

**TO STUDY THE IMPACT OF VARIOUS INTERVENTIONS ON REDUCTION OF DRUG  
ADMINISTRATION ERROR FREQUENCY: A PROSPECTIVE OBSERVATIONAL  
STUDY****Dr. Sajad Hussain Bhat\*, Dr. Farooq a jan, Dr. Mohd Yousuf Dar**

Skims Soura Srinagar Jammu And Kashmir India Pin 190011, Srinagar, Jammu and Kashmir, India.

**\*Corresponding Author: Dr. Sajad Hussain Bhat**

Skims Soura Srinagar Jammu And Kashmir India Pin 190011, Srinagar, Jammu and Kashmir, India.

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**ABSTRACT**

To err is human and every medical professional is a human. Medication safety is essential in any setting where medications are prescribed, dispensed and/or administered. The safe administration of any medication requires that the correct medication is prescribed, then correctly dispensed, in the correct form and strength, prepared correctly and given at the correct times and in the correct dose to the correct person via the correct route. **Aim And Objective:** The aim of present study was to determine the impact of various intervention programmes in reducing the frequency of drug administration errors. **Methods:** This study was carried in continuation to previous study to ascertain the impact of various interventions to reduce the drug administration error rate. After completion of the baseline study various interventions were done to reduce the error rate and error rate was calculated after implementing intervention programmes. An observational study was carried out for a period of three months in inpatient wards of SKIMS and any discrepancy observed during drug administration was recorded as an error. **Results:** A total of 1216 drug administrations were observed over a period of three months. Among 1216 drug administrations, errors were 103. This gives an incidence of errors as 8.4%. In the background study error rate was 12.4%. It was observed that error rate reduced significantly after intervention. **Conclusion:** Drug administration errors are a serious problem in the healthcare settings and need to be reduced to large extent. There is no acceptable incidence of drug administration errors.

**KEYWORDS:** MAE: medication administration errors.**INTRODUCTION**

National coordinating council for medication error reporting and prevention (NCC MERP) defines medication error as any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of healthcare professional, patient or consumer.<sup>[1]</sup> Medication administration errors are defined as any deviation from physician's medication order as written on patient's treatment chart during medication administration to patient.<sup>[2]</sup>

In hospitals, medication-related error is the most frequent source of patient harm,<sup>[3,4]</sup> representing 20% of all incidents.<sup>[5]</sup> Not all medication errors lead to serious harm to patients; it is estimated that only around 1% of medication errors lead to serious adverse events for the patient.<sup>[6]</sup> The prescription and administration phases of the medication process are the most common points where errors occur,<sup>[7]</sup> with prescription or ordering error accounting for approximately 16% of all medication errors and 50% occurring at the administration phase, according to figures from the United Kingdom.<sup>[8]</sup> The

overall prevalence of medication administration error has been variously estimated in empirical studies as being between 1.7% and 59.1% of total opportunities for error, a broad range which is difficult to interpret.<sup>[9]</sup> A systematic review of 91 studies using direct observation, however, calculated a median error rate of 19.6% (8.6–28.3%) of all types of error, including timing errors, and 8.0% (5.1–10.9%) when timing errors were excluded.<sup>[10]</sup>

The Plan for medication administration begins with identifying the patient, the drug, the route and the time.<sup>[11]</sup> National coordinating council for medication error reporting and prevention (NCC MERP) classified administration errors into<sup>[12]</sup>:

- Wrong Dose Wrong Drug
- Wrong Route Wrong Time
- Wrong Patient Contra Indicated Drug
- Wrong Site Wrong Infusion Rate
- Wrong Dosage form Expired Medication

Such errors may occur intentionally or un-intentionally.

The elderly and mentally ill patients are also more susceptible as they may be confused, resist medication administration, are physically weak and require complex medication regimens.<sup>[13]</sup>

Despite the fact that nurses do their best to attach to rights, sometimes due lack of knowledge about drugs and their adverse effects or systemic or personal factors medication administration errors occur. The Findings of many international studies showed that performance deficit, poor calculation, competency, poor adherence to protocols, poor knowledge of medications and complacent behavior of the nurses are the main factors for medication administration errors. This is referred to as “person- centered” approach to explain errors.<sup>[14]</sup>

Major Consequences of medication errors are patient morbidity and mortality. These can affect patient’s families and health care providers indirectly by cost implications, prolonged hospital stays and psychological impact since errors erode public confidence to health care services.<sup>[15]</sup> The cost of litigation which may be delayed and could implicate the hospital and its staff would be even more substantial.

Interventions are usually targeted at specific sources of error, such as drug identification, distraction, dispensing of incorrect drugs, or incorrect prescribing. Information technology-based interventions, such as Computerized Decision Support Systems (CDSS) and Computerized Physician Order Entry (CPOE), have been used to improve dispensing and prescription practices, as well as to improve drug titration and patient monitoring to prevent under- or over-dosage.<sup>[16]</sup> A systematic review of this class of intervention has reported that few studies show statistically significant evidence of effectiveness with smaller improvements in practice seen in more methodologically rigorous studies and so their actual effectiveness remains unclear.<sup>[17]</sup> Other interventions, such as signage and designated “quiet zones” have been implemented to reduce the effect of distractions and interruptions on staff administering medications.<sup>[18]</sup> Distractions and interruptions are common during medication administration and are considered to be associated with medication errors due to their negative impacts on memory and concentration.<sup>[19]</sup> A 2013 systematic review of these interventions highlighted the methodological weakness of the existing evidence on these types of interventions, with many studies at high risk of bias.<sup>[18]</sup> Other interventions, including education, electronic bar-coding, system changes and ward redesign have also been used with varying degrees of effect.<sup>[19]</sup> Despite the extensive prior work to improve medication safety, medication errors still persist. Multiple interventions have been implemented to address this problem and improve medication safety, many papers have been published, and multiple systematic reviews of those interventions have been conducted, on specific interventions, in specific geographic regions and more broadly. Despite the extent of this work, wide searches

have found that no umbrella review has yet been published to bring together the findings of all good quality systematic reviews and meta-analyses on this topic. It is essential that the most effective interventions are recognized so they can be implemented into practice to prevent medication error and promote medication safety.

## MATERIALS AND METHODS

The study to find the impact of interventions to reduce the frequency of drug administration errors was carried out at Sher-i-kashmir institute of medical sciences (SKIMS) Soura Srinagar, a tertiary care hospital. The background data showed that error rate was 12.4%, with wrong time errors constituting around 5%. If wrong time errors were excluded, the error rate reduced to 7.5%.<sup>[20]</sup> After completion of the baseline study various interventions were done to reduce the error rate which included:

- The staff members who were observed for drug administration errors were informed that errors were committed by them. They were also interviewed about the reasons for drug administration errors according to them.
- The supervisory staff were also educated about the errors occurring during drug administration.
- Seminar was conducted in which all the nurses, supervisory staff and hospital administrators were educated about the errors, reasons for these errors and steps for reducing them. The researcher gave a detailed presentation on medication administration errors which was followed by question answer session.
- As shortage of staff was one of the reasons for medication administration errors more staff was recruited to increase the nurse patient ratio where it was less.

To avoid any bias same methodology was applied which was used in the baseline study. To study impact of intervention on drug administration errors, a prospective observational study was carried out for a period of three months from 1st Jan. 2017 to 31<sup>st</sup> March 2017. The observations were entered in a predesigned proforma. The proforma in addition to patient’s demographic details, included list of drugs given, their prescribed dosage, time of administration and error if any detected during observation. Observations were compared with the drug prescription of concerned patient. Any discrepancy observed during drug administration was recorded as an error. Errors detected during study were categorized into wrong dose errors, wrong rate of administration errors, wrong time of administration errors, missed dose errors, wrong route errors, unprescribed drug errors and other types.

## Data Entry and Statistical Analysis

The responses obtained on the questionnaires were converted into data over a Microsoft excel sheet. The variables of interest have been shown in term of

frequency and percentages. The standard statistical test, Pearson's chi square test has been used to analyze the data. All the results so obtained were discussed at 5% level of significance ( $p$ -value $<0.05$ ). Also the appropriate statistical charts have been used to represent the results. SPSS V 20 has been used to analyze the data.

## RESULTS

To err is human and every medical professional is a human. The present study was a disguised observational study and study area was inpatient wards of a tertiary care teaching hospital to determine the impact of various intervention programmes in reducing the frequency of drug administration errors.

1216 drug administrations were observed over a period of 3 months, involving 406 patients the mean age of patients was  $43 \pm 8$ .

To study the frequency of drug administration errors all the drugs administered by one nurse or any other staff were observed during one drug round. The administration was compared with the patients prescription and any discrepancy was treated as error. Among 1216 drug administrations, errors were 103. This gives an incidence of errors as 8.4%. (Table 1)

**Table 1: Shows no. of doses observed and total no. of errors noticed.**

Total Doses	Total errors	Error %age
1216	103	8.4%

The drugs observed were broadly divided into four classes viz. antibiotics, analgesics, fluids and others. Other drugs included cardiovascular drugs, neurological drugs, gastrointestinal drugs etc. Among the drugs whose administration was observed 419 belonged to antibiotic class, 206 to analgesics, 183 to fluid class and 408 were drugs belonging to other class. (Table 2)

**Table 2: Shows classes of drugs observed for drug administration errors.**

Drug Round	No. of observations	%age
Antibiotics	419	34.4%
Analgesics	206	17%
Fluids	183	15%
Others	408	33.6%
Total	1216	100%

## Drug Route Wise Number of Observations Made

The routes through which these drugs were administered were, 536 were to be given by intravenous route, 455 drugs were to be given by oral route and 225 drugs were to be given by other routes like intramuscular, subcutaneous etc. (Table 3).

**Table 3: Shows number of drugs given by different routes.**

Route of drug administration	No. of Observations	(%)
IV	536	44%
ORAL	455	37.4%
OTHERS	225	18.6%
TOTAL	1216	100%

## Types of drug administration errors and their frequencies

Table 4 shows different types of drug administration errors that were observed after implementation of various interventions and comparison with baseline study. The most frequent type of drug administration error observed was wrong time error 33 (32%) like previous study followed by wrong rate error 24 (23.3%). Other types of errors observed were wrong dose error 16 (15.5%), missed dose error 11 (10.7%), unprescribed drug errors 7 (6.8%) and other type of errors 11 (10.7%). Wrong route error were 1(1%). (Table 4)

**Table 4: Shows Different Types of Errors Observed Be And Comparison With Error Rate Before Intervention.**

TYPES OF DRUG ADMINISTRATION ERRORS				
S. No	Type of error	Number	%Age In Relation To Total Rrors N=103	Error %Age In Background Study
1.	Wrong Dose Error	16	15.5	16.2
2.	Wrong Rate Error	24	23.3	25.7
3.	Wrong Time Error	33	32	35.1
4.	Missed Dose Error	11	10.7	12.2
5.	Wroung Route Error	1	1	0
6.	Unprescribed Drug error	7	6.8	4
7.	Any other error	11	10.7	6.8
	Total	103	100%	100%

It was observed that wrong time error, wrong dose error, wrong rate error, missed dose error rates decreased while unprescribed drug error and other types of error rates increased as compared to previous study. One wrong route error was also observed during the period of study.

## DISCUSSION

The present study was a prospective observational study carried out for a period of three months in the inpatient wards of SKIMS to study the impact of various intervention programmes in reducing medication administration errors. The results of present were compared with the background data that was collected

before applying various interventions. It was observed that there was a significant reduction in the error rate. Before intervention were applied the error rate was found to be around 12.4%. After implementing the various interventions the error rate reduced to around 8.4% and it was observed that wrong time errors, missed dose errors, wrong rate of administration errors, wrong dose errors reduced significantly ( $p < 0.001$ ). However unprescribed drug errors rate were seen to have increased which may be due to observer bias. Also one wrong route error was observed while in the baseline study no wrong route error was observed. Siew-Siang Chua *et al* in their study in pediatric wards observed a significant reduction in error rate by sharing information on drug administration errors, from 44.3% to 28.6%, ( $P < 0.001$ ) in pediatric wards like our study. The intervention in this study was the sharing of Phase 1 findings with the ward staff and to bring awareness of drug administration errors.<sup>[21]</sup> Johanna I Westbrook *et al* in their study showed if interruptions are decreased during drug administration the errors can be reduced significantly. It is clear from these studies that error rate can be reduced by various interventions.<sup>[22]</sup>

## CONCLUSION

Drug administration errors are a serious problem in the healthcare settings and need to be reduced to large extent. There is no acceptable incidence of drug administration errors. It is essential that the most effective interventions are recognized so they can be implemented into practice to prevent medication error and promote medication safety.

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## BIBLIOGRAPHY

1. NCC MERP: The first ten years. Defining the problem and developing solutions.[[http : // www. nccmerp. Org / pdf /reportFinal2005-11-29.pdf](http://www.nccmerp.Org/pdf/reportFinal2005-11-29.pdf) website]
2. Allan EL, Barker KN: Fundamentals of medication error research: *Am J Hosp Pharm*, 1990; 47: 555-571.
3. Fogarty GJ, McKeon C. Patient safety during medication administration: the influence of organizational and individual variables on unsafe work practices and medication errors. *Ergonomics*, 2006; 49(5-6): 444-56.
4. De Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boormeester MA. The incidence and nature of in-hospital adverse events: a systematic review. *Qual Saf Health Care*, 2008; 17(3): 216-23.
5. Malpass A, Helps S, Runciman W. An analysis of Australian adverse drug events. *J Qual Clin Pract*, 1999; 19(1): 27-30.
6. Lisby M, Nielsen LP, Mainz J. Errors in the medication process: frequency, type, and potential clinical consequences. *Int J Qual Health Care*, 2005; 17(1): 15-22.
7. Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of Medication Administration Errors in Hospitals: a Systematic Review of Quantitative and Qualitative Evidence. *Drug Saf.*, 2013; 36(11): 1045-67.
8. National Patient Safety Agency. The report from the patient safety observatory. *Safety in Doses: Improving the use of medicines in the NHS*. 2009. [Cited 15/05/17] Available from: <http://www.nrls.npsa.nhs.uk/EasySiteWeb/getresource.axd?AssetID=61626>.
9. Allan E, Barker K. Fundamentals of medication error research. *Am J Health Syst Pharm.*, 1990; 47(3): 555-71.
10. Keers RN, Williams SD, Cooke J, Ashcroft DM. Prevalence and nature of medication administration errors in health care settings: a systematic review of direct observational evidence. *Ann Pharmacother*, 2013; 47(2): 237-56.
11. Jones SW; Reducing medication administration errors in nursing practice: *Nursing Standard*, 2009; 23(50): 40-46.
12. Rhonda L, Neville AS, David H: Applying hierarchical task analysis to medication administration errors: *Applied Ergonomics*, 2006; 37: 669-79.
13. Susan P. Beyond the Five Rights: Improving Patient Safety in Pediatric Medication Administration through Simulation: *Clinical Simulation in Nursing*, 2009; 5: 181-86.
14. Fanak F, Parham A, Mehrdad F *et al*: Errors in preparation and administration of intravenous medications in the intensive care unit of a teaching hospital; An observational study: *Australian College of Critical Care Nurses*, 2008; 21: 110-16.
15. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: A systematic review of the literature. *Eur J Clin Pharmacol*, 2013; 69(4): 995-1008.
16. Lainer M, Mann E, Soñnichsen A. Information technology interventions to improve medication safety in primary care: a systematic review. *Int J Qual Health Care*, 2013; 25(5): 590-8.
17. Kaushal R, Shojania KG, Bates DW. Effects of computerized physician order entry and clinical decision support systems on medication safety: a systematic review. *Arch Int Med.*, 2003; 163(12): 1409-16.
18. Raban MZ, Westbrook JI. Are interventions to reduce interruptions and errors during medication administration effective?: a systematic review. *BMJ Qual Saf*, 2014; 23(5): 414-21.
19. Keers RN, Williams SD, Cooke J, Walsh T, Ashcroft DM. Impact of interventions designed to reduce medication administration errors in hospitals: a systematic review. *Drug Saf*, 2014; 37(5): 317-32
20. Sajad Hussain Bhat *et al*: To study the frequency and types of drug administration errors in a large teaching hospital in north India: *ijcr Nov*, 2016.

21. Siew-Siang Chua et al. Effects of sharing information on drug administration errors in pediatric wards: a pre– post intervention study *Therapeutics and Clinical Risk Management*, 2017; 13: 345–353.
22. Johanna I Westbrook et al Effectiveness of a ‘Do not interrupt’ bundled intervention to reduce interruptions during medication administration: a cluster randomized controlled feasibility study; *MJ Qual Saf*: first published as 10.1136/bmjqs-2016-006123 on 23 February 2017