



Evaluation of Medication Errors in an Infectious Diseases Ward of a Teaching Hospital in Iran

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ABSTRACT

Background: Medication errors (MEs) and adverse drug reactions (ADRs) are among the main causes of adverse events in hospitals, leading to disability and death in up to 6.5% of hospital admissions. Application of appropriate measures for identifying medication errors and assessing potential adverse drug events are of clinical interest. **Methods:** This was an observational study performed in the infectious diseases ward of Imam Reza Hospital in Tabriz during the July 2013 to March 2014. Medical files and drug charts of 200 patients were reviewed, and errors in physician and nursing levels were determined. For detecting medication errors, treatment regimens of patients were evaluated, and then compared with the standard practice guidelines and drug references. Presence of any incompatibilities were considered as MEs. **Results:** During the study period, 126 MEs (0.63 errors per patient) were detected, occurring as incorrect time (38.1%), incorrect dose (29.37%), omission (11.9%), administration error (9.52%), incorrect dosage form (4.76%), incorrect drug (2.38%) and incorrect route (3.97%). Physicians and nurses were responsible for 48 (38.1%) and 78 (61.9%) of medication errors, respectively. **Conclusions:** MEs occur in all steps of drug therapy, including prescription, dispensing, preparation, transcription and administration, causing a great concern for hospitalized patients. Strict controlling and training programs for medical students and nurses regarding rational use and prescription of drugs, and presence of clinical pharmacists in the medical wards are highly recommended for preventing these types of errors.

Introduction

Medication errors (MEs) are defined as “any preventable incident that may cause or lead to an improper medication use or patient injury while in the control of the health care professional, patient or consumer”.¹

These errors are one of the most common and important problems happening in all hospitals causing undesirable consequences. Such errors have been reported in about 1.5% to 35% of hospitalized patients. Medication errors increase casualties among the hospitalized patients. It also increases duration of hospitalization and patients' costs in the health system.² MEs and adverse drug reactions are one of the most important factors of incidence of disability and even death among patients, and approximately 6.5% of morbidity and mortality of hospital admission are related to these events.²⁻⁸

It should be noted that medication errors can happen at

prescribing, dispensing, drug preparation and provision as well as drug distribution and executive sections.

MEs can happen by different individuals of medical group such as: physicians, nurses, pharmacists and those who take care of patient. It is estimated that in United States of America 1-2% of patients treated in hospitals suffers from injuries due to medication errors.⁹

Because of relatively high incidence of MEs and its importance in patient care, the aim of this study was to evaluate the rate of medication errors in the infectious ward of a teaching hospital in Tabriz-Iran.

Materials and Methods

This was an observational study performed in the infectious diseases ward of Imam Reza Hospital, the main referring hospital in Tabriz, during July 2013 to March 2014.

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Infectious diseases ward of Imam Reza hospital has 25 beds. Any patients admitted to this ward during the study period were included. During the study periods, 200 patient's medical files were reviewed by a pharmacy student under the supervision of a clinical pharmacist. Demographic characteristics of the patients including age, sex and reason for admission, as well as clinical and laboratory data were collected. To extract MEs, treatment regimens of patients were evaluated, and then compared with the standard practice guidelines and drug references. Presence of any incompatibilities was considered as MEs. This study was performed after obtaining an approval from the ethical committee of the Tabriz University of Medical Sciences. The patients information during all aspects of the study period, were remained private. Data analysis was performed using Excel 2007. Descriptive statistic was used to determine frequency of each type of medication errors. Continuous variables were reported as mean \pm standard deviations.

Results

In this Study, we detected 126 errors among 200 patients admitted to infectious diseases ward of Imam Reza Hospital during the study period. Mean number of medication Errors per patient was 0.63.

The mean age of the study population was 55.6 ± 19.3 years. This study consists of 111 (55.5%) and 89 (45.5%) males and females, respectively. Respiratory and urinary tract infections were the most common diagnosis among the study population (Table 1)

Table1. Demographic characteristics of the study patients

Characteristics	Value
*Age (year)	55.6 \pm 19.3
Gender percent	
Male	55.5
Female	44.5
Diagnosis percent	
Respiratory infections	26.5
Urinary tract infection	22
Fever and Neutropenia	15
Cellulite	14.5
Neurological disorders	7.5
Sepsis	5.5
Fracture and Trauma	5.5
Gastroenteritis	2
Abscess	1.5

*presented as mean \pm SD

Regarding origin of errors, physicians were responsible for 37% of the detected errors in medication processes and 62.7% of errors occurred by nurses.

Mean number of prescribed drugs for each patient during hospital stay were 8.2 ± 3.6 drugs which 3.8 \pm 1.8 of them were injectable dosage forms.

Antibiotics, acid suppressants, anticoagulants, analgesics and anti-inflammatory drugs, supplements, electrolytes and fluids, beta-blockers, hypoglycemic agents and lipid-lowering agents were the most

prescribed drug classes during patients' hospital stay. Numbers (percent) of each type of medication errors were as follow: incorrect time 48 (38.1%), incorrect dose, 37 (29.37%), omission 15 (11.9%), administration error 12 (9.52%), incorrect dosage form 6 (4.76%), incorrect route 5 (3.97%) and wrong drug 3 (2.38%). Examples for each type of errors and their frequency are presented in Table 2.

Most of the errors occurred in antibiotic drug classes 38 (30.16%), followed by acid suppressant agent 37 (29.36%), anticoagulants 17(13.5%), analgesics and anti-inflammatory agents 11 (8.73%), supplements 7 (5.55%), electrolytes and fluids 6 (4.76%), beta-blockers 6 (4.76%), hypoglycemic agents 3 (2.38%) and lipid-lowering agents 1 (0.8%), respectively. Frequency of errors by drug classes is presented in Table 3.

Table 3. Frequency of error by drug classes

Drug classes	n (%)
Antibiotic	38(30.16)
Acid suppressant	37(29.36)
Anticoagulants	17(13.5)
Analgesics and anti-inflammatory	11(8.73)
Supplements	7(5.55)
Electrolytes and fluids	6(4.76)
Beta-blockers	6(4.76)
Hypoglycemic agents	3(2.38)
Lipid-lowering agents	1(0.8)

Clinical significance of medication errors was categorized in five groups including, Insignificant, Minor, Moderate, Major and Life threatening.¹² Definition of each category are shown in Table 4 .

Discussion

In our study, a total of 126 errors were detected in 200 patients. From these, 48 errors (38.1%) were related to time interval error, accounting for the most detected error during the study period. Incorrect dose, omission error, administration error, incorrect dosage form, incorrect route and incorrect drug were responsible for 37 (29.37%), 15 (11.9%), 12 (9.52%), 6 (4.76%), 5 (3.97%) and 3 (2.38%) of medication errors, respectively.

In a study carried out by Majed Al-Jeraisy et al, the highest error was related to incorrect dose (22.1%). Incorrect route, unclear prescription, time interval error, drug interaction error, incorrect drug and repeated drug prescription were responsible for 12%, 11.4%, 5.4%, 9.1%, 1.7%, and 1% of detected errors, respectively.¹⁰

In another study, all medication interventions committed by nurses on hospitalized patients of ICU, were evaluated. Prevalence of drug administration error in ICU was 51.8%. similar to our finding, in this study, the most common error was related to time interval error (30.3%). 29% of errors were related to drug omission which happened due to no access to the drug. 18.3% of errors were related to missed doses.¹¹

Table 2. Demographic characteristics of the study patients

Type of Error	Example	n (%)
Incorrect time	Patient with estimated creatinine clearance below 30 ml per minute received ciprofloxacin 400 mg 2 times a day	48(38.1)
Incorrect dose	Patient with estimated creatinine clearance above 50ml per minute received meropenem 1 g 2 times a day	37(29.37)
Omission	DVT prophylaxis was not started for a patient in whom DVT prophylaxis is indicated	15(11.9)
Administration error	Vancomycin was not infused during 2 hours, so, the red man syndrome occurred	12(9.52)
Incorrect dosage form	Tab ranitidine 150 mg was administered instead of ampoule 50 mg	6(4.76)
Incorrect route	Heparin 5000 units 3 times a day as a DVT prophylaxis was administered IV instead of SQ	5(3.97)
Incorrect drug	Ceftriaxone 1 g was administered instead of cefazolin 1g	3(2.38)

DVT: deep-vein thrombosis; IV: intravenous; ml:milliliter; and SQ: subcutaneously

Table 4. Clinical significance of medication errors (n=126)

Clinical Significance	Description	n (%)
Insignificant	No harm or no injuries	19 (15.08)
Minor	Minor injuries, minor treatment required	49(38.89)
	No increased length of stay or re-admission	
Moderate	Major temporary injury, increased length of stay	46 (36.5)
	Or re-admission, cancelation or delay in planned Treatment/procedure	
Major	Major permanent injury, increased length of Stay or re-admission, morbidity at discharge	12 (9.52)
Life threatening	Death or large financial loss	0 (0)

The results of a research conducted by Khalili et al indicated that incorrect dose was responsible for the highest rate of errors (30%), and omission errors had the second rank (24.3%).¹²

In our study the frequency of errors committed by nurses and physicians was evaluated and the results showed that the most errors were generated by nurses. From 126 errors, 78 cases (61.9%) were occurred by nurses and 48 cases (38.1%) were done by physicians.

In contrast to our study, results of an observational study indicated that, among the 705 studied prescriptions, 55.9 % of prescribing errors occurred by physicians and 44.1% of prescriptions had dispensing error committed by nurses¹³.

Through an introspective study carried out by Naoual Jennane et al, on ICU patients during 6 weeks, prescriptions of patients hospitalized more than 24 hours, were examined. From 63 studied prescriptions, 60 MEs were related to dispensing and 2 cases were related to adverse drug event which resulted in death.¹⁴

In another study conducted by Khalili et al, during 1 year at infectious disease ward, drug regimen of 861 patients was evaluated and they concluded that from 112 detected errors, 55(49.1%) errors were committed by doctors which has the highest frequency, after that,

54 (48.2%) cases of errors occurred by nurses and patients were responsible for only 3 (2.7%) of errors. In their study, also, the average error for each patient was reported 0.13.²

In our study, 200 patients were studied, 126 errors were observed and average error for each patient was 0.63.

In another study carried out by Khalili et al medication errors were classified into 5 groups based on clinical importance. From clinical importance point of view, most errors of their study were classified as minor, which accounted for 36% of total detected errors. Similar to their findings, in our study, regarding clinical significance of detected errors, 19 (15.08%) were insignificant, 49 (38.89%) were minor which has the highest frequency, 46 (36.5%) were moderate and 12(9.52%) of errors categorized as major. Similar to their study, no life threatening error was observed in the present study.¹²

In another study carried out by Morimoto et al errors were classified into 3 groups based on clinical importance, including fatal, life threatening and serious. In contrast to our findings, most of errors in that study were reported as life threatening.¹⁵

As a conclusion, results of our study indicated that medication errors occur in all levels of patient's care and drug therapy. This issue is a great concern for hospitalized patients since these patients suffer from various difficulties and medical problems and receive various and numerous medications with potential drug-drug interactions. Importance of controlling errors and the necessity for dealing with them seem more outstanding in these wards since if left uncontrolled, more and progressive problems could occur for the patients and the health care system.

The followings are some recommendations for preventing and controlling of medication errors in medical wards:

1. Training programs for medical students and nurses regarding rational use and prescription of drugs. This can be conducted by introducing updated treatment guidelines through continuous medical education programs.
2. Enhanced patients monitoring by multi-disciplinary team approach including involvement of clinical pharmacists and pharmacy students in the medical wards.
3. Increasing the nurse-to-patient ratio
4. Periodical programs for evaluating medication errors in medical wards.

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