

Prescription System, Administration of Drug and Medication Dispensing Errors in Treatment Process of Inpatients of Teaching Hospitals in Erbil City

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Abstract

Background and objectives: Prescription and medication dispensing errors can cause a significant threat to patient's safety. This study aimed to evaluate the prescription errors and inpatients' medication dispensing errors in the treatment processes in teaching hospitals in Erbil city. **Methods:** This is a case study that investigating 3145 inpatient records in Rizgary and Hawler teaching Hospitals. The study was done in the period between April 1st 2017 and November 30th, 2017. Medical, surgical, and neurological patients' records were included. Infants, children and maternal records were excluded from the study. **Results:** According to the categorizing medication errors Algorithm Index, (67%) of errors considered non harmful including spelling (6%), using drug brand names (6%), absence of doctor signature (16%), absence of pharmacist signature (5%), absence of nurse signature (3%), absence of follow up by doctors (2%), patients education before discharge (5%), drug recording on the drug chart by nurse (8%), drug availability 16%. Also, 33% of them recorded as harmful; which involved (drug dosing instruction missing, dose interval (6%), contraindication (7%), drug-drug interactions (5%), non- laboratory monitoring (2%), sensitivity test of drug (4%), alternative drug (1%), adverse effects (2%), and laboratory monitoring (3%). **Conclusions:** Medication errors of Rizgary Teaching Hospital are common. The contraindication, absence of doctors' signature, drug unavailability, wrong dose, using brand names, lacks of drug recording on the drug chart by nurse, absence of nurse signature are the main medical errors. There was lack of collaboration between doctor, clinical pharmacist and nurses in the hospital.

Keywords: Medication errors; Doctor; Pharmacist; Nurse.

Introduction

Medication errors (MEs) is defined as any avoidable event failure in the treatment process that may trigger or lead to unsuitable medication use or patient harm while the medication is under the governor of the health care expert, patient, or user^{1,2}.

Little is known about medication errors in Middle Eastern countries. Studies related to medication errors in the Middle Eastern countries were relatively few in number and of poor quality³. In these countries, error rates varied from 7.1 % to 90.5 % for prescribing and from 9.4 % to 80 % for administration. In the US, the national rate of hospital-reported medical errors in hospitalized children was estimated to range from 1.8 to 3.0 per 100 discharges^{4,5}. Nowadays, patient safety is measured a highly significant challenging for our healthcare system and health care providers⁶. Medication errors have frequent direct and indirect consequences. The direct errors import harm to the patient, extensive hospitalization, magnified expenses^{7,8}, and increased hazard of death⁹. The indirect errors can cause weakening to the nurses in terms of specialized and personal circumstances, reduced self-sureness⁷.

Prescription errors are characteristically actions that originate from omissions, lapses, or errors¹⁰, for example, writing a dose that is orders of amount upper or lower than the correct one due to wrong calculation, or inaccurate prescription because of likenesses in drug brand names or pharmaceutical names¹¹. Human factors can consequently be the first identifiable reasons of these faults. Nevertheless, in most cases, analysis of error-inducing

situations shows dangerous environment as the 'latent condition' that gives to the coincidence. According to Reason's 'Swiss cheese' model of accident interconnection, sequential breakdowns in the system and insufficient defenses' and counteractions are essential for the event to occur¹². In the case of prescribing errors, insufficient feedback mechanism or lack of collaboration between doctor and nurses, with undefined roles regarding responsibility in prescribing, produce a cascade of errors that may cause an adverse effect. Among doctors, stressful conditions, a dense workload, a problematic work situation, insufficient consultation within the team, and not being in good physical and mental situation are among the chief reasons of prescribing errors and prescription mistakes¹³.

In addition, pharmacokinetic respects of drugs that frequently changes along with diverse clinical circumstances can afford a set of situations that increases the danger of medication errors in children¹⁴. The drug therapy is measured as one of the most imperative responsibilities of nurses¹⁵ and they expend 40% of their time for medication management¹⁶. In fact, nurses are a critical part of the health care team¹⁷. This study aimed to evaluate the prescription system, administration of drug and medication dispensing errors in treatment process of inpatients of Rizgary and Hawler teaching hospitals in Erbil city.

Materials and methods

This is a case study, investigating 5000 patient records during the period from April 1, 2017 to November 30, 2017. The patients are admitted in the hospitals during

the study period. In addition to investigating the patient's records, direct observation by the investigator was done with junior doctors, pharmacists, nurses and patients are done. This direct observation by the investigator was to recorded data regarding drug unavailability, drugs contraindications and drug sensitivity. The study was excluding the maternal and pediatric hospitals taking into account the different circumstances of these hospitals. This study used a modified National Coordinating Council for Medication Error Reporting and Prevention (NCC MER) questionnaire¹⁸. The NCC MERP Index algorithm classified medication errors into harmful and non-harmful errors. The harmful errors require an intervention necessary to sustain life; meanwhile the harmful errors were temporary and did not require initial or prolonged hospitalization.

The medication errors studied include: spelling, missing drug dosing instructions, using drug brand names, dose intervals, drug contraindications, drug-drug interactions, absence of doctor's, pharmacist's and nurse's signature, absence of follow up by doctors, adverse effects of drugs. Laboratory monitoring (antibiotic sensitivity test, allergy test, serum lipid test) and non-laboratory monitoring tests (physical complaint, patient drug history and illness history) are also included. In addition to patient's education before discharge, using alternative drug, absence of drug recording on the drug chart by nurses and drug unavailability.

The data was analyzed using MS excel 2010. Descriptive statistics was done in terms of frequency distribution tables.

The verbal informed consents were taken from doctors, nurses and pharmacists. The study protocol was approved by research ethics committee of Hawler Medical University.

Results

This study involved 5000 patient's records; the prevalence of medication errors was 63%. Out of 3145 medication errors, 33% are found to be harmful and 67% are found to be non-harmful errors, Table 1.

Table (1): Frequency distribution of medication errors.

Medication errors	Frequency	%
Harmful	1045	33
Non-harmful	2100	67
Total	3145	63

The most frequent harmful medication errors was contraindication of drugs was the most frequent (7%). Meanwhile the most frequent non-harmful medication errors was absence of doctor's signature and drug unavailability (16%), Table 2.

Table (2): Frequency distribution of medication errors

Medical Errors	Frequency	%
1. Harmful (total)	1045	33
Contraindication	225	7
Absence of dose intervals	175	6
Drug-drug interactions	150	5
No sensitivity test of drug	125	4
No laboratory monitoring	100	3
Adverse effects	75	2
None laboratory monitoring	50	2
Alternative drug	35	1
2. Non-harmful (total)	2100	67
Absence of doctor signature	500	16
Drug unavailability	500	16
Drug recording on the drug chart by nurse	250	8
Spelling (poor legibility)	200	6
Using drug brand name	200	6
Absence of pharmacist signature	150	5
No patients education before discharge	150	5
Missing drug dosing instruction	110	3
Absence of nurse signature	100	3
Absence of follow up by doctors	50	2
Grand total	3145	100

Panadol (Paracetamol) was the most frequent brand name of drugs that was used instead of the generic names 40 (20%) meanwhile Avonex (Interferon beta-1a) was the least frequent used brand name, Table 3.

Table (3): Frequency distribution of using brand names instead of generic names

Brand name used	Generic name	Frequency (N=200)	%
Panadol	Paracetamol	40	20
Suprax	Cefixime	25	12
Erythrocin	Erythromycin	25	12
Lipitor	Atorvastatin	20	10
Plavix	Clopidogrel	20	10
Depakin	Valproic acid	15	7
Tegretol	Carbamazepine	15	7
Rebif	Interferon beta-1a	10	5
Targocid	Teicoplanin	10	5
Gilenya	Fingolimod	5	2
Tysabri	Natalizumab	5	2
Remicade	Infliximab	5	2
Avonex	Interferon beta-1a	5	2

Table 4 showed errors which had been reported by direct observation with junior doctors, pharmacists, nurses and patients.

Table (4): Frequency distribution of MEs and their causes during interview.

Errors types	Cause	Frequency
Lack of information about hospitalized patients	Changes that had done on prescribed drug were not recorded due to duty substitution of staff.	300
Pharmacists round with doctors when they are at ward	Absence of specific morning round time	200
Fully unavailable drugs	Patients cannot afford due to economic difficulties	100
Concurrently using of drugs by patients particularly elderly patients like vitamins, supplement,	They don't consider to be medication	100
Out-patient prescription profile	Patients intended for more than one doctors before admission	50
Total		750

Discussion

Although the MEs are under-reported in all countries³, this study aimed to evaluate the prescription system, administration of drug and medication dispensing errors in treatment process of inpatients of Rizgary and Hawler teaching hospitals in Erbil city and identify the main contributory factors involved.

However, many systematic reviews has been done to review studies of the incidence and types of medication errors in Middle Eastern countries and to identify the main contributory factors involved³ but up to the authors' knowledge, there are no data available in Iraq regarding MEs.

The goal of the drug therapy is the achievement of the best curative outcomes and the improvement of the patient's situation. Inappropriately, there are hazards associated with the prescription of drugs, including medication errors²⁰. The results of the Table 1 and Table 2 were comparable to that reported by Nrupal Patel et al²¹, Nasreen and Amira²², Shahrzad et al²³, Carmen et al²⁴.

In this study, harmful errors were 1045 (33%) and non-harmful errors were 2100 (67%), the errors occur at all stages in medication use ordering, prescription, dispensing, and administration. The cause of these errors might be due to increased rates of hospitalization that cause incomplete inpatient records for drugs. In addition, absence of error reporting plan to supports a database of medication errors and encouraged error reporting have been verified as strategies that can reduce medication errors. Also, other causes may be encountered like: insufficiencies in knowledge and performance of some medical staff, lack of resources, tiredness, work environment, documentation, failure to use available information, inexperience, and absence of full-time unit based pharmacist and non-application of technology in the process of medication delivery.

Regarding the harmful errors in the current study, the drug contraindication was 225 (7%), and the rest of harmful medication errors in Table 2. These results are similar to a study done in university of Oxford in UK. Medication errors can occur in choosing a medicine irrational, inappropriate, and ineffective prescribing, under prescribing and over prescribing²⁵. It could be argued that these errors had been done because there was absence of a unique morning round which include junior doctors, clinical pharmacists and nurses under supervision of senior doctors who are considered the leader of award community or may be due to extreme patient numbers in the wards.

The study presented the non-harm errors which were (67%). A study done by WHO shows that the most common stage for medication errors was during the ordering and prescription stage (38.1%), followed by the administration stage (20.9%)²⁶.

In non-harmful medical errors, the absence of doctor's signature and pharmacist's signature were 16% and 5% respectively, the results were equivalent to a study done

by Naiire and Bahare²⁷. The illegible orders of doctors were considered as the main factor of medication errors. Also, there are factors related to the working conditions like: lack of ward personnel. Factors related to pharmacy 24-hour unavailability were deemed the main factors affecting the incidence of medication errors. Therefore, such error that may be due to clinical pharmacist was not such important in decision of medication.

This study also showed that, the drug recording on the drug chart by nurse was only (8%) meanwhile; the absence of nurse signature was only (3%). These results were similar to the results of studies done by Taheri et al²⁸, Seydi and Zardasht²⁹.

Medication errors may be the mistakes of the nurses in transferring the medication orders from patient medical record. So, the question is what are the sources of such errors? There are many factors which play roles in creating nurse errors. Firstly related to the working circumstances of nurses that working in Rizgary teaching hospital, Secondly the administration of drug is directed by nurse; nurses must not administer drugs unless they have been authorized by doctor and clinical pharmacist.

Using drug brand name is a hazardous system as in case medical staff, because they are inexperienced with the brand names. This is considered incompleteness of the prescriptions seen in a study done in United States when (84%) of the nearly 4 billion prescriptions written with a common drug³⁰.

In our study, non harmful MEs also involved spelling errors (6%) as shown in Table 2 meanwhile, using Brand names (6%) in Table 3 and lack of information about hospitalized patients (500), Table 4. Also, inaccuracy in writing, poor legibility of handwriting and the use of abbreviations or incomplete writing of a prescription can lead to confusion by healthcare personnel. The use of a single name and appearance for all approved bioequivalent versions of the identical medicine would improve the safety and effectiveness of medications by encouraging patients that they are always getting the same medication to which they are adapted³¹.

Conclusions

Medication errors of inpatients in Rizgary and Hawler teaching hospitals are common. The contraindication, absence of doctors' signature, drug unavailability, wrong dose, using brand names, lacks of drug recording on the drug chart by nurse, absence of nurse signature are the main medical errors. There was lack of collaboration between doctor, clinical pharmacist and nurses in the hospital.

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References

1. National Coordinating Council for Medical Error Reporting and Prevention (NCCMERP) Retrieved September 2, 2012, from <http://www.nccmerp.org/about-medications-errors>
2. Jeffrey K A. Medication errors: definitions and classification. *Br J Clin Pharmacol.* 2009; 67(6): 599–604
3. Alsulami Z, Conroy S, Choonara I. Medication errors in the Middle East countries: A systematic review of the literature. *European Journal of Clinical Pharmacology.* 2013; 69. DOI(4. 10.1007/s00228-012-1435-y)
4. Weingart S, Wilson R, Gibberd R, Harrison B. Epidemiology of medical errors. *BMJ.* 2000; 320:774-7.
5. Slonim A, LaFleur B, Ahmed W, Joseph J. Hospital-reported medical errors in children. *Pediatrics.* 2003; 111:617-21.
6. Alsulami Z, Choonara I, Conroy S. Paediatric nurses' adherence to the double checking process during medication administration in a children's hospital: an observational study. *J Adv Nurs.* 2013;70:1404-1
7. Mayo A, Duncan D. Nurse perceptions of medication errors: what we nursing care quality. 2004; 19(3):209-17.
8. Ashcroft D, Birtwistle M, Cooke J, Hingley K, Moore P. When do medication errors occur and who reports them? Analysis of a web-based incident reporting scheme in secondary care. *International Journal of Pharmacy Practice.* 2003; 11:R86-R.
9. Mihailidis A, Kronos L, Boger J. Assistive computing devices: a pilot study to explore nurses' preferences and needs. *Computers Informatics Nursing.* 2006; 24(6):328-36.
10. Ferner R, Aronson J. Clarification of terminology in medication errors: definitions and classification. *Drug Saf.* 2006; 29:1011–22.
11. Dean B, Schachter M, Vincent C, Barber N. Causes of prescribing errors in hospital inpatients: a prospective study. *Lancet.* 2002; 359:1373–8.
12. Aronson J. Medication errors resulting from the confusion of drug names. *Expert Opin Drug Saf.* 2004; 3:167–72.
13. Nolan T. System changes to improve patient safety. *BMJ.* 2000; 320:771–3.
14. Levine S, Cohen M, Blanchard N et al. Guidelines for preventing medication errors in pediatrics. *The Journal of Pediatric Pharmacology and Therapeutics.* 2001; 6: 427-43.
15. Manal B, Hanan A. Medication error, causes and reporting behaviours as perceived by nurses. *Journal of Pharmaceutical and Biomedical Sciences.* 2012; 19(17):1-7.
16. Armitage G, Knapman H. Adverse events in drug administration: a literature review. *Journal of nursing management.* 2003; 11(2):130-40.
17. Tang F, Sheu S, Yu S, Wei I, Chen C. Nurses relate the contributing factors involved in medication errors. *Journal of clinical nursing.* 2007; 16(3):447-57.
18. Taxonomy of Medication Errors Now Available National Coordinating Council for Medication Error Reporting and Prevention. from 2018 <http://www.nccmerp.org/about-medications-errors>
19. National Coordinating Council for Medication Error Reporting and Prevention 2001.
20. Hepler C, Strand L. Opportunities and responsibilities in pharmaceutical care. *Am J Hosp Pharm.* 1990; 47: 533–43
21. Nrupal P, Mira D, Samdih S, Anuradha G. A study of medication errors in a tertiary care hospital. 2016; 7(4): 168–73
22. Nesreen M, Amira I. The Importance of Medication Errors Reporting in Improving the Quality of Clinical Care Services 2016 Aug; 8(8): 243–51.
23. Shahrzad S, Tahir M, Hoi Y, Long C, Wui T. Medication Errors in the Southeast Asian Countries: A Systematic Review. *PLoS One.* 2015; 10(9): e0136545. Available from: doi: 10.1371/journal.pone.0136545 PMID: PMC4560405
24. Carmen G, Ana H, Maria L, et al. Prevalence of medication administration errors in two medical units with automated prescription and dispensing. *J Am Med Inform Assoc.* 2012; 19(1):72–78
25. Aronson J. Medication errors: what they are, how they happen, and how to avoid them. *An International Journal of Medicine.* 2009; 102 (8).p 514-20
26. WHO Reporting and learning systems for medication errors: the role of pharmaco vigilance centres. World Health Organization. 2014. ISBN 978 92 4 150794 3
27. Naiire S, Bahare F T. Frequency, type and causes of medication Errors in in Pediatric Wards of Hospitals in Yazd, the Central of Iran. *Int J Pediatr* 2016; 4(9):3481-85.
28. Taheri N M, Rassouli M, Kavousi A. Nurses' perspectives on factors related to medication errors in neonatal and neonatal intensive care units. *Iran Journal of Nursing* 2013; 25(80):65-74.
29. Seidi M, Zardosht R. Survey of nurses' viewpoints on causes of medicinal errors and barriers to reporting in pediatric units in hospitals of Mashhad University of medical sciences. *Journal of Fasa University of Medical Sciences* 2012; 2(3):142-7.
30. IMS Institute for Healthcare Informatics. Declining Medicine Use and Costs: For Better or For Worse? – A Review of the Use of Medicines in the United States in 2012. Parsippany, NJ: IMS Institute.
31. Engelberg A. Have Prescription Drug Brand Names Become Generic? *The American Journal of Managed Care.* 2014. Available from: <http://www.ajmc.com/journals/issue/2014/2014-vol20-n11/have-prescription-drug-brand-names-become-generic>