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Medication errors in medicine wards in a tertiary care teaching hospital of a hill state in India

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ABSTRACT

The study was done to calculate the incidence of errors, classify them and to determine the factors that may have led to these errors.This was a prospective study done in a tertiary care teaching hospital of hill state of uttrakhand India for a period of 1 year. All patients admitted in medicine wards were included and Errors were detected by daily chart review and interview of care providers, resident doctors, and nurses. The medication error rate was 25.7% in a sample of 1586 admissions. Errors related to medication were 50.26%, related to treatment procedures 16.23% and related to clerical procedures in 28.27% with a predilection of errors during night shifts and long working hours. Most of the errors resulted in no significant morbidity (66.49%) .,16.23% resulted in mild morbidity ,10.49% patients suffered from moderate morbidity while 6.28% of the patients experienced severe morbidity.37.17% of incidences were due to content errors, 18.32% were errors in administration, 16.23% errors were due to faulty procedures and 28.27% were due to clerical errors. Maximum errors were committed during routine situations and were unforced .Weight-based dosing, equipment failures or inadequacy, clerical mistakes in, carelessness and a lack of training and experience were important causes of these errors. The present study cites an incidence of 25.7% error rates related to medication. Cause of medication errors is related to human factors and also system failures. The approach of identifying failures and redesigning faulty systems can reduce errors.

Key words: Hill state, medication errors, medicine wards, Administration error.

Introduction

To err is human and a doctor is human. Patients will be safer when we accept this reality and design clinical tasks accordingly . This is to understand circumstances that can entail unforced errors either by the attending clinician or the support staff.Medication errors pervade all phases of acute care. About 20% of patients will have a potentially harmful error in their preadmission medication history that may result in an incorrect medication order at the time of admission.(1) During admission to hospital, the error rate for drug prescribing is at least 3%,(2,3) and, based on direct observation, the error rate in drug administration is about 19%(4) There is a 2% error rate for intravenous infusions in critical care.(5)Upon discharge, about 25% of patients will have an error in their discharge prescriptions compared with their hospital medications.(6) Although these studies used different methods and measures and included different patient populations, their collective message is that the likelihood of having a hospital admission free of medication error is vanishingly small. Despite the frequency of these medication errors, most cause no harm to patients. The most common error is delayed drug administration resulting from a missing dose. More serious medication errors have a greater potential for harm and can be termed "potential adverse drug events." For example, a 10-fold error in morphine concentration is obviously more serious than a 10% error. Medication errors that actually cause harm are termed "preventable adverse drug events." For every 100 medication errors, there are between 4 and 10 potential adverse drug events and 1 preventable adverse drug event.(7)Depending on methods and definitions, about 1%–2% of patients will experience a preventable adverse drug event while in hospital.(8) The

hospitals currently have to bear the fallout of any legal actions brought against them. As part of risk management plans it is imperative to monitor drug administration errors as an indicator of the effectiveness of their prescribing, supply, and administration chain. Since detailed knowledge of the incidence and characteristics of errors are a prerequisite for appropriate planning of error prevention strategies this study was undertaken to calculate incidence of errors, to classify them and to determine the factors that may have led to these errors.

Material and methods

This prospective study was conducted between 1st January and 31st dec 2009 in a tertiary care teaching hospital in hilly state of uttrakhand India. The sample population included all patients admitted in the medicine ward , of this hospital. Errors were detected by daily chart review and interview of care providers, resident doctors, and nurses. All patients who were detected to have a medical error and confirmed by another specialist were included in this study. Medical error was defined "as any error in the delivery of medical care, whether it has the potential to cause harm or not. Detailed information of the incident was collected, including patient age, sex, diagnosis, exact error, time of error, person responsible for the error and outcome of the error. Anonymity of both patient and the personnel was maintained for medicolegal reasons.

Results

There were 1586 admissions during the study period with age range from 18 yrs to 82 years The total number of errors detected was 382/1486 (25.7%). Types of errors included errors related to medication 192, related to treatment procedures 62 and related to clerical procedures in 108. Of the 1586 admission in various wards of Medicine department during the study period the total instances of detected errors was 382 (25.7%) . Slightly more than half 54.45% of the errors occurred in the night slight between 8 P.M. – 8 A.M. Most of the errors resulted in no significant morbidity (66.49%) . 16.23% resulted in mild morbidity (eg mild alterations in rhythms of heart asymftomatic hypo/hyperglycemia, thrombophlebitis, sedation, restlessness, nausea, vomiting, headache). 10.49% patients suffered from moderate morbidity (eg blurred vision, renal insufficiency,skin and muscle haematomas, symptomatic hypoglycemia, desaturation, symptomatic hypothermia). While 6.28% of the patients experienced severe morbidity(ICD insertion due to pneumothorax, rash and skin oedem , GI bleeding , CCF, apnea with bradycardia, DIC and rebound hyperbilirubinemia). Fortunately no incidence of death was reported (table1) . 48.7% of the errors could be traced to the prescribers end with more than half of them (54.30%)involving junior residents. The nursing staff was found wanting in 43.9% of the incidences while 9.9% of the errors resulted on part of the technical staff. 37.17% of the errors were found out to be of content errors, maximum errors related to medications were due to use of incorrect concentration of the prescribed drug (11.78%) followed by incorrect calculation of the dose (9.42%). Incorrect use of medication caused 4.19% of the errors while incorrect dosage form and incorrect schedule contributed 3.40% instances each. 1.05% instances were due to of medication and 1.57% were because of incorrect route(table.2). Errors in administration comprised 18.32% of the errors with maximum instances (15.76%) were of stopping the IV fluid without instruction followed by errors in rate of administration (4.19%) and non compliance of orders contributed 2.36% and 2.88% resp.(table3) Errors in procedures contributed 16.23% of total errors with wrongly placed IV lines contributing maximum (7.07%) Improper explanation of procedures, transfusion procedures and placement of reads accounted for 2.09% each. 3 cases (0.79%) resulted in development of pneumothorax as a result of faults in placement of chest tube .(table 4)

28.27% of errors were due to clerical errors. Errors in recording weight (8.38%), delays in investigation reports (5.76%), omission of drugs or instructions (4.71%)Errors in identification (4.71%) miscommunication (2.62%) and misinterpretation of orders (2.09%) constituted these errors (table5) . Maximum goof ups were made while

handling antimicrotbials followed by sedatives, analgesia vasopressors and catecholamines. The study revealed that maximum chances of errors were noted during routine situations. While during admission and discharge procedures, emergencies during interventions and urgent crisis with another patient in the unit were cited as contributing factors by the attending staff.

Discussion

The method of detection influences the detection of the magnitude of medication errors. Kaushal, et al.[9] have successfully used the technique of daily chart review and interview of care providers and the same was followed in this study but the said method is effort intensive. Our study did not show any significant diurnal variation in errors. However in other studies errors were common between 6-10 PM[10,11] due to the impact of sleep deprivation on performance.The percentage of medication errors in other studies that have used similar methodologies varies between 2.4% and 19%[12,13,14,15] The comparison of the results of these studies has limitations due to differences in definitions, methods, and environments, including different delivery systems,and to the fact that they refer to errors that reach the patient (discrepancies between prescription and administration).With regard to other variables associated with errors,there are studies that have not found any relationship with the number of drugs in each dose. [16,17].However,an association has been reported between administration errors and the workload falling on the nursing staff [18]a variable that could be related to the administration schedules. Given the low predictive capacity of the present study ,it is possible that the workloads of the nursing staff and other variables not included in this study are important to explaining the proportion of medication errors.

Improperly written medical orders directly or indirectly lead to commitment of errors as the investigators found that it leads misinterpretation of orders leading to undue commission or omission of drugs , wrong dosing or schedules as stated by Larson EB that inadequate and ambiguous orders are still judged to be a problem.[19]

In a subjective assessment of staff,workload,stress,and fatigue were seen as a contributing factor for error in33% of all events. [20]Tarnow-MordiWO reported that the maximum chances of errors at the administration stage occurred during routine procedures ,similar trend was demonstrated in the present study probably hinting towards a hint of carelessness or at ease attitude which can be addressed very easily thereby decreasing the chances of errors significantly.[21]

KorenG, Barzilayz and Modan M [22]reported an incidence of around 6.3% in computation of volumes of drugs to be administered citing a deficiency in the in service training of the staff. While Hereout PM, Essted BL [23] have reported an errors rate of 6% in dosing. The present study estimated are slightly higher in 11.78% which reinforces the idea of adequate in services training and routine updates for the attending staff. The present study hints at predilection to medical errors during the night shift probably indicating a lack of sleep / tiredness as a contributing factor as reported by vanden Bent PMet al and Gaba DM and Howard SK. who cited maximum chances of errors around midnight. [24.25]Incidences of severe morbidity as a consequence of drug error in our study (6.28%) is also reported from round the world (0.75- 6.5%)[26] . Hilmer et al in 2007 have reported that Failure to weigh patient often results in erroneous administration of dose of a particular drug as was found out in the present study where 11.78% of the errors were due to wrong calculation of the concentration of the drugs and 9.42% errors due to wrong calculation of the effective doses.[27] LaPointe NM et al noticed that transition from out patient to inpatient was the most common point in the system for the occurrence of these medication errors. Higher numbers of errors were also identified during the transition period of house staff.The in the present study investigators found that maximum errors were unforced or during routine procedures but the movement of the patient within hospital also has a significant bearing on commiting errors[28] 48.7% of the errors in the present study were ascribed to doctors with more than half of them (54.30%)involving junior residents as reported by Hendey GW, Barth BE, & Soliz T

who in their study highlighted the role of junior residents and night shifts as a cause of error in medication orders [29].

One of the most important steps in improving patients' safety is to understand how and why error occurs .We identified several contributing factors for errors in the administration of medication, through our observational design ,so we can not confirm any causal relationship .With respect to the daily process of care, the most robust results refer to the beneficial effect of routine checks of perfusors and infusion pumps at every nursing shift change and the existence of a critical incident reporting system.[30] Given the frequency and impact of errors of omission , preventive measures for this type of error should be investigated .As both types of administration errors ,omission and commission might be reducible by technical measures such as aided recall, drug identification (such as barcodes), and proper design of infusion pumps. We should focus on developing systems that view humans as fallible and assume that errors will occur, even in the best organizations. In this model, multiple barriers and safeguards can be developed to reduce the frequency of errors. Error reporting is an important component of this strategy because it reveals the active failures and latent conditions in the system[31] Ideally, error reporting should be voluntary, anonymous, centralized to increase the pool of data, and designed to identify opportunities for performance improvement. The approach of identifying failures and redesigning faulty systems appears to be a more promising way to reduce human error. Forcing functions, simplification and standardization are useful safety-improvement concepts[32] Medication errors are unavoidable, but attention to safety improvement principles can reduce harm. The focus of our attention should be on systematically applying and evaluating safety improvements, rather than demanding perfection from individual health care professionals.
Reduction of the drug administration error rate will depend on doctors, nurses, and pharmacists working together. Each has a role in improving the quality of drug administration and in monitoring the quality of other groups and a healthy interactive interplay of these players can be a major step towards lowering the error rates. Doctors must use the generic drug name so that nurses can check it against the label on the drug. Pharmacists must clarify any unclear or inappropriate prescriptions. Simplification is another valuable safety improvement method. Calculators strategically placed in preparation areas for intravenous drugs will simplify the task and eliminate the potential for error that results from mental arithmetic. There are 2 potential approaches to reducing medication error. The "person-centred approach" focuses on the individual who makes the error. This individual may receive education, training or possibly discipline. The person-centred approach is doomed to fail, however, because errors are an inherent property of the people doing the work and the complexity of the work itself.

By contrast, the "system-centred approach" is based on 3 principles: error is unavoidable; processes can be designed to reduce the possibility of error; and processes can be designed so that errors are detected and corrected before harm occurs.[32]

Strategies to prevent medication errors

Optimization of the medication process can be achieved by medication standardization, computerized physician order entry,clinical decision support,bar code technology , computerized intravenous infusion devices.
The risk factors can be minimized by avoiding excessive consecutive and cumulative working hours, minimize interruptions and distractions and training supervision and graduated responsibility , adequate staffing and last but not the least incorporation of quality assurance into academic education.

Table .1 Consequences of medication errors

Not significant	254 (66.49%)
Mild morbidity	62 (16.23%)
Moderate morbidity	42 (10.49%)
Severe morbidity	24 (6.28%)
Death	0

Table .2.Content errors / errors related to medications

Incorrect medications	16 (4.19%)
Incorrect concentrations	45 (11.78%)
Incorrect dosage forms	13 (3.40%)
Incorrect dose	36 (9.42%)
Omission of medication	4 (1.05%)
Incorrect schedule	13 (3.40%)
Incorrect route	6 (1.57%)

Table .3. Errors in administration

Errors in rate of infusion	16 (4.19%)
Over infusion	12 (3.14%)
I.V. fluids stopped without instructions	22 (5.76%)
Incorrect IV fluid	9 (2.36%)
Non compliance of orders	11 (2.88%)

Table . 4. Errors in procedures

Improper explanation about procedures	8 (2.09%)
Transfusion	8 (2.09%)
Chest tube placement	3 (0.79%)
Errors in placement of IV lines	27 (7.07%)
Wrong handling of Foleys	6 (1.57%)
Improper placement of leads	8 (2.09%)
Errors in L.P	2 (0.52%)

Table 5. Clerical errors

Errors in identification of patient	18 (4.71%)
Errors in recording of weight	32 (8.38%)
Delays in investigation reports	22 (5.76%)
Omission of drugs / instructions	18 (4.71%)
Miscommunications	10 (2.62%)

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