



A STUDY OF MEDICATION ADMINISTRATION ERRORS IN A TERTIARY CARE HOSPITAL

K.S.Arun Kumar^{*1}, A.Srujana², A H V Santhoshi³

^{*1}Department of Pharmacy Practice, College of Pharmaceutical Sciences, Andhra University, Visakhapatnam,
Andhra Pradesh, India.

²Post Graduate student, ³Department of Pharmaceutical Chemistry, Avanthi Institute of Pharmaceutical sciences,
Tagarapuvalasa, Vizianagaram, Andhra Pradesh.

*Corresponding Author Email: santhosh.pharmacy@gmail.com

ABSTRACT

Medication administration errors account for 34% of all medication errors and identified as one of the important reasons for patients' morbidity and mortality. NPSA statistics show that 59.3% of medication errors occur during the administration stage. Thus, identifying and resolving the administration errors will improve the patient care and decreases the health care costs. National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) taxonomy was used to analyse the frequency, types, severity and factors responsible for medication administration errors. The findings of the study reveal that the frequency of medication administration errors is 15.34%, omission errors (33.02%), improper dose (17.43%) and wrong time (12.84%) errors were the major types of errors occurred and the majority administration errors belonged to category C (112), B (46) and D (35). Frequent interruptions and distractions, lack of communication between health care professionals, performance deficit and work stress on duty nurses are identified as major factors responsible for administration errors.

KEY WORDS

Medication Administration Errors (**MAEs**), National Coordinating Council for Medication Error Reporting (**NCC MERP**) taxonomy, National Patient Safety Agency (**NPSA**)

INTRODUCTION

Medication errors (MEs) are a major issue in health care and are known to be one of the most common types of medical errors.¹ Medication Errors may occur at any stage of prescribing, documenting/Transcribing, dispensing, **administration** and monitoring contributing to morbidity, mortality and increased health care cost². Medication errors may be committed by both experienced and inexperienced staff, including pharmacists, physicians, nurses, supportive personnel (e.g., pharmacy technicians), students, clerical staff (e.g., ward clerks), administrators, pharmaceutical manufacturers, patients and their caregivers, and others.³ Frequent occurrence of medication errors in hospitals will affect the patient's confidence on health care professionals and reputation of

the hospitals. The department of health in UK, estimated the direct and indirect health care expenditure due to medication errors as 2£ billion.¹ In US, American health care system estimated the medication errors expenditure as \$37 billion per year.⁴

In adults, it was estimated that medication errors can cause harm in 1 – 2% of patients admitted to UK and US hospitals.¹ As the medication administration process is performed by the nursing staff especially to in-patients, nurse is held responsible if any medication errors occur and the reason for which is multifactorial and some of them include poor calculation, poor adherence to protocols and poor knowledge on medications.¹⁰

The elderly, and mentally ill patients are particularly more susceptible as they may be confused, resist medication

administration, physically weak and require complex medication regimes.⁵ Paediatric patients are also more susceptible to medication administration errors due to lack of appropriate drug dosages and strengths for use in this group of patients.⁶

Studies shows that patients in the intensive care unit (ICU) are at high risk for administration errors for three reasons.

1. ICU patients usually receive many drugs.
2. The majority of these drugs are given parenterally, and
3. Patient often are sedated and therefore cannot detect and correct possible errors themselves.⁷

According to a retrospective analysis of reports of MAEs in a UK psychiatric hospital, the two most common factors for the MAE due to the nurses as contributing to error causation were a busy, noisy environment and personal factors, such as feeling tired or unsupported.⁸

The most common types of drug administration errors were found to be incorrect time of administration, followed by incorrect drug preparation, omission errors and incorrect dose in a Malaysian study⁹

Vast research and reporting of Medication administration errors was carried out in developed countries like USA and UK, but, very less research was conducted in India on the types, categories, factors responsible and health care costs implied on Medication administration errors.

Thus, the present study was conducted to identify, assess and report MAEs which is need of the hour in order to prevent adverse incidents in a healthcare system and can serve as an important tool for improving patient safety.¹⁰

MATERIALS AND METHODS

Study Setting

The present study was conducted at a South Indian 300 bedded multi-specialty tertiary care private hospital for a period of nine months during January 2012 and September 2012 in the Acute Medical Care (AMC) Unit of

the study site. An average of about 30 patients are admitted either from the outpatient, emergency and casualty departments or transferred from the wards of other clinical specialties to the AMC unit.

Study Approval:

The present study was approved by the Institutional Human Ethics Committee (IHEC) in the meeting held on 02-01-2012.

Study objectives:

General objective:

To study the Medication Administration Errors in the inpatients of Acute Medical Care of tertiary care private hospital in Warangal.

Specific objectives:

- To identify and analyze the medication administration errors.
- To assess the frequency and risk factors of medication administration errors.
- To categorize the medication administration errors based on the severity by using National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP).

Study Procedure:

The case records of patients admitted to, meeting the inclusion criteria were included in to the study. Demographic details of the patients, diagnosis, treatment advised were documented in the documentation form. Medication administration in these patients was followed up on daily basis to identify the administration errors. The frequency and type of medication administration errors were categorized in to various classes using NCCMERP classification system.

Medication administration of the in-patients was followed upon daily basis to identify the administration errors. Frequency of medication administration errors was analyzed by using the 10 following formula:

Number of Significant + Non-significant MAEs

$$\text{Frequency of MAE} = \frac{\text{Doses given + doses ordered but not given}}{\text{Number of Significant + Non-significant MAEs}} \times 100$$

NCC MERP taxonomy was applied to analyze the frequency and types of medication administration errors. The types of medication administration errors were classified in to

omission error, improper dose, wrong medication, wrong strength, wrong dosage form, wrong technique, wrong route of administration, wrong rate, wrong time, wrong patient 11 errors and other types.

Medication administration errors were categorized in to various categories as A, B, C, D, E, F, G, H and I categories based on NCC MERP. Current NCC MERP categorizes medication administration errors in to the 9 following categories.

Category A: Circumstances or events that have the capacity to cause an error

Category B: An error has occurred, but the error did not reach the patient

Category C: An error has occurred that reached the patient, but did not cause harm to patient

Category D: An error has occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm.

Category E: An error has occurred that may have contributed to or resulted in temporary harm the patient and required intervention

Category F: An error has occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization

Category G: An error has occurred that may have contributed to or resulted in permanent patient harm

Category H: An error has occurred that required intervention necessary to sustain life

Category I: An error has occurred that may have contributed to or resulted in the patient's death.

RESULTS

During the study period, medication administration for 222 patients admitted to AMC were reviewed. Among them, 392 medication administration errors were observed in 222 patients. Among the 222 patients, 127 were male patients and 95 were female patients. Among the 392 medication administration errors, 221 were belongs to male patients and 169 were female patients. MAEs were not occurred in 30 patients among the 222 patients. Among the 30 patients, 14 were male and 16 were women.

The frequency of medication administration errors were calculated and was found to be was **23.07%** by using the following formula: 6

$$\text{Frequency of MAE} = \frac{\text{Number of Significant + Non-significant MAEs}}{\text{Doses given + doses ordered but not given}} \times 100$$

In the present study the most common types of errors observed were **wrong rate errors** (IV infusion rate was too fast, n=190 i.e., 48.46%), **omission errors** (failure to administer or failure to record the administration, n=95 i.e., 24.23%) and improper dose errors (over dosage, n=51 i.e., 13.01%), followed by wrong route (n=24 i.e., 6.12%),

wrong strength (n=17 i.e., 04.33%), wrong drug (drug other than the prescribed one, n=08 i.e., 02.04%), and wrong time (e.g. dose was given in noon instead of morning dose. n=07 i.e., 01.78%).

The details of the error types with their percentages are given in Table 1:

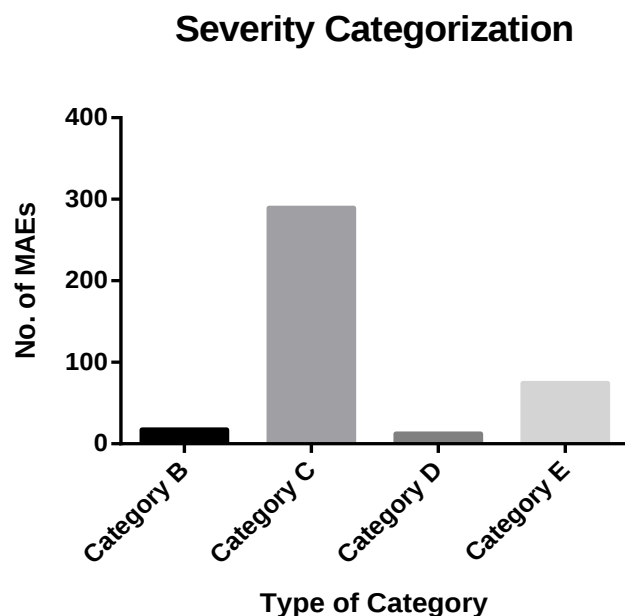
Table 1: Types of Medication Administration Errors:

S.No	Types of errors	Number (n=392)	Percentage (%)
1.	Omission error	95	24.23
2.	Improper dose / quantity	51	13.01
3.	Wrong strength	17	04.33
4.	Wrong drug	08	02.04
5	Wrong route of Administration	24	06.12
6.	Wrong rate: too fast	190	48.46
7	Wrong time	07	01.78

In present study NCC MERP taxonomy was used to assess the severity of the medication administration errors on patient outcomes. The medication administration errors were analyzed and classified in to various categories. Most

of the errors were belonged to the **Category C** (73.72%), Category E (18.87%) and Category B (04.33%) followed by the category D (03.06%) which was represented below graphically in Figure 1:

Fig1: Graphical representation for categorization of MAEs



In the present, study the factors responsible for medication administration errors were also identified like **lack of training** (61.73%), **lack of staffing** (23.72%), lack of communication between the health care professionals

(HCPs) (7.14%) and frequent interruptions and distractions (06.12%). The details of the contributing or risk factors responsible for medication administration errors are presented in Table 2.

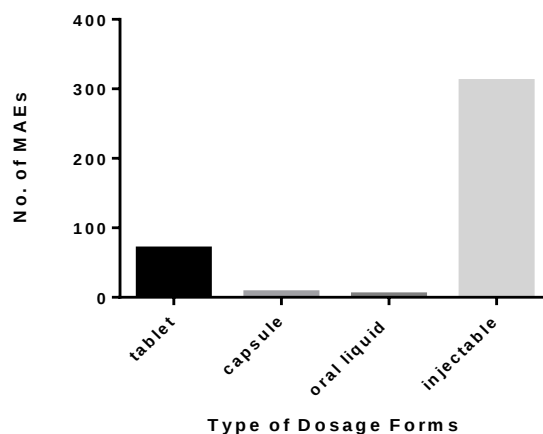
Table 2: Contributing / Risk factors for MAEs

S.No.	Contributing factors	Number (n=95)	Percentage (%)
1	Frequent interruptions & distractions	24	06.12
2	Lack of training	242	61.73
3	Lack of staffing	93	23.72
4	Lack of Communication between HCPs	28	7.14
5	Others	5	1.27

Note: Others include (Patient refusal to take medication / Unable to purchase / swallow medication etc). In the present study, the dosage forms which were involved in most MAEs include **injectable drugs (79.33%)** and **tablets (17.85%)** which was shown in the below figure 2 graphically:

Fig 2: Graphical Representation for Type of Dosage Forms Involved in MAEs:

Type of Dosage Forms involved in MAEs



The common human factors responsible for medication administration errors were studied. **Performance deficit (51.02%), stress (high work load etc) (28.06%),** knowledge deficit (09.43%), recopying MAR (05.35%) and fatigue

(04.59%) are the commonest human factors responsible for medication administration errors that were observed. The list of human contributing factors causing medication administration errors are presented in table 3.

Table 3: Human Factors responsible for MAEs:

S.No	Human factors	Number (n=95)	Percentage (%)
1	Knowledge deficit	37	09.43
2	Performance deficit	200	51.02
3	Recopying MAR	21	05.35
4	Stress	110	28.06
5	Fatigue/ lack of sleep	18	04.59
6	Others*	6	1.53

*Others include (Patient refusal to take medication/ Unable to purchase/swallow medication etc).

CONCLUSION:

In the present study Medication Administration Errors were identified to occur at a frequency of 23.07%. Majority of the errors belonged to Category C (73.72%). Wrong rate errors (48.46%) were the most common type of medication administration errors occurred with injectables as the dosage form commonly involved (79.33%).

The major contributing system related factors associated with medication administration errors were lack of training (61.73%) and human factors include performance deficit (51.02%), stress and peak work load.

Early detection and intervention of medication administration errors will improve the therapeutic

outcomes. Implementation of medication error reporting system in the hospital, conducting the continuing professional development programs for nurses, developing and adopting the policies regarding the drug administrations, implementation of bar coding system minimizes the frequency of medication administration errors.

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***Corresponding Author:**

K.S.Arun Kumar*

Email: santhosh.pharmacy@gmail.com