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## RESEARCH ARTICLE

# TO STUDY THE FREQUENCY AND TYPES OF DRUG ADMINISTRATION ERRORS IN A LARGE TEACHING HOSPITAL IN NORTH INDIA

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MAE: Medication administration errors,
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**ABSTRACT**

Background: Safety is a concern in many professions including healthcare. Medication use in hospitals is a complex process and depends on successful interaction among healthcare professionals functioning at different areas. Medication errors may occur at any stage of prescribing, documenting, dispensing, preparation or administration.

**Objective:**

- To study the frequency of drug administration errors.
- To study the types of drug administration errors.

**Methods:** A prospective observational study was carried out for a period of one year in the inpatient wards of Sher-i-kashmir institute of medical sciences (SKIMS) Soura Srinagar. The researcher used to visit one ward two days in a week; the wards were selected by simple random sampling. The administration of drugs was observed and compared with concerned patient's prescription. Any deviation observed was noted as error.

**Results:** A total of 4752 drug administrations were observed and compared with patient's prescription. These involved 312 drug rounds done by 138 staff members. A total of 592 errors were noticed. The frequency of drug administration errors was 12.4%. If wrong time errors were excluded, the error rate reduced to 8.1%. Regarding the types of errors noticed, the most frequent type of error observed was wrong time error viz. 208 (35.1%) followed by wrong rate error 152 (25.2%). The frequency of wrong dose error, missed dose error, unprescribed drug error and other type of errors was 96(16.2%), 72(12.2%), 24(4%), and 40(6.8%) respectively.

**Conclusion:** Drug administration errors is a common problem in healthcare settings which needs to be addressed on priority basis for patient safety.



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## INTRODUCTION

Patient safety is freedom from unintended harm due to healthcare intervention. Preventing medical errors and promoting patient safety is currently a focus of many organizations including Institute of medicine (IOM) and Joint Commission (http://www. nccmerp.Org/pdf /reportFinal 2005-11-29.pdf). The most common breach in safety that occurs in hospital settings are medication errors (http://www.joint commission.org/sentinelevents/sentineleven talert/sea_39.htm). 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 (http : // www. nccmerp. Org / pdf /reportFinal2005-11-29.pdf). 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 (Allan *et al*., 1990). It has been estimated that between 44,000 to 98,000 people are harmed each year due to medical errors that could have been prevented in United States and around 7000 deaths occur annually across all patient populations due to medication errors (Kohn *et al*., 2000). Medication errors may occur at any stage of prescribing, documenting, dispensing, preparation or administration (Rhonda *et al*., 2006). According to National patient safety agency (NPSA) 59.3 % of medication errors occur during administration stage.[6] Medication administration error (MAE) rates varied from 1.7% to 59.1% of total opportunities for error (TOE) in an early review of observational studies, with a later systematic review focusing

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on critical care settings, finding an error rate of 3.3–72.5% of drug observations (Allan *et al*., 1990). National coordinating council for medication error reporting and prevention (NCC MERP) classified administration errors into[5]: 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. Keeping in mind the impact, medication administration errors can have on the outcome of patient care, it was thought appropriate to study the scenario of drug administration errors at Sheri Kashmir Institute of Medical Sciences (SKIMS).

## MATERIALS AND METHODS

The study to find frequency and types of drug administration errors was carried out at Sher-i-kashmir institute of medical sciences (SKIMS) Soura Srinagar, which is a 700 bedded large tertiary care teaching hospital in north India. The present study was a disguised observational study and study area was all in-patient wards, excluding emergency wards of a tertiary care teaching hospital. The study was carried over a period of one year from 1st Oct. 2013 to 30th Sep. 2014. The Study wards were selected by simple random sampling and the researcher used to visit one ward two days in a week. Days of the week were also selected by simple random sampling. The wards were divided into Medical & Allied specialties and Surgical & Allied specialties. The researcher used to observe all the drugs administered by one nurse during drug round. The nurse to be observed was selected randomly and observed for one complete medication round. All the drug rounds on selected day were observed. The Drug rounds were divided into Morning, Noon and Night rounds. Records available were also consulted. The observations made in various Drug rounds were entered in a predesigned profoma. The observations made were compared with the drug prescription of concerned patient. Any deviation observed during drug administration was recorded as an error. The drugs whose administration was observed were divided into four classes viz. Antibiotics, Analgesics, Fluids and Others. The drugs were also divided according to route of administration viz. Intravenous, Oral and Others. 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.

## RESULTS

A total of 4752 drug administrations were observed over a period of one year involving 312 drug rounds. The drugs prescribed were given as OD, BID, TID, QID etc. The OD dosages are usually given in morning or night depending on the drug. BID drugs are started at 9 am and 9 pm. TID doses are started at 6 am, 2 pm and 10pm. QID doses are started at 6 am, 12 pm, 6pm and 12 am. In most of wards drugs are given at above timings. The nurses usually make an over of doses to be administered to patients in a drug round. The study area was divided into Medical & Allied and Surgical & allied specialties. The medical specialty included wards where patients with medical problems were admitted and surgical & Allied specialties included wards where patients with surgical ailments were treated. Out of 4752 doses observed 2456 were in Surgical & Allied specialties and 2296 were in Medical & Allied specialties, (Table 1).

**Table 1. Shows percentage of observations made in Medical & Allied and Surgical & Allied specialties**

| Specialty | No. of Observations | (%) |
|---|---|---|
| Medical & Allied Specialties | 2296 | 48% |
| Surgical & Allied Specialties | 2456 | 52% |
| Total | 4752 | 100% |

### Drug Round Wise Observations

The drugs prescribed for patients were given in various drug rounds. These drug rounds were broadly divided into drug rounds in morning, drug rounds at noon and drug rounds in night. During morning rounds 2328 drug administrations were observed, 872 drug administrations were observed during noon rounds and 1552 drug administrations were observed during night rounds (Table 2).

**Table 2. Shows number of drug administrations observed in various drug rounds**

| Drug Round | No. of observations | (%) |
|---|---|---|
| Morning | 2328 | 49% |
| Noon | 872 | 18.3% |
| Night | 1552 | 32.7% |
| Total | 4752 | 100% |

### Drug Class Wise Observations

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, 1800 belonged to antibiotic class, 480 to analgesics, 784 to fluid class and 1696 were categorized in other class. (Table 3)

**Table 3. Shows classes of drugs observed for drug administration errors**

| Drug Round | No. of observations | (%) |
|---|---|---|
| Antibiotics | 1800 | 38% |
| Analgesics | 480 | 10% |
| Fluids | 784 | 16% |
| Others | 1688 | 36% |
| Total | 4752 | 100% |

### Drug Route Wise Number of Observations

Depending upon the route of drug 2758 were to be given by Intravenous route, 1574 drugs were to be given by Oral route and 420 drugs were to be given by other routes like Intramuscular, Subcutaneous etc (Table 4).

**Table 4. Shows number of drugs given by different routes**

| Route of drug administration | No. of Observations | (%) |
|---|---|---|
| Intravenous | 2758 | 58% |
| Oral | 1574 | 33% |
| Others | 420 | 9% |
| Total | 4752 | 100% |

### Frequency of drug administration errors

Out of total 592 errors observed, 536 drug administrations had one error, 16 had two errors and 8 were having three errors. (Table 5)

**Table 5. Shows total no. of doses observed along with number of errors, doses without errors and doses with multiple errors**

| Doses without Errors (%) | Doses with one error (%) | Doses with two errors (%) | Doses with three errors (%) | Total (%) |
|---|---|---|---|---|
| 4192 (88.2%) | 536 (11.3%) | 16 (0.3%) | 8 (0.2%) | 4752 (100%) |
| Total Errors | 536 | 16 X 2=32 | 8X3=24 | 592 |

Hence frequency of errors = Total errors / Total doses x 100
= 592 /4752 x100
= 12.4%

Thus the frequency of errors was 12.4%

Since wrong time errors are considered as less harmful by most researchers and it is recommended to calculate frequency of medication errors with and without wrong time errors. A total of 208 wrong time errors were observed (Table 6). If wrong time errors were excluded the frequency of dug administration errors will be 8.1%.

**Types of drug administration errors and their frequencies**

The most frequent type of drug administration error observed was wrong time error 208 (35%) followed by wrong rate error 152 (25.7%). Other types of errors observed were wrong dose error 96 (16.2%), missed dose error 72 (12.2%), unprescribed drug errors 24 (4%) and other type of errors 40 (6.8%). Wrong route error was not found in any of the doses observed. (Table 7)

**Table 6. Shows different types of errors observed viz. relative percentage in relation to total errors**

| S. No | Type of Error | Number | %Age In Relation To Total Errors N=592 |
|---|---|---|---|
| 1 | Wrong Time Error | 208 | 35.1% |
| 2 | Wrong Rate Error | 152 | 25.7% |
| 3 | Wrong Dose Error | 96 | 16.2% |
| 4 | Missed Dose Error | 72 | 12.2% |
| 5 | Unprescribed Drug Error | 24 | 4% |
| 6 | Wrong Route Error | 0 | 0% |
| 7 | Any Other Error | 40 | 6.8% |
| | Total | 592 | 100% |

## DISCUSSIONS

A total of 592 drug administration errors were observed. In the present study the frequency of drug administration errors including wrong time errors was 12.4%. This is comparable with study conducted by Chua and colleagues who found that error rate was 11.4% in an adult hematology unit (Chua *et al*., 2009). Chua and *et al*. did a study in two pediatric wards and found that rate of drug administration errors was 11.7% (Chua *et al*., 2010). In another study conducted in Geriatric and Cardiovascular- thoracic surgery unit by Tissot *et al*. the error rate was 14.9% which was slightly more than present study (Tissot *et al*., 2003). In the present study 208 wrong time errors were observed. If wrong time errors are excluded, the error rate in present study would be 8.1%. This error rate is comparable to many other studies. Keers *et al*. observed that if wrong time errors are excluded the error rate will be 8 % in their study (Keers *et al*., 2013). Berdot *et al.* found that if wrong time errors are excluded from their study the error rate will be 7.5% (Sarah Berdot *et al*., 2012). In present study wrong time error was the most frequent type of error observed viz. 35.1% (n=208) where the drug was given before or after scheduled time. In line with present study wrong time errors was a major type of error in many other studies. Elizabeth Manias observed that wrong time error was the most frequent type of error observed (Manias *et al*., 2005). Sonia Prot and colleagues conducted an observational study on drug administration errors in pediatric inpatients in a teaching hospital and found that wrong time errors were 36% of a total of 538 drug administration errors observed (Sarah Berdot *et al*., 2012). The second most frequent type of error observed in our study was wrong rate error viz. 152(25.7%). In line with our study Fanak *et al*. in a study in Tehran observed a wrong infusion rate error of 23% (Fanak *et al*., 2008). Tissot *et al*. noticed wrong rate error incidence of 19% in their study slightly less as compared to present study[10]. In present study 96 (16.2%) wrong dose errors were observed. This error rate is comparable to many studies. Ridge *et al*. in their study found wrong dose error rate of 15 % (Ridge *et al*., 1995). In another study by Prot *et al*. wrong dose error rate was again 15 %.[16]
In present study missed dose error rate was 12.2%. Costa *et al*. in their study observed a missed dose error rate of 10.4% (Costa *et al*., 2006). In another study by Yong *et al* in assisted living settings the missed dose error rate was 11.1% (Heather *et al*., 2008). We found 24(4%) unprescribed drug errors in a total of 592 errors observed. Berdot *et al*. in their study observed that 3.7% of drugs administered were unprescribed which is comparable to present study (Manias *et al*., 2005). In another study by Feleke *et al*. an unprescribed drug error rate of 3.1% was observed (YemisirachFeleke, 2010). No wrong route error was observed in present study. Wrong route error rate is very low in other studies also. Gaur *et al* in their study found a wrong route error rate of 1.5% (Sanjay gaur *et al*., 2012). Kumar *et al* found a wrong route error rate of 1.8 % (Kumar *et al*., 2011). In contrast to our study Agalu *et al*. observed wrong route error rate of 9.1% (Asrat Agalu *et al*., 2012). In the present study 40 (6.8%) errors were observed which were classified as other type of errors. These errors include wrong person giving the drug, wrong dosage form, expired medication, contraindicated drug etc. These errors constituted only 6.8% of errors and literature could not be obtained where frequency of these errors has been studied separately.

**Conclusion**

Drug administration errors are a common problem in healthcare settings which need to be addressed on priority basis as per causes. Present study was an attempt to study the rate of medication administration errors. More studies need to be carried out to know the magnitude of drug administration errors in developing countries to get an insight into this problem so that appropriate measures are taken to decrease their occurrence.

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**Ethical Approval**: Taken

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