

Pharmacist's Intervention and Medication Errors Prevention at Pediatrics, Obstetrics and Gynecology Hospital in East Province, Saudi Arabia

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Abstract

Objectives: Medication errors have a large impact on patient safety and on healthcare cost. Errors occur due to a combination of human and system-related failure. The pharmacist prevents all drug related problems. The objective of this study was to explore pharmacist intervention and prevented medication errors in Pediatrics, Obstetrics and Gynecology at a Tertiary Hospital in East Province, Saudi Arabia.

Methods: This article describes 12 months retrospective cohort study of pharmacist intervention and prevented medication errors in year of 2015. This was a retrospective study conducted at 500-bed Pediatrics, Obstetrics and Gynecology in a Tertiary Hospital in East Province, Saudi Arabia. This system was a part of medication safety program. A tertiary hospital had medication safety officer with medication safety committee. All errors or unexpected events related with the medication system or a step in the medication process shall be reported using the medication error form/sheet. The form consisted of patient information, the sources of medication errors and qualification of committing errors. The type of medication errors, description of errors, causes of errors, approval to prevent the errors and the consequence of medication errors by using National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) system. **Results:** The total number of prevented medication errors were 1654 within 827 patients' prescriptions. The medication errors had been made by physicians followed by nurses. The sources of errors were general practitioner 631 (38.15 %) followed by consultant 554 (33.5%). The most common error was made in Pediatrics (1-month to 6 years) followed by young adults (18-40 years). An occurred error, most of the time was afternoon 872 (52.72%) errors followed by morning duty 685 (41.4%) errors. The majority kind of mistakes were prescriber-related 1216 (73.52%) followed by patient-related errors 426 (25.75%). The outcome of medication error was 1651 (99.82%) occurred which did not reach the patient. The most common medications involved in errors were Paracetamol syrup, iron tablet, folic acid tablet and calcium tablet. There were three errors for high-risk medication prohibited for instant: insulin, enoxaparin and heparin. **Conclusion:** This article presented the pharmacist's role in preventing medication errors, especially with pediatrics populations. Pharmacists have a crucial system-level role in planning and important medication safety programs and enhancement initiatives within health care organizations. The expanded role of pharmacists in preventing medication errors associated with patient safety programs and avoid the needless cost.

Key words: Pharmacist, Intervention, Errors, Prevention, Pediatrics, Obstetrics, Gynecology, East Province, Saudi Arabia.

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INTRODUCTION

The role of the pharmacist has changed significantly in recent decades. Medication errors are a threat to patient safety. These errors reason for prolonged hospitalizations, extra medical interventions, indisposition and even death. Medication error is defined as any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is under the control of the health care professional, patient, or consumer. Medication Safety is defined as freedom from preventable harm with medication use. The goal of every health care organization in Ministry of Health (MOH) should be to constantly expand systems to avoid harm to patients due to common causes of medication errors.^[1] Health care organizations in MOH should monitor actual and potential medication errors that occur within their organization and investigate the root cause of errors with the goal of recognizing ways to advance the medication use system to prevent forthcoming medication errors and possible patient harm. Error reporting helps to understand why errors occur, to prioritize opportunities for error prevention and to generate long term improvements in patient safety. The focus on Medication safety start in the world in 1995 by the National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP). The Council was formed to actively promote increased reporting, open communication, understanding and promotion of medication error prevention strategies through the coordinated efforts of member associations and agencies and to emphasis on ways to boost patient safety programs through a coordinated approach and a systems-based perception. Medication errors can also be categorized according to the severity of the consequences. The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) classifies its medication error index into 9 categories: no error (category A), error and no harm (categories B-D), error and harm (categories E-H) and error and death (categories I).^[2]

A study conducted by Kaushel R *et al.*^[3] on pediatrics population has found 616 of medical errors (out of 10,778 experiential medical doses; this represents 5.7% out of the whole observed doses. Another study, conducted by Wang JK *et al.*^[4] found 865 of medical errors (out of 16,938 investigated doses; this represents 5.2 out of each 100 prescriptions). This result is upsetting as the study was conducted at a large academic Tertiary hospital and specifically on pediatric inpatient

settings. The present study found that pharmacists prohibited 3,089 medication errors occurred within 805 patients that means the number of medication errors prevented was 3.8 errors per each prescription. The study of Alagha HZ *et al.*^[5] has showed that there is, at least, once the prescription error in 1,107 medication orders. In addition, the researcher conducted a descriptive analysis of the Egyptian national online reporting system where they found that most of the common medication errors are related to prescription errors with 54% before monitoring, which represent 25% of the errors and 16% of errors caused by the administration. The study of Elden NMK, Ismail A^[6] revealed that most of the causes of medical errors occur during the ordering and prescription stage with 38.1%. In addition, the study showed that 20.9% of the errors are due to administration-related practices. A recent study has found that each type of error was found to occur at various stages, though some more often during the packaging stages and the highest medication error rates were the missing clinical information (83.74%) and miscommunication of drug order (80.9%). The majority of medication errors occurred during prescribing drugs was 24.5-79% in pediatric practice.^[7,8] The most frequent class of medication error reported was anti-infective agent.^[7] Both of previous studies were completed at pediatric inpatient settings. The objective of this study was to explore pharmacist intervention and prevented medication errors at ambulatory care, emergency and inpatient sections in Pediatrics, Obstetrics and Gynecology in a Tertiary Hospital in East Province, Saudi Arabia.

METHODS

This article describes 12 months retrospective cohort analysis of pharmacist intervention and prevented medication errors in year of 2015. This was a retrospective study conducted at department of Pediatrics, Obstetrics and Gynecology in a Tertiary Hospital in Dammam, Saudi Arabia. The hospital is formed of 5 floors and with 500 beds. This hospital uses outpatient clinics, inpatient departments, ambulance as well as pharmaceutical preparations room, mixing intravenous solutions, all pediatrics and adults' patient during the conduct of the study. The hospital provides clinical services in different specialties such as Endocrinology, Pediatrics, Hematology Pediatrics, Nephrology Pediatrics, Cardiology Pediatrics, Pulmonary pediatrics, The Neonatal Intensive Care Unit (NICU), The Pediatric Intensive Care Unit, Obstetrics and Gynecology in addition to ambulatory care services and emergency

services. Also, the hospital pharmacy offers very comprehensive pharmaceutical services including inpatient pharmacy, ambulatory care pharmacy, intravenous admixture preparations, Total Parenteral Nutrition (TPN) services, pediatrics extemporaneous facilities and drug information services. Recently, the pharmacy department established medication safety program at East Province Region in 2013 and yet to start computerized physician order entry system. It was a part of National medication safety program of Ministry of Health and Central committee of medication committee and it headed by first author and second author membership.^[9] East Province Regional Medication safety committee established in 2013 headed by second author membership. In particular, a hospital medication safety program managed by part-time pharmacist and the program consisted of medication officer and local committee of medication safety. The officer monitors all medication errors, adverse drug reaction, drug quality system inside the hospital, local standard of accreditation body (Saudi Central Board of Health Care Accreditation) slandered, medication safety of Joint commission of Hospital accreditation from United States of America.^[10,11] And Institute Safety Medication Practice (ISMP) guidelines.^[12-15] They also felt responsible for medication safety course to all health care professional, physician, pharmacist, nurses etc. and report all medication safety related issues to higher administration and MOH.

Medication officers are responsible for documenting Adverse Drug Events (ADEs) using the medication error form. All errors or unforeseen events related with the medication system or a step in the medication process shall be reported using the medication error notification form/medication error sheet whether or not the error reached the patient. The medical error form consists of 2 parts and 40 items including types and causes of medical errors. The form mainly consisted of patient information, description of errors - date and time, medical product involved in the event, impact of the error, consequences, intervention, the sources of medication errors and qualification of committing errors. Suspected medications, drug classification, stage of medication orders, details of reporter, route of administration for medication, the type of medication errors, description of errors, causes of errors, approval to prevent the errors and the consequence of medication errors by using National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) system.^[2] The study was conducted according to the ethics guidelines set out in

the Declaration of Helsinki and written consent from was obtained from the institution. The Microsoft Excel sheet version 10.0 was used for data entry and analysis.

RESULTS

The total number of prevented medication errors were 1654 within 827 patients' prescriptions. The prevented medication errors had been made by physicians followed by nurses. The most common sources of errors were general practitioner 631 (38.15%) and consultant 554 (33.5%). The most common prevented error was made in Pediatrics (1-month to 6 years) 1128 (68.20%) and young adults (18-40 years) 432 (26.12%) (Table 1). The majority kind of prevented mistakes were prescriber-related 1216 (73.52%) followed by patient-related errors 426 (25.75%). The most common subtype of prevented medication errors was Wrong abbreviations 652 (53.62%), Poor handwriting 561 (46.13%) and Diagnosis not written 426 (100%) (Table 2 and Table 3).

Table 1: Demographic Information of preventing medication errors reports.

No of Medication errors: 1654

No of Patients 827

No	Analysis Category	Number	Percent ages	
1	Age of Patient	30 Days	76	4.59%
		1 month - 6 years	1128	68.20%
		6 - 12 years	18	1.09%
		12 -18 years	0	0.00%
		18- 40 years	432	26.12%
		40 - 65 years	0	0.00%
		more than 65 years	0	0.00%
	Total	1654	100.00%	
2	Source of Medication Error	Physician	1648	99.64%
		Pharmacist	0	0.00%
		Nurses	6	0.36%
		Others	0	0.00%
	Total	1654	100.00%	
3	Qualification of committing Errors	GP	631	43.58%
		Specialist	263	18.16%
		Consultant	554	38.26%
	Total	1448	100.00%	

Table 2: Type of medication errors preventions.

Elements	Numbers	Percentages
Patient-Related error	426	25.75%
Prescriber-Related and general errors	1216	73.52%
Drug-Related errors	10	0.6%
Dosage form-Related errors	0	0%
Therapeutics-related errors	2	0.13%
Total	1654	

Table 3: The subtype of medication errors preventions.

Patient-Related error	N (%)
Diagnosis not written	426 (100%)
Patient allergy	0 (0%)
Patient body weight not written	0 (0%)
Patient age not written	0 (0%)
Wrong patient	0 (0%)
Non- existing patient	0 (0%)
Total	426
Prescriber-Related and general errors	N (%)
Prescriber name is missing /unclear	0 (0%)
Prescriber ID# is missing /unclear	0 (0%)
Prescriber signature missing / unclear	0 (0%)
Prescriber not follow policy of prescribing (write dose, weight)	3 (0.25%)
Department is missing / unclear	0 (0%)
Poor handwriting	561 (46.13%)
Wrong abbreviations	652 (53.62%)
Prescription data unclear	0 (0%)
Total	1216
Drug-Related errors	N (%)
Incorrect dose-overdosing	6 (60%)
Dose omitted	1 (10%)
Duration-inadequate	0 (0%)
Dosing frequency-excessive	1 (10%)
Incorrect dose-under dosing	0 (0%)
Amount of drug missing / unclear / insufficient	0 (0%)
Drug name is missing /incorrect	0 (0%)
Duration-excessive	0 (0%)
Dosing frequency-inadequate	0 (0%)
IV drug without labeling	1 (10%)
Incorrect drug	1 (10%)
Total	10
Dosage Form-Related Errors	N (%)
Incorrect /unclear formulation	0 (0%)
Incorrect / unclear route	0 (0%)
Incorrect / unclear strength	0 (0%)
Total	0
Therapeutics-Related Errors	N (%)
Drug-drug interaction	0 (0%)
Drug-Disease interaction	0 (0%)
Therapeutic duplication	2 (100%)
Total	2

An occurred error, most of the time was afternoon 872 (52.72%) errors followed by morning duty 685 (41.4%) errors. The most of prevented Medication

administration errors were oral 1201 (76.84%) followed by Intravenous 113 (7.23%) and Nose administration 113 (7.23%). The most package container error was the Bottle packaging 1371 (90.44%) and Multi-dose vial 88 (5.80%). The most common preventable medication errors were near miss an error occurred but did not reach to the patients 1651 (99.82%) followed by errors reached to the patient without any harm 3 (0.18%) (Table 4). The most common medications involved in errors were Paracetamol syrup, Iron tablet, Folic acid tablet and Calcium tablet. There were three errors for high-risk medication prohibited for instant: insulin, enoxaparin and heparin (Table 5).

DISCUSSION

Much has been written on the importance of medication errors in pediatrics and in precise on medication errors. The MOH's Medication Safety Program starts to arise in 2013.^[1] The program aims to eliminate or reduce the medication errors and prevent harms from reaching the patients. It can be reached through building safer organization endlessly improve its quality. The medication safety manual, which is considered as the foundation of the program, was the first step to be formulated to serve as guide for MOH organizations. There are medication safety officers, as well as there is a committee to medication safety in both the hospitals, primary health care and the Committee for each region as well as the main committee meets monthly in the ministry's pharmaceutical care administration. For the eastern region, there are 10 hospitals containing medication safety officer, medication safety committee, ISMP medication safety for hospitals in 2014, medication safety committee in the region to analyze the study to develop plans and prevent their reoccurrence. In 2015, basic medication safety course was started in maternity children hospital, Dammam, where 42 nurses, 9 doctors and 7 pharmacists were the highest attendees. Medication error is an essential variable to determine patient safety services, so it is crucial to realize the weak points of health care members regarding medication error and provide an educational program to resolve them.

The aim of the study is to explore learning outcome of medications safety program with emphasis of medications error prevention. The mean number of medication errors committed through physicians because the most frequent type of error occurred during prescribing errors and only by law in Saudi Arabia, the physicians had prescribing authority. The similar

Table 4: Types of preventing medication errors reports.

			Number	Percentages
4	Time of Error	Morning 7:30am-3:30pm	685	41.46%
		Afternoon 3:30pm-11:30pm	872	52.78%
		Night 11:30pm-7:30am	95	5.75%
		Total	1652	100.00%
5	Route of Administration	Oral	1201	76.84%
		Eye	11	0.70%
		Ear	7	0.45%
		Nose	113	7.23%
		Inhalation	2	0.13%
		IV	113	7.23%
		IM	37	2.37%
		IT	0	0.00%
		SC	0	0.00%
		Topical Skin	4	0.26%
		Rectal	75	4.80%
		Others	0	0.00%
		Total	1563	100.00%
6	Package Container	Unit Dose	10	0.66%
		Syringe	37	2.44%
		Bottle	1371	90.44%
		Single Dose Vial/ Ampoule	1	0.07%
		Multi Dose Vial	88	5.80%
		IV Piggy Bag	8	0.53%
		Intravenous Solution	1	0.07%
		Others	0	0.00%
Total	1516	100.00%		
7	Outcome of Error	A (Potential Risk)	0	0.00%
		B (Near miss)	1651	99.82%
		C	3	0.18%
		D	0	0.00%
		E	0	0.00%
		F	0	0.00%
		G (SE)	0	0.00%
		H (SE)	0	0.00%
		I (SE)	0	0.00%
		Total	1654	100.00%

findings reported by Cunningham KJ and Kaushal R et al.^[6,7] during their study. Medical errors committed by residents have inadequate disclosure to senior

Table 5: Top twenty medications involved prevention of errors.

NO	Medication	Number
1	Paracetamol syp	220
2	Iron tab	210
3	Folic acid tab	210
4	Calcium tab	210
5	Chlorpheniramine syp	170
6	Normal saline drop	120
7	Insulin inj	108
8	Augmentin susp	91
9	Paracetamol supp	77
10	Diphenhydramine syp	63
11	Oral rehydration solution	53
12	Clexane inj	37
13	Vit D3 drop	17
14	Gentamycin drop	13
15	Actifed syp	11
16	Amoxicillin susp	7
17	Ventolin Buff	4
18	Fucidin oint	4
19	Erythromycin susp	2
20	Gentamycin inj	2

physicians. Unfortunately, very few residents have been taught how to disclose the error and majority do not have proper experience of disclosing an error. Trainees often choose not to disclose their medical errors to their senior physicians or supervisors. However, potential errors-those errors not causing harm-occurred in pediatric patients more often than in adults.^[6] The current study was conducted among ambulatory care and few from inpatient settings, while the previous study was conducted among inpatient settings.^[6]

The prescribing stage is one of the stages where medication errors occur most frequently. The most common factors related with errors at this stage have been cited as lack of knowledge pertaining to both the drug prescribed and the patient for whom the drug is prescribed. Prevention of errors at the prescribing stage is one of the important steps towards reducing medication errors with emphasis of wrong used of abbreviations or poor handwriting or patient related errors. The similar findings reported by Cunningham KJ.^[7] The potential of errors occurred during morning or evening duty. The morning duty is normal with regular days, while evening duty associated with emergency visitors. Pediatric patients are more susceptible to

medication errors for a variety of reasons including physical and social differences and the necessity for patient-specific dosing. Patients used oral pediatrics formulations and most of medication errors occurs at ambulatory care or emergency pharmacy in this study. Kaushal R *et al.* study analyses different research setting parenteral medication dispensing from mostly inpatient settings more than outpatient settings.^[6] Preventable medication errors contribute substantially to healthcare cost, not reached to the pharmacist or didn't cause harm or didn't reach the patient and there is not death case. The most common type of error was wrong administration such as Paracetamol for pediatrics usage or two medications for pregnant lady's as received for instance folic and calcium. Kaushal R *et al.* showed anti-infective agent was the most frequent class of medication error reported because difference in the research site as well as inpatient settings, while current study was conducted among mostly ambulatory care settings.^[6] The study showed some high-risk medications prevented mistakes. High-risk medications have the potential to cause significant patient harm or even death when used mistakenly. Special safeguards are in place in most healthcare institutions to minimize the risk of errors associated with these medications as per the new regulations of medications management of Saudi Board of Health care institution accreditation.^[16] The medications safety program is very essential in the pharmacy practice. The program impact was very critical benefit to the patient care. The medications safety program should increase and implement to all MOH hospitals in the Kingdom of Saudi Arabia.

CONCLUSION

Pediatric medication errors can be reduced through multiple interventions aimed at improving the medication process. Further research is needed in the areas of ambulatory patients, non-developed countries, administering and dispensing errors and community hospitals and should use identical definitions for medication errors and outcomes. Basic medication safety course is essential for all pediatrician working at healthcare institutions. Additional cost-effectiveness data on interventions and preventions to diminish pediatric medication errors would advantage policy makers and medical leaders as they choose between multiple possible interventions. Reducing medication errors offerings an important occasion for refining the quality and variety of current research. Expanding of pediatrics medication safety program is highly recommended at hospitals in Kingdom of Saudi Arabia.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

MEs: Medication Errors; **UK:** United Kingdom; **MOH:** Ministry of Health; **ISMP:** Institute Safety Medication Practice; **NCC:** National Coordinating Council; **MERP:** Medication Error Reporting and Prevention; **KSA:** Kingdom of Saudi Arabia.

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REFERENCES

1. Alomi YA. National Medication Safety Program at Ministry of Health in Saudi Arabia. *J Pharmacol Clin Res.* 2017;3(2):1-7.
2. Hartwig SC, Denger SD, Schneider PJ. Severity-indexed, incident report-based medication error-reporting program. *Am J Hosp Pharm.* 1991;48(12):2611-6.
3. Kaushal R, Bates DW, Landrigan C, McKenna KJ, Clapp MD, Federico F, *et al.* Medication errors and adverse drug events in pediatric inpatients. *JAMA.* 2001;285(16):2114-20.
4. Wang JK, Herzog NS, Kaushal R, Park C, Mochizuki C, Weingarten SR. Prevention of pediatric medication errors by hospital pharmacists and the potential benefit of computerized physician order entry. *Pediatrics.* 2007;119(1):e77-85.
5. Alagha HZ, Badary OA, Ibrahim HM, Sabri NA. Reducing prescribing errors in the paediatric intensive care unit: an experience from Egypt. *Acta Paediatr.* 2011;100(10):e169-74.
6. Elden NMK, Ismail A. The importance of medication errors reporting in improving the quality of clinical care services. *Glob J Health Sci.* 2015;8(8):243.
7. Kaushal R, Bates DW, Landrigan C, McKenna KJ, Clapp MD, Federico F, *et al.* Medication errors and adverse drug events in pediatric inpatients. *J Am Med Assoc.* 2001;285(16):2114-20.
8. Cunningham KJ. Analysis of clinical interventions and the impact of pediatric pharmacists on medication error prevention in a teaching hospital. *J Pediatr Pharmacol Ther.* 2012;17(4):365-73.
9. Alomi YA. National Medication Safety Program at Ministry of Health in Saudi Arabia. *J Pharmacovigil.* 2015;3(5):e145.
10. The Joint Commission. 2016 Comprehensive Accreditation Manuals. Joint Commission Resources, Spi Lsif edition. 2016. Available from: https://www.jointcommission.org/standards_information/edition.aspx.
11. Medication Management (MM). In: National Hospital Standards. 2nd Editio. Saudi Central Board for Accreditation of Healthcare Institutions. 2015;194-211.
12. Institute for Safe Medication Practices. Medication Safety SelfAssessment® for Community/Ambulatory Pharmacy. 2017. Available from: <https://www.ismp.org/assessments/community-ambulatory-pharmacy>.
13. Institute for Safe Medication Practices. Medication Safety SelfAssessment for Hospitals, Key Definitions. 2011. Available from: <http://ismp.org/>

- selfassessments/Hospital/2011/definitions.pdf.
14. Institute for Safe Medication Practices. Medication Safety Self Assessment® for Oncology. 2012. Available from: <https://www.ismp.org/assessments/international-oncology>.
 15. Conners J, Dager W, Evan M, Gulseth M, Jenkins RWM. 2017 ISMP Medication Safety Self Assessment for Antithrombotic Therapy. Medication Management (MM). In: National Hospital Standards. 2nd Edition. Saudi Central Board for Accreditation of Healthcare Institutions. 2015;194-211.
 16. Saudi Center Board for Accreditation for Healthcare Institutions (CBAHI). Medication Management (MM). In: National Hospital Standards. 2nd Edition. 2016;194–211.

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