication dispensing error, followed by wrong dose errors.
Distribution of administration errors

Out of 271 medication errors, administration errors were found to be 136 and these errors were assessed and classified into omission, overdose, underdose, wrong preparation, wrong time, wrong technique, and wrong site. According to Johari, right time knowledge was tested on questionnaire, in which IV antibiotic was given 4 times/day, 95.8% were right time, and 4.2% served at wrong time [20].

Out of 129 medication administration errors, omission error observed to be >1/2 of medication administration errors 68 (50%) and the least were of wrong site 1 (0.73%) as shown in Table 2.

National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) categorization of medication errors

Patients were reviewed on daily basis for medication errors and then the same were analyzed using NCCMERP taxonomy and categorized into various categories, as shown in Fig. 4.

A total of 271 errors were found and most of the errors belong to Category C 96 (35.42%), followed by Category B 87 (32.10%), Category D74 (27.3%) and Category E 1 (0.36%).

Contributing risk factors for medication errors

After multidisciplinary reviews of medication errors which help to identify underlying causes or factors that might have contributed to the event were assessed, as shown in Fig. 5

Out of all risk factors, performance deficit contributes the highest 92 (33.94%), which led to medication errors, followed by lack of knowledge 81 (29.88%), heavy work load 47 (17.34%), lack of concentration 39 (14.39%), interruption 7 (2.58%), knowledge deficit in dose calculation 4 (1.47%), and undertrained 1 (0.36%).

Personnel involved in medication errors

Medication errors may occur at any stage, i.e., while prescribing, dispensing, and administering of drugs and persons involved in this process have been identified and assessed. L. La Pietra, in their article which states that, failures in communication sometimes relate directly to poorly written prescriptions.

In most of the medication errors, nurses were involved 154 (56.82%), followed by prescriber 94 (34.68%), pharmacist (8.11%), and patient (0.36%) as shown in Table 3.

Duration of medication errors

Duration of medication errors indicates information about which stage medication errors have been identified and stopped and also measures to be taken to prevent further errors which may occur due to the previous errors occurred.

Out of 271 medication errors, most of the errors were identified and stopped initially 54 (26.34%) then followed by 1 day 52 (25.36%), 1 dose 36 (17.56%) then errors continued for 2 days 36 (17.56%), 3 days 18 (8.7%), and 4 days 9 (4.39%) as shown in Table 4.

Distribution of medication class involved in medication errors

In 271 medication errors, many drugs were involved. These drugs have been classified into their therapeutic class after assessing which were found to be cardiovascular (CVS) drugs, anti-platelets, antibiotics, anti-inflammatory drugs, antifungal, gastrointestinal (GI) drugs, bronchodilators, corticosteroids, anti-neoplastic, vitamins CNS agents, diuretics, anti-diabetic, and miscellaneous drugs. In a study conducted by Patel et al, antibacterial (70%) was the most common inappropriately prescribed drug group followed by GI (30%) [20-26].

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**Table 1: Details of dispensing errors**

| S. No. | Types of dispensing errors | No. of error (n=22) | Percentage |
|--------|---------------------------|---------------------|------------|
| 1.     | Wrong ward                | 19                  | 86.36      |
| 2.     | Wrong dosage              | 1                   | 4.54       |
| 3.     | Wrong dosage form         | 1                   | 4.54       |
| 4.     | Wrong drug                | 1                   | 4.54       |

**Table 2: Details of transcription errors**

| S. No. | Type of transcription errors | No. of error (n=19) | Percentage |
|--------|------------------------------|---------------------|------------|
| 1.     | Omission                     | 7                   | 36.84      |
| 2.     | Wrong frequency              | 4                   | 25         |
| 3.     | Wrong dose                   | 4                   | 25         |
| 4.     | Wrong time                   | 1                   | 6.25       |
| 5.     | Wrong dosage form            | 1                   | 6.25       |
| 6.     | Wrong preparation            | 1                   | 6.25       |
| 7.     | Wrong drug                   | 1                   | 6.25       |
Table 4: Details of duration of medication errors

| S. No. | Duration | No. of errors (n=205) | Percentage |
|--------|----------|-----------------------|------------|
| 1.     | Initially | 54                    | 26.34      |
| 2.     | 1 dose    | 36                    | 17.56      |
| 3.     | 1 day     | 52                    | 25.36      |
| 4.     | 2 days    | 36                    | 17.56      |
| 5.     | 3 days    | 18                    | 8.78       |
| 6.     | 4 days    | 9                     | 4.39       |

The dosage forms which were involved in most medication errors included oral drugs 189 (53.84%) and injectable 144 (41.02%) followed by inhaled drugs 9 (2.56%) and topical 9 (2.56%) as shown in Fig. 7.

**DISCUSSION**

Understanding of medical errors and patient safety has gained scientific attention in due course of time due to increased frequency of errors.

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**Table 3: Details of personnel involved in medication errors**

| S. No. | Personnel involved | No. of errors (n=271) | Percentage |
|--------|--------------------|-----------------------|------------|
| 1.     | Prescriber         | 94                    | 34.68      |
| 2.     | Pharmacist         | 22                    | 8.11       |
| 3.     | Nurse              | 154                   | 56.82      |
| 4.     | Patient            | 1                     | 0.36       |

The study of involvement of a particular medication class to the medication errors showed that the CVS drugs 55 (15.66%) contributing maximum, which was followed by anti-platelets 48 (13.67%) and antibiotics 48 (13.67%) as shown in Fig. 6.

**Generic versus brand**

All the drugs involved in medication errors were distributed into brand and generic names. A total of 329 (93.73%) errors were found to be due to brand and 22 (6.26%) were found to be generic. Out of 271 medication errors, many drugs dosage forms were involved.

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The diagram Fig. 6: Medication classes involved in medication errors shows the distribution of medication classes involved in medication errors. The bars represent the percentage of each medication class as follows:

- CVs: 15.66%
- Anti-platelets: 13.67%
- Antibiotics: 13.67%
- GI drugs: 9.11%
- Bronchodilators: 5.12%
- Corticosteroids: 4.55%
- Antimicrobial: 2.84%
- Vitamins: 1.7%
- CNS agents: 0.85%
- Diuretics: 0.28%
in medicine causing enormous financial costs and health hazards. In a review done by Karthikeyan, the incidence of nursing errors was ranged from 19% to 34%, whereas in our study, it was higher and observed to be 56.82%. According to Nguyen, wrong administration technique errors were 23.5%, but this study had higher number of administration errors and was noted as 50.18% making it the top most medication errors. Patel in his study stated that prescribing errors 70.40% were the most frequently occurring type of error, in contrast, in this study, only 34.68% were observed out of all medication errors. The current study highlights the importance of identification of medication errors in a multi-specialty hospital which help in achieving better therapeutic outcomes and improved patient care.

CONCLUSION

Lack of facilities, resources, and infrastructure were the key points for the occurrence of medical errors. This study focused on the various types of errors and personnel involved which are possible drug-drug interactions; hence, complete review of past and present medical history is needed before writing a prescription to occur in a patient care setting. Most of the prescription related errors were found to be due to inaccurate administration which was due to performance deficit. This study indicates the clear need for the regular investigations, follow-ups that are to be done to rectify and minimize various types of medication errors.

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AUTHORS’ CONTRIBUTIONS

Shivani Ravula and AkhilaJanga conceptualized the research idea, performed literature search; Rajasekhar Poonuru wrote and edited the manuscript, revised the manuscript, and acted as the corresponding author.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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REFERENCES

1. Bates DW, Boyle D, Vander VM, Schneider J, Leape L. Relationship between medication errors and adverse drug events. J Gen Intern Med 1995;10:199-205.
2. Lesar T. Medication-prescribing errors in a teaching hospital. A 9-year experience. Arch Intern Med 1997;157:1569-76.
3. Khosla D, Patel FD, Sharma SC. Palliative care in India: Current progress and future needs. Indian J Palliat Care 2012;18:149-54.
4. Inch J, Watson MC, Anakwe-Umeh S. Patient versus healthcare professional spontaneous adverse drug reaction reporting: A systematic review. Drug Saf 2012;35:807-18.
5. Gandhi TK, Weingart SN, Borus J, Seger AC, Peterson J, Burdick E, et al. Adverse drug events in ambulatory care. N Engl J Med 2003;348:1556-64.
6. Claesson CB, Burman K, Nilsson JL, Vinge E. Prescription errors detected by Swedish pharmacists. Int J Pharm Pract 1995;3:151-6.
7. Khoja T, Neyaz Y, Qureshi NA, Magzoub MA, Haycox A, Walley T. Medication errors in primary care in Riyadh city, Saudi Arabia. East Mediterr Health J 2011;17:156-9.
8. Chan M, Nicklaus MC, Xia Y. Adverse drug events as a cause of hospital admission in the elderly. Intern Med J 2001;31:199-205.
9. Lu CY, Roughhead E. Determinants of patient-reported medication errors: A comparison among seven countries. Int J Clin Pract 2011;65:733-40.
10. Royal S, Smeaton L, Avery AJ, Hurwitz B, Sheikh A. Interventions in primary care to reduce adverse events and hospital admissions: Systematic review and meta-analysis. Qual Saf Health Care 2006;15:23-31.
11. Bates DW, Miller EB, Cullen DJ, Burdick L, Williams L, Laird NP, et al. Patient risk factors for adverse drug events in hospitalized patients. ADE prevention study group. Arch Intern Med 1999;159:2553-60.
12. Barach P, Small SD. Reporting and preventing medical mishaps: Lessons from non-medical near miss reporting systems. Br Med J 2000;320:759-63.
13. Earcharo S, Tomas N, Pelclova D. Medication errors: an enduring problem for children and elderly patients. Ups J Med Sci 2012;117:309-17.
14. Gor AP, Desai SV. Adverse drug reactions (ADR) in the inpatients of medicine department of a rural tertiary care teaching hospital and influence of pharmacovigilance in reporting ADR. Indian J Pharmacol 2008;40:37-40.
15. Hou JY, Cheng KJ, Bai KJ, Chen HY, Wu WH, Lin YM, et al. The effect of a computerized pediatric dosing decision support system on pediatric dosing errors. J Food Drug Anal 2013;21:286-91.
16. Kaushel R, Bates DW, Landrigan C, Mckenna KJ, Clapp MD, Federeska E, et al. Medication errors and adverse drug events in pediatric inpatients. JAMA 2001;285:2114-20.
17. Wilson D, McAritney R, Newcombe R, McAritney R, Gracie J, Kirk C, et al. Medication errors in paediatric practice: Insights from a continuous quality improvement approach. Eur J Pediatr 1998;157:769-74.
18. Woolf SH, Kuzel AJ, Devaney SM, Phillips KL. A string of mistakes: The cascade analysis in describing, counting, and preventing medical errors. Ann Fam Med 2004;2:317-26.
19. Mugada V, Devineni RC, Pendyala RM, Vempati K, Kuchi S. Categorization, appraisal, and reporting of medication errors ascertained on a medical ward of tertiary care hospital. J App Pharm Sci 2018;8:109-14.
20. Rey MB, Prados YA, Gomez ES. Analysis of the medication reconciliation process conducted at hospital admission. Classification and variability of drug assessment reports on the GENESIS group. Farm Hosp 2016;40:246-59.
21. Layqah LA, Alakeld YS, Shamou JJ. The practice of counseling in pharmacy: Patients’ perspectives. Asian J Res Pharm Sci 2018;5:170-6.
22. Ramadevi K, Kalyan VR, Abber RM. A study on the effect of dietary factors on functional gastrointestinal disorders in women of haji region in Saudi Arabia. Asian J Pharm Clin Res 2018;11:202-7.
23. Vira T, Colquhoun M, Etchells E. Reconcilable differences: Correcting medication errors at hospital admission and discharge. Qual Saf Health Care 2006;15:122-6.
24. Praveena P, Usman S, Deepika B, Kumar R, Mohanta GP, Manika P, et al. Impact of patient counselling on knowledge, attitude, practice and quality of life in patients with Type II diabetes mellitus and hypertension. Indian J Pharm Pract 2011;4:50-4.
25. Mihajlovic S, Gautheier J, MacDonald E. Patient characteristics associated with adverse drug events in hospital: An overview of reviews. Can J Hosp Pharm 2016;69:294-8.
26. Francis J, Abraham S. Clinical pharmacists: Bridging the gap between patients and physicians. Saudi Pharm J 2014;22:600-2.