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To Study Drug Administration Errors and Different Factors Responsible for These Errors in a Large Teaching Hospital in North India

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ABSTRACT

Background: *Medication errors can occur at any of the three steps of the medication use process: prescribing, dispensing and administration. We aimed to study drug administration errors and different factors responsible for drug administration errors.*

Objective: *To study different factors responsible for drug administration errors.*

Methods: *A prospective observational study was carried out for a period of one year to study drug administration errors and factors responsible for these errors at Sher– I – Kashmir institute of medical sciences Soura Srinagar. Administration of drugs was observed and compared with concerned patient's prescription. Any deviation between administration and prescription was taken as error.*

To study factors responsible for drug administration errors, the reasons noted by researcher for these errors were noted down. An interview of the staff members who were observed for drug administration errors, nursing administrators, and doctors for reasons of such errors was conducted at the end of study. The demographic details of the staff including age, qualification, experience were taken from hospital administration.

Results: *A total of 4752 drug administrations were observed involving 312 drug rounds and 138 staff members. In a total of 4752 drug administrations, 592 errors were noticed. Among these drug administrations 536 dosages had one error, 16 had two errors and 8 had three errors.*

The most common reasons noticed by researcher were interruptions during drug rounds, shortage of staff, and lack of communication between healthcare professionals among themselves as well as with patients. The major reasons cited by staff as well as doctors were excess workload, interruptions and poor communication. Other less common reasons were fatigue, stress, knowledge deficit, miscalculation of dose etc. There was no significant effect of gender and age of staff on the occurrence of medication administration errors. However the error rate was less with more qualified and experienced staff.

Conclusion: *Drug administration errors need to be reduced by identifying the factors responsible for these errors.*

Keywords: *Medication Administration Errors.*

Introduction

Medication use in hospitals is a complex process and depends on successful interaction among healthcare professionals functioning at different areas. Medication administration has become more complex as a result of the increasing number

of medications available and new routes of administration. Little evidence is currently available to guide practitioners, administrators and policy makers in their efforts to reduce incidence of medication administration errors. The most common breach in safety that occurs in hospital settings are medication errors.[1] It has been estimated that 7000 deaths occur annually across all patient populations due to medication errors.[2] 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.[3] 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.[4] The risk of medication errors tend to be higher in pediatric patients than in adults. 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.[5] Current medication administration processes include many tasks, including but not limited to, assessing the patient to obtain pertinent data, gathering medications, confirming the five rights (right dose, patient, route, medication, and time), administering medications, documenting administration, and observing for therapeutic and untoward effects. 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.[6] Another approach to explain errors states that a series of failures combines to form an error. This is often referred to as "Swiss cheese model" in which each hole in the cheese is an error.[7] The System related causes for administration errors include physician's poor handwriting, lack of coordination between health care professionals, increased workload, stress etc. are also responsible for medication administration errors.[7] National coordinating council for medication error reporting and prevention (NCC MERP) takes stance that there is no acceptable incidence rate for medication errors and the goal should to continuously improve healthcare system so that medication errors are prevented. Thus interventions are needed to decrease medication errors and patient safety through safe medication administration.[8]

Methods

A prospective observational study was carried out for a period of one year at Sher– I – Kashmir institute of medical sciences Soura Srinagar, which is a 700 bedded large tertiary care teaching hospital in north India from 1st October 2013 to 30th sep. 2014.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 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 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 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.

To study factors responsible for drug administration errors, the reasons noted by researcher for these errors were noted down. An interview of the staff members who were observed for drug administration errors, nursing administrators, and doctors for reasons of such errors was conducted at the end of study. The demographic details of the staff including age,

qualification, experience were taken from hospital administration.

Data Entry and Statistical Analysis

The responses obtained 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

A total of 4752 drug administrations were observed over a period of one year involving 312 drug rounds and 138 staff members. 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.

To study the drug administration errors all the drugs administered by one nurse or any other staff were observed during one drug round. Any deviation in administration of drugs from prescription of concerned patients was taken as error. Among 4752 drug administrations observed, errors were 592. This gives a frequency of errors as 12.4%. (Table 1)

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

Total Doses	Total errors	Error %age
4752	592	12.4%

To study factors responsible for drug administration errors, the demographic characteristics of staff including age, gender, qualification, time since recruitment were noted. The errors observed were studied in relation to demographic details of the staff. A total of 138 nurses were observed for drug administration errors. In addition the reasons for various errors as perceived by the researcher were also noted. These reasons were divided into six broad categories viz. interruptions during drug round or administration, shortage of staff, lack of communication between staff and patients, knowledge deficit, miscalculation of dose and others. At the end of study an interview of concerned staff and nursing administrators was done. The reasons cited by staff were again divided into six broad categories viz. excess workload, interruptions during drug round, poor communication, stress to complete drug round, fatigue and others. Other reasons include lack of training, did not agree that medication errors occur, patient refuses to take medication etc. Some staff members gave more than one reasons but the most important reason as per them was noted. A total of 50 doctors were also asked about drug administration errors and reasons for their occurrence. The reasons given by doctors like excess workload, interruptions, poor communi-cation were also the common causes of errors in their view. They were also of the view that performance deficit, fatigue and other reasons are also causes of drug administration errors. At the end of the study the nursing administrators were asked about the reasons for drug administration errors. They were of the opinion that errors occur sometimes, due to shortage of staff but by the time the study was finished more staff had been recruited and that will surely improve the scenario.

Age of staff and drug administration errors

In a total of 138 staff members that were observed for drug administration errors, 69% (n=95) had age between 20 to 40 yrs and 31% (n=43) had age between 41 to 60 yrs.

Table 2: Shows relation between age of staff and the number of errors observed

Age Of Staff (In years)	Number Of Errors		Total	P Value
	Yes (%)	No (%)		
20 TO 40	468 (12.8%)	3198 (87.2%)	3666(100%)	0.324
41 TO 60	124 (11.4%)	962 (88.6%)	1086(100%)	
Total (%)	592 (12.4%)	4160 (87.6%)	4752(100%)	

Table 2 shows the errors in doses administered by staff having age between 20 to 40 yrs were 468 (12.8%) in a total of 3666 doses administered by them. 124 (11.4%) doses were erroneous in 1086 doses administered by staff having age between 41 to 60 yrs. There was no significant effect of age on error rate.

Gender of staff observed for drug administration errors

Regarding gender of staff who were observed for drug administration errors 99% (n=136) of doses were administered by female staff and 1% (n=2) were administered by male staff.

Table 3: Shows relation between gender of staff and the number of errors observed

Gender	Number Of Errors		Total	P Value
	Yes (%)	No (%)		
Male	587 (12.5%)	4109 (87.5%)	4696(100%)	
Female	5 (8.9%)	51 (91.1%)	56(100%)	0.849
Total (%)	592 (12.4%)	4160(87.6%)	4752(100%)	

Table 3 shows that among 4696 doses observed which were given by female staff, the errors were 587 (12.5%) The number of errors were 5 (8.9%) in 56 doses given by male staff. There was no significant difference in error rate between doses given male or female staff.

Qualification of staff and drug administration errors

Regarding the qualification of staff that were observed for drug administration errors 72% (n=99) had diploma in nursing and 28% (n=28) were having a Bsc in nursing or higher qualification.

Table 4: Shows relation between qualification of staff and the number of errors observed.

Qualification	Number Of Errors		Total	P Value
	Yes (%)	No (%)		
Diploma	478(14.2%)	2930(85.8%)	3408(100%)	0.001
Bsc	114 (8.5%)	1230(91.5%)	1344(100%)	
Total (%)	592(12.4%)	4160(87.6%)	4752(100%)	

Table 4 shows that among 3408 doses administered by staff who were having diploma in nursing, 14.2% (n=478) doses were having some error. In a total of 1344 doses given by staff who had done Bsc in nursing, the error rate was 8.5% (n=114) while 91.5% doses were given as prescribed. There was a significant low error rate in doses administered by staff having a degree in nursing than those having a diploma.

Experience of staff and drug administration errors

Regarding experience of staff that was observed for drug administration errors 80 (58%) had an experience of 1 to 10 years, 52 (38%) had an experience of 11 to 20 years and only 6 (4%) staff were having time since recruitment of more than 20 years.

Table 5: Shows relation between time since recruitment of staff and the number of errors observed

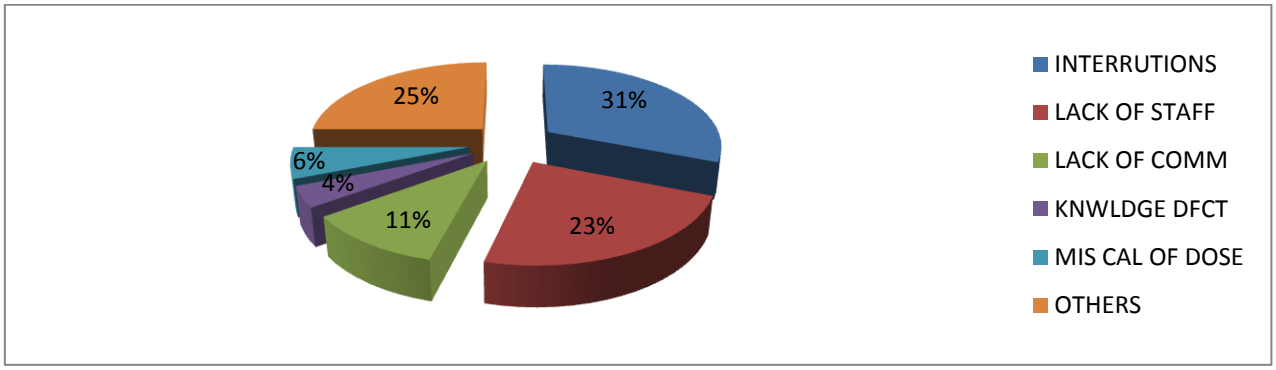
Time Since Recruitment	Errors		Total	P Value
	Yes (%)	No (%)		
1 to 10 Yrs	368 (13.3%)	2390 (86.7%)	2758(100%)	0.0431
11 to 20yrs	215 (11.5%)	1659 (88.5%)	1874(100%)	
>20yrs	9 (7.5%)	111 (92.7%)	120(100%)	
Total (%)	592(12.4%)	4160(87.6%)	4752(100%)	

Table 5 shows that there was a significant decline in error rate with increased years of experience. The error rate was highest 368 (13.3%) with staff having experience of <10 years among 2758 doses administered by them. The staff having experience of 11 to 20 years and >20years rate of 215 (11.5%) and 9 (7.5%) had errors respectively in 1874 and 120 doses administered by them.

Reasons for drug administration errors as seen by researcher

Interruption during drug rounds was most frequent cause of errors viz.31% (n=184) followed by lack of staff 23% (n=134). Other causes of errors included lack of communication between health care professionals and patients 11% (n=65), miscalculation of dose 6% (n=36), knowledge deficit 4% (n=24) and others 25% (n=149). Other causes included patient refusal, patient was not present at the time of drug round, iv access unavailable etc. (Fig. 1)

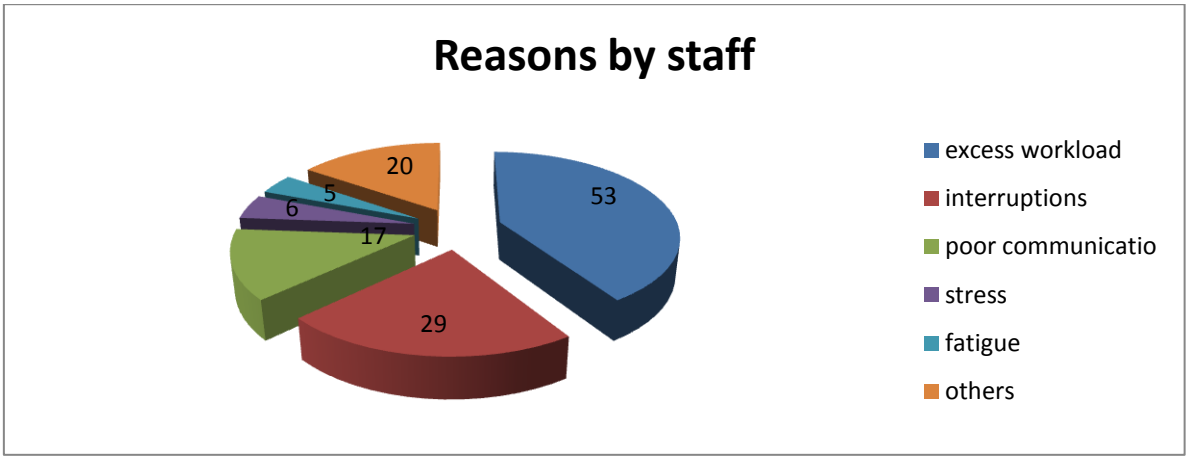
Fig. 1: Shows reasons cited by researcher for various drug administration errors observed



Reasons given by staff for drug administration errors

At the end of the study the concerned staff that was observed for drug administration errors was asked about the reasons for errors that were seen. 130 nurses were asked about reasons for drug administration errors. Excess workload 41% (n=53) and interruptions during drug rounds 22% (n=29) were main reasons given by staff for drug administration errors. Other reasons that were cited by staff for errors in drug administration were poor communication among healthcare professionals and patients 13% (n=17), stress to complete drug round 5% (n=6), fatigue 4% (n=5) and others 15% (n=20). The other reasons include patient refusal to take medicine, did not agree that errors occur, patient was not present at the time of drug round.(Fig. 2)

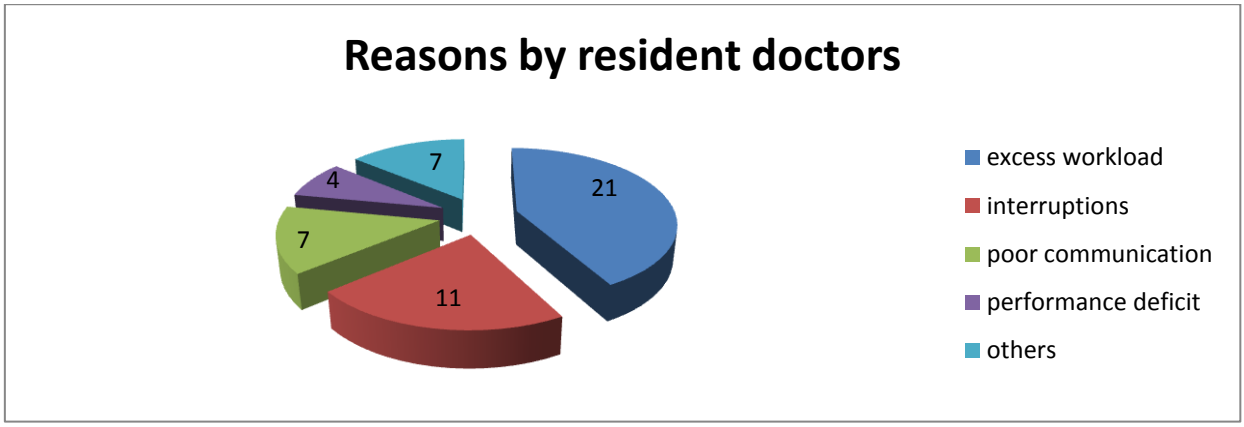
Fig. 2: Shows reasons cited by staff for various drug administration errors observed



Reasons given by doctors for drug administration errors

A total of 50 doctors were asked about the reasons for drug administration errors that were observed. They were also of the view that errors occur sometimes during drug administration. Excess workload was also the most common reason for drug administration errors by doctors. 42% (n=21) doctors of the view that nurses have high work load. Other reasons given by doctors were interruptions during drug rounds 22% (n=11), poor communication 14% (n=7), performance deficit 8% (n=4), others 14% (n=7). (Fig. 3)

Fig. 3: Shows reasons cited by doctors for various drug administration errors observed



Discussion

In the present study the frequency of drug administration errors was 12.4%. This is comparable with study conducted by Chua and colleagues (11.4%) in an adult hematology unit,[9] Chua and et al. in two pediatric wards(11.7%)[10] and Tissot et al. in Geriatric and Cardiovascular-thoracic surgery unit (14.9%)[11]

In the present study there wasn't a statistically significant difference in error rates between male and female staff (p=0.849). Fanak et al in their study did not find a significant correlation between gender of staff and medication administration error rate just like present study.[6] Age of staff also had not a significant effect on the occurrence of drug administration errors (p=0.324). Like present study Fanak et al did not found a significant effect of age on occurrence of medication administration errors.[6] There was a significantly lower error rate among staff having Bsc in nursing. In line with our study Westbrook et al. showed that with each year of experience, up to 6 years reduced the risk of errors by 10.9% and serious error by 18.5%.[12]

The main reasons for drug administration errors cited by researcher, staff and doctors were interruptions during drug rounds, excess workload and lack of communication between healthcare professionals and patients, which is comparable with study by Kumar et al who observed frequent interruptions, lack of communication between healthcare professionals, shortage of staff were the main reasons for drug administration errors.[13] Westbrook et al showed that error frequency increased with interruptions.[14] Elizabeth Manias in her study observed heavy workload, stress and fatigue are main contributing factors for drug administration errors.[15] Szczepura et al studied medication administration errors in long term residential homes for older people and observed that nearly all staff identified interruptions during drug rounds as cause for administration errors followed by stress to complete drug round.[16] Tissot et al in their study for potential risk factors for medication administration errors found that nurse workload and incomplete and illegible prescriptions were two independent risk factors for medication administration errors.[17] Richard Keers et al revealed that common error provoking conditions influencing administration errors include inadequate written communication, high perceived workload, problems with medicine supply and storage, fatigue and stress and interruptions and distractions during drug administration.[18]

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