


Inpatient Medication Errors and Pharmacist Intervention at Ministry of Health Public Hospital, Riyadh, Saudi Arabia

Yousef Ahmed Alomi*,  The Past General Manager of General Administration of Pharmaceutical Care Head, National Clinical Pharmacy and Pharmacy Practice Head, Pharmacy R & D Administration, Ministry of Health, Riyadh 11392, SAUDI ARABIA.

Nisreen Al-Shubaar, King Salman Hospital, Ministry of Health, Riyadh 11392, SAUDI ARABIA.

Nadia Lubad, King Salman Hospital, Ministry of Health, Riyadh 11392, Riyadh, SAUDI ARABIA.

Fatimah Ali Albusalih, College of Clinical Pharmacy, Imam Abdulrahman Bin Faisal University (University of Dammam) Dammam, SAUDI ARABIA.

Correspondence:

Dr. Yousef Ahmed Alomi, Bsc. Pharm, MSc. Clin Pharm, BCPS, BCNSP, DiBA The Past General Manager of General Administration of Pharmaceutical Care Head, National Clinical Pharmacy and Pharmacy Practice Head, Pharmacy R & D Administration, Ministry of Health, Riyadh 11392, SAUDI ARABIA.

Phone no: +966504417712

E-mail: yalomi@gmail.com

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ABSTRACT

Objectives: To explore the inpatient medication errors and pharmacist intervention at Ministry of Health Hospital, Riyadh, Saudi Arabia. **Methods:** This is a 9-month cross-sectional study conducted at a 300-bed public hospital to evaluate pharmacist response and prevention of inpatient medication errors in adult and pediatric patients. There is a medication safety officer in the hospital along with a medication safety committee. The following information on medication errors were documented in the form available at the hospital: patient's demographic information, sources of medication errors, time of errors, type of errors, description of errors, causes of errors, recommendation to prevent such errors and the outcome of errors. The form was developed by using the National Coordinating Council (NCC) for Medication Error Reporting and Prevention (MERP) system. **Results:** According to the results, the pharmacist prevented a total of 3089 medication errors within 805 patients. About 3.8 errors per prescription were prevented. Most of the prevention occurred during prescribing stage (705 (99.2%)). Patient-related errors (1564 (50.63%)) and prescriber-related errors (1435 (46.46%)) were the most type of prevented errors. Allergy was the most prevented subtype of errors (560 (91.4%)) followed by patient's body weight (543 (88.6%)) and prescriber data missing/unclear (347 (56.6%)). Most of the errors that were prevented were near miss (93.3%) followed by 6.3% of the errors that reached the patient but did not cause any harm. The highest percentage with respect to the causes of medication errors was missing clinical information (649 (83.7%)) and miscommunication of drug order (627 (80.9%)). The top 20 medications involved in medication errors were oral and intravenous injections (Paracetamol and enoxaparin injection, respectively). **Conclusion:** The pharmacist plays a very crucial role in preventing medication errors. In order to prevent medication errors and improve patient outcome, the pharmacist provides education to the healthcare professional about medication safety and establishes the intravenous medication guidelines.

Key words: Inpatient, Medication errors, Pharmacist, Intervention, Ministry of Health, Riyadh, Saudi Arabia.

INTRODUCTION

Clinical pharmacist plays a vital role in patient's care at hospitals. Nowadays, researchers are placing more emphasis on the relationship between the pharmacist and the patient.¹ Training and experience of clinical pharmacists is considered unique because it is focused on therapeutics, as well as patient and provider providence of comprehensive drug management and by providers, we mean different healthcare professionals.¹ Quality of life, economics, satisfaction of patient, appropriateness of medications, adverse reactions and events are the primary outcomes of the pharmacist intervention.¹ MEs can be defined as incidents that occur in the medication processing regardless of the stage of origin and whether they cause harm to the patient.² To be more specific, an ME is an occasion that can be prevented and may cause or prompt improper drug usage or harm patient regardless of the time of occurrence or when the drug was under the supervision of patient, consumer or healthcare professional. Such occasions might be identified with proficient practice, medicinal service items, techniques and frameworks, including compounding product labeling, dispensing, prescribing, monitoring order communication, administration, packaging, nomenclature, distribution and use.³ It is noteworthy that MEs should not be mistak-

en for adverse drug reactions.⁴ An adverse drug reaction is defined as "an impact that is poisonous and unintended which happens at measurements utilized for prophylaxis, determination or therapy".⁵ Furthermore, prescribing errors are a notable issue in hospitals. Various studies have demonstrated that prescribing errors and adverse drug reactions are two of the fundamental causes of harmful incidents in hospital facilities.⁵⁻¹⁰ The improvement of prescribing practice is connected with the advancement of pharmacy practice in hospital. A further set of measures can be produced to give advantages outside the pharmacy. This may include writing care plans with possible interventions that can be provided to adjust the treatment for patients. Enhancement of medication safety, treatment efficacy and cost effectiveness is expected when using the recommended interventions in the care plan.¹¹ Pharmacists' interventions were clinically estimated.¹² Worldwide, several investigations have been conducted related to the pharmacist's intervention and prevention of MEs,¹³⁻²¹ whereas similar studies conducted locally in KSA are scarce.²² To the best of our knowledge, there are no studies conducted locally or in Gulf or in Middle Eastern countries regarding the pharmacist's role in preventing MEs in inpatient setting. Therefore, in this study,

we aimed to explore the inpatient MEs and pharmacist's intervention at MOH public hospital, Riyadh, Saudi Arabia.

METHODS

This is a 9-month cross-sectional study conducted at a 300-bed public hospital through pharmacist response and prevention of inpatient MEs in adult and pediatric patients. The hospital has several specialties such as endocrinology, nephrology, cardiology, internal medicine, surgery, critical care, NICU, PICU, obstetrics and gynecology for adults and it also has pediatrics. The hospital had ambulatory care services and emergency services in addition to having accredited pharmaceutical services for inpatient, ambulatory care, total parenteral nutrition services, drug information services and computerized physician order entry system in both inpatient and outpatient units. In 2014, the Department of Pharmacy established Medication Safety Program. This program was founded in 2013 in Riyadh Region. It was a part of National Medication Safety Program of MOH and the Central Committee of Medication Committee is headed by the first author of this article. Riyadh Regional Medication Safety Committee is headed by the second author of this article. The Medication Safety Program is operated by part time pharmacist and the program consists of medication officer and local committee of medication safety. The officer monitors all MEs, adverse drug reactions and drug quality system inside the hospital by applying ISMP guidelines,²³⁻²⁶ Saudi Central Board of Health Care Accreditation standards²⁷ and medication safety guidelines of the Joint Commission of Hospital Accreditation from the United States of America.²⁸ In addition, the medication safety officer provides medication safety course to all healthcare professionals such as physicians, pharmacists and nurses and reports all medication safety-related issues to higher administration and to MOH. The officer also documents drug events by using the MOH form of MEs. Any intervention should be documented in the ME form. The form collects information regarding patient, sources of MEs, qualification of the personnel who committed the error, time of error, suspected medications, drug classification, stage of medication orders, route of administration, type of MEs, description of errors, causes of errors, recommendation to prevent such errors and the outcome of MEs by using NCC for MERP system.²⁹ The data are analyzed by using the Microsoft Excel Version 10.

RESULTS

The pharmacist prevented 3089 MEs occurred within 805 patients. About 3.8 MEs per prescription were prevented. The majority of patients involved in preventing MEs were in the age group of 18-65 years (71%) (Table 1). Most of the interventions were provided as prescribing stage (705 (99.2%)). Patient-related errors (1564 (50.63%)) and prescriber-related errors (1435 (46.46%)) were the most prevented errors (Table 2A and B). Allergy (560 (91.4%)) was the most prevented subtype of error followed by patient's body weight (543 (88.6%)) and prescriber data missing/unclear (347 (56.6%)) (Table 3). Most of the errors prevented were near miss (93.3%) followed by errors that reached the patient but did not cause any harm (6.3%) (Table 4). In packaging error, unit dose packaging (452 (77.1%)) and syringe bottle packaging (42 (7.2%)). Most route of administration MEs prevented were oral followed by intravenous and ophthalmic administration (Table 5A and B). The highest percentage of causes of MEs were clinical information missing (649 (83.7%)) and miscommunication of drug order (627 (80.9%)) (Table 6). The top 20 medications involved in MEs were oral and intravenous injections (paracetamol and enoxaparin injection, respectively) (Table 7).

DISCUSSION

Pharmacist interventions done in the several hospital and pharmacy units including the hospital outpatient clinics, inpatient departments

Table 1: Age of patients.

Answer Options	Response Count	Response Percent
30 Days	8	1.8%
1 month - 6 years	27	6.1%
6 - 12 years	35	7.9%
12 -18 years	27	6.1%
18- 40 years	158	35.7%
40 - 65 years	156	35.3%
more than 65 years	31	7.0%
Answered Question	442	
Skipped Question	363	

Table 2A: Pharmacist intervention of stage of medication operation.

Answer Options	Response Count	Response Percent
Prescribing	705	99.2%
Preparing	3	0.4%
Dispensing	2	0.3%
Transcribing	0	0.0%
Administering	1	0.1%
Monitoring	0	0.0%
Answered Question	711	
Skipped Question	94	

Table 2B: Type of medication errors preventions.

Type of Error	Number of medication errors	Percent
Patient-Related error	1564	50.63%
Prescriber-Related errors	1435	46.46%
Drug-Related errors	6	0.19%
Dosage form-Related errors	72	2.33%
Therapeutics-related errors	12	0.39%
Total	3089	100.00%

and ambulance, as well as pharmacy preparation room, mixing intravenous solutions and during discharge. All pediatrics and adult patients as resources of the prevention of MEs.^{12-20,22,30-32} Our current site research mostly done at inpatient pharmacy with related preparation and adult patients. The majority of MEs prevented were in adult patient's setting, with less in pediatrics. Most of the errors occurred at prescribing stage, the pharmacist reporting of MEs more than physicians. As result, the pharmacist prevented MEs during preparation and dispensing stage this finding is similar to those reported by Scarsi *et al.*, Khalili *et al.*, Majid and Kuo *et al.*^{13,16-18} The majority of prevented errors were patient- and prescriber-related which shows that the hospital uses manual method of prescription rather than computerized system. Several mistakes related to the written allergy or patient body weight which not existed as well as or prescriber missing information. The hand writing of prescription and the high workload will lead to missing information. However, all

Table 3: The subtype of medication errors preventions.

Answer Options	Response Count	Response Percent
Patient-Related error		
Allergy not written	560	91.4%
Wrong Patient	10	1.6%
Patient Age not written	269	43.9%
Patient Body Wt. not written	543	88.6%
Diagnosis not written	182	29.7%
Non-existing patient	0	0.0%
Drug-Related errors		
Drug dose Omission	2	0.3%
Drug incorrect Dose (under-dosing)	2	0.3%
Drug Incorrect Dose (overdosing)	18	2.9%
Wrong Drug	5	0.8%
Amount of drug missing/unclear/insufficient	2	0.3%
Drug Duration (Inadequate)	0	0.0%
Drug Duration (Excessive)	3	0.5%
Drug Dosing Frequency (Excessive)	31	5.1%
Drug Dosing Frequency (Inadequate)	3	0.5%
Therapeutics-Related Errors		
Drug Contraindications	1	0.2%
Drug-Drug Interaction	5	0.8%
Drug Diseases Interaction	0	0.0%
Infective Therapy	3	0.5%
Duplicate Therapy	3	0.5%
Dosage Form Related	27	4.4%
Drug Uncorrected/ unclear Formulation	4	0.7%
Drug Incorrect/ Unclear Route	11	1.8%
Drug Incorrect/Unclear Strength	30	4.9%
Prescriber-Related and general errors		
Poor Handwriting	69	11.3%
Wrong Abbreviation	34	5.5%
Prescription date unclear	322	52.5%
No-Drug information on the prescription	48	7.8%
Prescriber data missing/ Unclear	347	56.6%
Department is missing / Unclear	220	35.9%
Prescriber sig. Missing/ Unclear	341	55.6%
Other (please specify)	54	
Answered Question	613	
Skipped Question	192	

Table 4: The outcome of medication error prevention.

		Number of Medication errors	Percent
Outcome of Error	A (Potential Risk)	0	0.0%
	B (Near miss)	713	93.3%
	C	48	6.3%
	D	3	0.4%
	E	0	0.0%
	F	0	0.0%
	G (SE)	0	0.0%
	H (SE)	0	0.0%
	I (SE)	0	0.0%
	Answered question	764	100.0%
Skipped question	41		

Table 5A: The type of medication packaging.

Answer Options	Response Count	Response Percent
Unit Dose	452	77.1%
Syringe	20	3.4%
Bottle	42	7.2%
Single Dose Vial/ Ampoule	30	5.1%
Multi-Dose Vial	12	2.0%
IV Piggy Bag	0	0.0%
Intravenous Solution	30	5.1%
Other (please specify)	0	0.0%
Answered question	586	
Skipped question	219	

Table 5B: Route of administration medication errors.

Answer Options	Response Count	Response Percent
Oral	533	76.8%
Eye	23	3.3%
Ear	1	0.1%
Nose	3	0.4%
Inhalation	1	0.1%
IV	105	15.1%
IM	1	0.1%
IT	0	0.0%
SC	4	0.6%
Topical Skin	19	2.7%
Rectal	1	0.1%
Nasogastric Tube (NGT)	3	0.4%
Answered Question	694	
Skipped Question	111	

Table 6: Causes of medication errors.

	Response Count	Response Percent
Clinical information missing	649	83.7%
Drug information missing	7	0.9%
Miscommunication of drug order	627	80.9%
Drug name, label, package problem	6	0.8%
Drug storage or delivery problem	2	0.3%
Drug delivery device problem	1	0.1%
Environmental, staffing or workflow problem	1	0.1%
Lack of staff education	1	0.1%
Patient education problem	0	0.0%
Lack of quality control or independent check system	6	0.8%
Answered Question	775	
Skipped Question	30	

Table 7: Top 20 medications involved prevention of errors.

#	Medication	Number Of Errors
1	Paracetamol oral	29
2	Paracetamol IV	20
3	Enoxaparin injection	17
4	Amoxicillin/Clavulanic Acid oral	14
5	Omeprazole IV	14
6	Metronidazole oral	13
7	Alfacalcidol injection	12
8	Ciprofloxacin Oral	11
9	Omeprazole oral	11
10	Cefuroxime 750mg	9
11	Erythropoietin injection	6
12	Ibuprofen oral	6
13	Multivitamin oral	6
14	Amoxicillin oral	4
15	Clarithromycin oral	4
16	Lactulose oral	4
17	Ondansetron oral	4
18	Alfacalcidol oral	4
19	Cholecalciferol oral	4
20	Antirabies injection	3

basic information related to patient or prescriber was well documented with computerized physician order entry. This finding shows that most of the errors prevented were near miss and did not reach the patient; this reflects a good effort on the part of pharmacy team at inpatient pharmacy. Similar results have been reported by Kuo *et al.* the highest percentages of type errors with different level severity.¹⁸ There was no cases where the patient was harmed or died. In this study, most of the mistakes occurred at unit dose system and intravenous preparations in

the inpatient pharmacy. In case of the unit dose system, there may not be double-checking performed and the pharmacy had intravenous admixture system during the study period. The majority of errors were missing clinical information or miscommunication with healthcare staff, which might be due to manual prescribing system. Most of the medications that were implicated in prevention of drug errors were Paracetamol or intravenous enoxaparin. This may be because it is a parental preparation and the pharmacy does not have intravenous preparation unit. This finding is similar to those reported by Khalili *et al.* who conducted a study on inpatient setting, whereas our findings were contradictory to those reported by Kuo *et al.* and Poudel *et al.* this might be because their research site was conducted in both outpatient plus inpatient setting or outpatient alone.¹⁶⁻¹⁹ In addition, the high-risk medication procedures may not be existing in their hospital. This study shows the high impact of medications safety program at public hospital, which is very critical to expand the program to cover all hospital units and implement the program at all MOH hospitals in KSA.

CONCLUSION

The pharmacist plays an essential role in preventing MEs through medication safety program at inpatient setting. Targeting to educate healthcare providers about medication safety is highly recommended. The role of pharmacist should expand to cover all healthcare services at MOH hospitals in KSA.

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None.

CONFLICT OF INTEREST

None.

ABBREVIATIONS

MEs: Medication errors; **UK:** United Kingdom; **MOH:** Ministry of Health; **NICU:** Neonatal Intensive Care Units; **PICU:** Pediatrics Intensive Care Units; **ISMP:** Institute of Safe Medication Practice; **NCC:** National Coordinating Council; **MERP:** Medication Error Reporting and Prevention; **KSA:** Kingdom of Saudi Arabia.

ORCID ID

Yousef Ahmed Alomi  <https://orcid.org/0000-0003-1381-628X>

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