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Research Article

Patient Centred Approach To Minimise Medication Error With High-Risk Medications: A Call To Action

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ABSTRACT

Background:

Medication errors are a prevalent concern and a significant risk associated with modern healthcare delivery, representing one of the many hazards of hospitalization. This issue is multifaceted and stems from various factors across different disciplines. The utilization of high-risk medications and their associated medication errors has become more prevalent owing to the heightened incidence of illnesses.

Objectives:

Evaluate medication errors and drug-drug interactions associated with HRMs in a 1000-bed teaching hospital across various specialties. Materials and methods: A six-month prospective observational study was conducted in the hospital's General Medicine, Cardiology, and Intensive Care Unit departments.

Results:

About 32 pharmaceutical errors were primarily involving incorrect dosage error 28.23%, followed by incorrect prescription error 25%, incorrect preparation error 18.75%, improper storage and monitoring error 9.38%, dispensing error 6.25% and wrong duration error 3.13%. Additionally, 45 potential drug-drug interactions were identified, with 15% involving HRMs.

Conclusion:

This study underscores the importance of assessing high-risk medications and highlights the integral role of clinical pharmacists in managing such medications. Their involvement facilitates in ensuring medication safety, providing personalized care, educating patients, and fostering collaboration across disciplines. These efforts collectively contribute to improving the quality of patient care and outcomes.

KEY MESSAGES:

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Medication errors, particularly with high-risk medications, present a critical challenge in modern healthcare. Our study, conducted in a large teaching hospital, identified various errors and potential drug-drug interactions across clinical settings. These findings underscore the urgent need for vigilance and the pivotal role of clinical pharmacists in ensuring medication safety and improving patient outcomes.

INTRODUCTION

High-risk medications (HRMs) constitute a subset of pharmaceuticals characterized by a narrow therapeutic index and a heightened susceptibility to adverse effects when misapplied [15]. Often prescribed for critically ill patients or those with complex medical conditions, HRMs present unique challenges due to the heightened potential for drug interactions and medication errors. In healthcare settings, where multiple personnel are involved in the medication management process—from prescription to administration—the complexity of the system amplifies the likelihood of errors [7]. Medication errors, as defined by the National Coordinating Committee on Medication Error Reporting and Prevention (NCCMERP), encompass any preventable event that may result in inappropriate medication use or patient harm while under the control of healthcare professionals, patients, or consumers. Identifying and addressing medication errors is paramount in enhancing clinical practice and ensuring patient safety [10]. Given the heightened vulnerability of patients in these settings and the potential for severe harm associated with medication errors, there was a pressing need to identify areas of improvement to minimize medication errors and enhance the quality of care provided to patients [8].

MATERIALS AND METHODS

Table 1: High Risk Medications Associated With Various Medication Errors

S.NO	HRM	PE	WPE	IDE	MOE	SE	DE	WDE
1.	Insulin	✓	-	✓	✓	✓	-	-
2.	Noradrenaline	-	✓	-	-	-	-	-
3.	Vasopressin	-	✓	-	-	-	-	-
4.	Dobutamine	-	✓	-	-	-	-	-

In a six-month observational study across Intensive Care, General Medicine, and Cardiology departments, we investigated medication errors and Drug-Drug interactions associated with high-risk medications as classified by the Institute for Safe Medication Practices. Patient demographics, medical history, medications, and treatment plans were collected through interviews and chart reviews. Daily clinical reviews assessed patient progress. Medication errors were identified through a multi-pronged approach. Prescription review identified prescribing errors and improper dosing. Medication preparation errors were detected by analysing dilution calculations. Dispensing and storage errors were observed directly. Drug-drug interactions were scrutinized using comprehensive databases like identified using Micromedex and Lexicomp. This comprehensive approach aimed to evaluate medication safety practices for high-risk medications in these high-acuity settings.

RESULTS

A total of 97 prescriptions with high alert medications was assessed, majority of them were Males (n = 66, 68.05%). Age ranged from 20 – 99 years out of which majority of high alert medications were prescribed among old adults (60 – 99 years). From the study, a total of 32 medication errors were observed. The most prevalent type of error was prescribing error (PE) 25% and wrong preparation error (WPE) 25% followed by improper dose error (IDE) 21.88%, monitoring error (MOE) and storage error (SE) each 9.38%, dispensing error (DE) 6.25% and wrong duration error (WDE) 3.13%.



5.	Adrenaline	-	✓	-	-	-	-	-
6.	Heparin	✓	-	-	✓	✓	✓	✓
7.	Tramadol	✓	-	-	-	-	-	-
8.	Digoxin	✓	-	-	-	-	-	-
9.	Potassium chloride	✓	-	-	-	-	✓	-
10.	Dextrose	-	-	-	✓	-	-	-

(HRM-High Risk Medication; PE-Prescribing Error; WPE-Wrong Preparation Error; IDE-Improper Dosing Error; MOE-Monitoring error; SE-Storage error; DE-Dispensing error; WDE-Wrong duration error)

Table 2: Improper Dose Errors

DRUGS	ACTUAL DOSE TO BE GIVEN	ADMINISTERED DOSE	CATEGORY
Insulin	20units	12units	C
Insulin	8units	4units	C
Insulin	16units	14units	C
Insulin	4units	No order	C
Insulin	No order	4 Units	E
Epinephrine	0.1 to 0.5mcg/kg/min	0.026mcg/kg/min	C
Norepinephrine	8-12mcg/min IV	1.33mcg/min	C
Heparin	5000 U	500 Units	C

Table 3: Wrong Preparation Errors

DRUGS	STANDARD DOSE	PREPARED DOSE
Noradrenaline	3.5 – 70mcg/min	0.166mcg/min
Vasopressin	0.04units/min	0.005units/min
Dobutamine	175-700mcg/min	150mcg/min
Adrenaline	0.5 – 35mcg/min	0.3mcg/min
Adrenaline	0.05 – 0.5mcg/kg/min	2.87mcg/kg/min
Adrenaline	0.5 – 35mcg/min	0.2mcg/min

Table 4: Storage Errors

DRUG	ACTUAL STORAGE CONDITION	OBSERVED STORAGE CONDITION	CATEGORY
Heparin	In the HRD cabinet	Along with insulin	D
Insulin	Refrigerator	Outside the refrigerator	C
Insulin	Refrigerator	Outside the refrigerator	C

Table 5: Monitoring Errors

DRUG	MONITORING PARAMETER	CATEGORY
Dextrose	Blood glucose level	C
Heparin	Clotting time	B
Insulin	Blood glucose level	E

Table 6: Prescribing Errors

DRUG	ACTUAL DOSE TO BE PRESCRIBED	PRESCRIBED DOSE	CATEGORY
Tramadol	30mg	30g	A
Digoxin	0.25mcg	0.25mg	A
Heparin	0.4cc	0.4c	A
Insulin	24U	24	A
Insulin	6U	6	A
Heparin	0.4ml	0.4	A
Tramadol	30mg	30g	A



Syp. Potassium chloride	10ml (TDS) diluted in H2O	30ml	A
Syp. Potassium chloride	10ml (TDS) diluted in H2O	NO DIRECTIONS OF USE	A
Insulin	12U (based on sliding glucose scale)	NO UNITS MENTIONED	A

Table 7: Wrong Duration Error

DRUG	DURATION	CATEGORY
Heparin	The medication to be given every 6 hours was administered exceeding 6 hours of duration	E

Table 8: Dispensing Errors

DRUG	ACTUAL DOSE/DRUG TO BE DISPENSED	DISPENSED DOSE/DRUG	CATEGORY
Heparin	25000 IU	5000 IU	B
Potassium chloride	Inj. Potassium chloride	Inj. Calcium gluconate (Gluci)	A

Categories of medication errors

The various categories of medication errors with High-Risk Medications were established. It was evident that Category C stands out as the most prevalent category of medication errors, with a notably higher frequency of 53.13%, followed by category A of 25%, category E of 12.5 %, category B of 6.25% and category D of 3.13%.

Drug-drug interactions

In our study a total of 45 potential Drug-Drug Interactions were observed, among which 15 (33%) were caused by High-Risk Medications. In that 80% was major Drug-Drug Interactions, which requires alternate drugs or avoiding concurrent use and 20% was moderate Drug-Drug Interactions which requires close monitoring.

S.no.	Object drug	Precipitant drug	Severity	Percentage
1.	Morphine	Fentanyl	Major	4.44%
2.	Fentanyl	Propofol	Major	6.67%
3.	Labetalol	Insulin	Moderate	2.22%
4.	Morphine	Midazolam	Major	2.22%
5.	Midazolam	Propofol	Major	2.22%
6.	Morphine	Propofol	Major	2.22%

DISCUSSION

The data analyzed in the study revealed the maximum number of the study population was in the adult group, where the results were found to be coinciding with a previous study conducted by Subbaiah et al [5], where they reported that the majority of the study subjects with HRM were ≥ 60 years of age. The results on gender categorization revealed that the male population were more predominantly prescribed with High-Risk Medication as similar to the study conducted by Arjun et al [11]. In the study, a total of 32 medication errors were observed, among them prescribing error was highest followed by

improper dose error and wrong preparation error where the results were found similar to the study conducted by Manjunath et al [9] in which prescription error was found highest followed by improper dose error. Medication error category C was found to be high and followed by medication error category E. These results were found similar to the study performed by Manias et al [4]. In our study out of 45 potential DDIs observed, among which 15 were caused by HRM. where 80% was major DDIs which requires alternate drugs or avoiding concurrent use and 20% was moderate DDI's which requires close monitoring as similar



to the results obtained from the study done by Subbaiah et al [5].

CONCLUSION

As High-Risk medications are drugs that bear a heightened risk of causing significant harm while they are used in error, this study on prevalence and drug related problems of High-Risk Medication in various departments emphasises the importance of patient safety in the use of High-Risk Medications. This study has shed light on the prevalence, medication errors and Drug-Drug Interactions of High-Risk medications. By addressing these aspects of High-Risk Medications, we were able to highlight the status of medication safety within our hospital setting. Hence this project underscores the ongoing assessment and refinement of medication practices that can ensure the highest standard of care for patients, ultimately advancing the quality of health care delivery in a tertiary care teaching hospital. Therefore, the study signifies the indispensable role of Clinical pharmacists in handling High-Risk medications as they contribute to medication safety, individualized care, patient education, and interdisciplinary collaboration, all of which enhances the overall quality of patient care and outcomes..

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