

A Five Years Retrospective Study of Reported Medication Incidents at a Jordanian Teaching Hospital: Patterns and Trends

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Abstract

Purpose: This is a five years retrospective study aiming to examine the frequency, type, and severity index classification of reported medication incidents at a multi-specialty Jordanian teaching hospital between January 2009 and December 2013.

Method: Out of 10042 incident reports retrieved from the quality department 3165 incident reports were related to medication management process. Detailed content analysis of medication incident reports was conducted to obtain all relevant information. Data were coded anonymously and codes were recorded using SPSS data extraction sheet.

Results: There was decrease in the incidents from 31.2% in 2009 to 14.3% in 2013, and 39% of incidents occurred between august and October. Around 86% of reported incidents were near miss incidents and captured before reaching the patient. Incorrect dose accounted for more than 52% of the reported incidents. Most reporters were pharmacists, followed by nurses and then others including physicians.

Conclusion: Effective reliable medication error reporting system could provide direction on reducing medication errors. Medication incident reports provide priceless learning opportunities to prevent medication errors. It is obvious that more educational and training is needed about drug dosing for new nurses and physicians in Jordan.

Keywords: Medication error, Incident reports, teaching hospital, Jordan.

1. Background

Medication errors are recurrent and expected to be a prolonged problem in the health care system. Medication error incidents present a common problem that lead to increase mortality and morbidity and can cause serious consequences for patients. Medication management in health care sector and particularly in hospitals received a lot of concern and attention from hospital managers and researchers. Investigating the reported medication incidents could help to design prudent quality improvement projects and plan organizational efforts to enhance patient safety.

2. Literature Review

Medication management is a complex process which includes procurement, storage, prescribing, dispensing, administration and monitoring. Medication management process stages involve physicians, pharmacists and nurses.

Bates *et al.* (1995) defined medication errors as a mistake that occurs anywhere in the medication use process. The National Coordinating Council for Medication Error (NCCMERP) (2007) defined medication errors as being any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. In hospitals such events may occur in procurement; prescribing; dispensing; distribution; administration; education and monitoring.

In spite of hard work done universally at all levels each year medications related incidents cause hundreds of thousands of injuries and deaths. Medication errors rank fifth in the list of sentinel events according to a report by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO 2010). Medication adverse events result in more than 4 million visits to health care facilities annually (Zhan *et al.* 2005), and 117,000 hospitalizations each year (Budnitz *et al.* 2006). The Institutes Of Medicine (IOM) estimates that 400,000 hospitalized patients experience a preventable adverse drug event annually and 7,000 inpatient deaths per year in the United States (IOM 2007).

Medication errors mainly occur during the prescription and administration stages and could be accounted for 65%-87% of all medication errors. (Al-Shara 2011). In United Kingdom the most common type of medication errors according to the National Patient Safety Agency (2009) were 16 % in prescribing, 18 % in dispensing and 50 % in administration of drugs. The American Society of Health-system Pharmacists (ASHP) (1993) classified Drug administration errors into the nine categories: omission error, wrong time error, unauthorized drug error, wrong dose error, wrong dosage-form error, wrong drug-preparation error, wrong administration technique error, deteriorated drug error and other medication error not fitting into the previous predefined categories.

Hospitals are the most researched setting for medication error, medication errors occur in all stages of the medication-use process, most frequently at the prescribing and administration stages (IOM 2007). There is a high incidence of adverse drug events in hospitals; reports range from over 2 events to more than 6 adverse drug events per 100 admissions (Bates 1995)

Alsulami *et al.* (2013) in systematic review study about medication errors in the Middle East countries revealed that the most frequent types of reported medication incidents errors were incorrect drug dose, wrong frequency and wrong strength during the prescribing stage and the main factor contributing to medication incidents in Middle Eastern countries is poor knowledge of medicines in both physicians and nurses. Berdot *et.al.* (2012) found that (94%) out of 430 errors were omissions and did not have clinical impact on the patient and only 6% of errors had serious or significant impact but not potentially life-threatening errors. The common causes of reported medication incidents include not accurate diagnosis, prescribing errors, drug-drug related adverse reactions, dose miscalculations, incorrect drug administration and lack of patient education (Reddy 2009).

Due to the increase hospitals accreditation movement nationally and internationally the hospitals have designed several means to capture medication errors, including incident reporting system, chart review and direct observation. Many hospitals have an incident reporting process, usually overseen by quality department or patient safety officer, who conduct investigation, analysis, data aggregate and plan performance improvement activities. Reporting medication error is both a legal and ethical obligation for every health care provider and crucial in improving the medication management process, under reporting is continue as a major threat for the hospitals incident reporting process (Leape 2002). Incident reporting method considered the most valuable resource for information to quality improvement efforts regardless of the under reporting and underestimating the prevalence of medication errors (Osborn *et al.* 1999, Meyer-Masseti *et al.* 2001, Flynn *et al.* 2002, Keers *et al.* 2013).

Medication errors are under-reported in most countries particularly in developing countries (Osborn *et al.* 1999, Kozer 2009). The barriers for reporting by health care providers are the potential for litigation, feared negative repercussions, not being able to report anonymously, time constraints, fear of professional disciplinary action and thinking that it was unnecessary to report the errors because no harm to patients (Uribe *et al.* 2002, Mayo & Duncan, 2004, Brady 2009). In no punitive environment and or if confidentiality guaranteed, nurses are a good source of information about medication errors and the circumstance in which the incidents occurred. For example Balas *et al.* (2006) in a descriptive study collected data on errors and near-miss errors using daily logbooks from 502 critical care nurses sample for 28 days, found 350 near-miss errors and 224 errors were reported during the study period. In another study Balas *et al.* (2004) found that 127 nurses 33% reported at least one near-miss error and 119 nurses 30% reported making at least one error, and, for a total of 213 near-miss errors and 199 errors and in the 28-day data collection period.

Wilkins *et al* (2008) reported that around 20% of hospital registered nurses had experienced occasionally or frequently medication error involving patients within the last year. Those medication errors were related to working overtime, role overload, perceived staffing or resource inadequacy, low co-worker support, and low job security and shift length.

Errors are an unavoidable outcome in all processes of care. The ultimate goal of health care providers is ensuring patient safety and improving quality of care particularly in medication process that the proper drug is delivered to the right patient. In health care system medication related incidents cannot be eliminated completely in all care processes (Margareth 2012). Therefore efforts need to focus on investigating the incidents so we will have better understanding the distinction between preventable and non-preventable incidents, the characteristics associated with preventable incidents, and may plan organizational efforts to enhance patient safety. In Jordan Mrayyan *et. al.* (2008) found that medication errors in governmental hospitals were higher than teaching hospitals and reporting medication errors in teaching hospitals were more than reporting in private hospitals. While in another cross-sectional descriptive study Mrayyan *et. al.* (2007) found the average number of recalled committed medication errors by nurses was 2.2 per nurse. In the most recent study by Mrayyan (2012) in four teaching hospitals the mean of the reported incidence of medication errors for sample of 212 nurses was 35%.

In Jordan most of medication errors studies were cross-sectional surveys collected subjective data based on recalling medication errors by nurses, therefore the purpose of this study is to examine the frequency, type, and severity index classification of reported medication error incidents at Jordanian teaching hospital between January 2009 and December 2013. This study will be the first five years retrospective study in Jordan that depend on collected data from reported medication errors related incidents.

This study aims to answer the following questions: (1) what is the frequency of self reported medication incidents? (2) What are the types of self reported medication incidents? (3) What are the classifications of self reported medication incidents according to severity index?

3. Methods

This is A five-year retrospective descriptive study. Reported near misses error and medication error incident reports register data were used to determine the frequency, type, and severity index classification of reported medication incidents. Data were retrieved from incident reports kept in quality department at a multi-specialty tertiary teaching hospital in North Jordan. We first screened all the self reported incident reports from the quality department records for relevance to study purpose.

Reported incident reports related to medication management process including procurement, storage, ordering, dispensing, administration, or monitoring that occurred between January 2009 and December 2013 were included in the study.

Detailed content analysis of medication incident reports was conducted as follows: First, each incident report was read thoroughly to obtain all relevant information regarding the incident, reporting staff, department where the incident occurred, type, date and severity index of the incident.

Then, data were coded according to relevant information regarding the department, type, date, reporting staff and severity index. These codes were recorded in an anonymous form on the data extraction form. SPSS spread sheet was used in order to transform the narrative data into electronic format. Coded data did not include personal data concerning the patients or health professionals involved in incident report.

The statistical package for social science (SPSS Version 20) was used for statistical analysis. Descriptive statistics and cross-tabulation were used to examine the characteristics of reported medication incidents and to answer the research questions.

The study was approved by the appropriate Institutional Review Board and hospital administration.

4. Results:

A total of 10042 incident reports were reviewed, and 3165 incident reports 31.5% met the inclusion criteria and found to be related to medication management process between January 2009 and December 2013 Numbers of reported incidents during the years 2009, 2010, 2011, 2012, 2013 were (989 incidents; 31.3%), (711 incidents; 22.5%), (740 incidents; 23.3%), (271 incidents; 8.6%) and (454 incidents; 14.3%), respectively of the total included incident reports. Table 1 displayed the distribution of included incidents according to months and years.

The reporting rate and consistency according to months varied but reports during the three months of August, September and October accounted for the highest reporting rate 39% of the total reports while reports during the months of January, February and March were the lowest 16.3% of the total reports.

Table 1: Distribution of included incidents according to months and years

		Year					Total
		2009	2010	2011	2012	2013	
Month	January	2	14	90	41	32	179
	February	2	27	86	16	68	199
	March	3	4	68	24	39	138
	April	100	27	36	29	30	222
	May	131	10	67	34	37	279
	June	104	24	8	30	35	201
	July	102	59	46	7	37	251
	August	158	157	13	10	22	360
	September	124	141	135	24	99	523
	October	87	74	141	25	21	348
	November	92	80	15	10	24	221
	December	84	94	35	21	10	244
Total		988	711	740	271	454	3165

Results show that (57.85%; 1831 medication incidents) were related to outpatients services while (42.15%; 1334 medication incidents) were related to inpatients services as detailed in table 2.

Most of the reports 82.4% were reported by pharmacists, while nurses reported 16.8% and others including physicians reported only 0.8%.

Table 2: Distribution of incidents among reporting patients care services

Location	Frequency	Percent	Cumulative Percent
Outpatients Department	1831	57.85	57.85
Surgical Department	350	11.1	68.95
Medical Department	247	7.8	76.75
Intensive care Units	236	7.5	84.25
Pediatrics Department	216	6.8	91.0
Inpatient Pharmacy.	191	6.0	97.0
Obstetric and Gynecology	94	3.0	100.0
Total	3165	100.0	

The majority of incidents 2722 (86%) were classified as near miss incidents and did not reach the patients, while 415 incidents 13.2% reached the patients but did not cause permanent harm to them. However these errors did have the potential to cause significant patient harm. Twenty five incidents 0.8% reached the patients and caused temporary patient harm which required transfer to a higher level of care and or required more frequent monitoring and laboratory testing. One incident reached the patient and caused minor patient harm that needed limited intervention or treatment. One incident reached a patient and caused major harm.

Most common types of incidents involved incorrect dosage 52.8% while other types of incidents were equal or less than 7.7% for each. Table 3 shows medication error types in different phases of the medication management process.

Table 3: Type of medication incidents reports

Incidents Types	Frequency	Percent	Cumulative Percent
Incorrect Dosage	1670	52.8	52.8
Broken ampoule	192	6	58.8
Improper Order	182	5.6	64.4
Pharmacy Dispensing Error	168	5.3	69.7
Incorrect Rout	144	4.5	74.2
Incorrect Drug	138	4.4	78.6
Omission	113	3.6	82.2
Timing	107	3.4	85.6
Adverse Reaction	67	2.1	87.7
Patient Identification	66	2.1	89.8
Hold	25	0.8	90.6
High concentration	17	0.5	91.1
Given Without Order	12	0.4	91.5
Storage problem	10	0.3	91.8
Mislabeled	8	0.3	92.1
Other	245	7.7	100
Total	3164	100	

5. Discussion

The aim of this 5 years retrospective study was to examine the frequency, type, and severity index classification of reported medication incidents. Unfortunately, data regarding the medication error incidences in Jordan at the national level is not available unlike to other countries since there is no national database or mandatory reporting system for health organizations. To our knowledge, this is the first study investigating the actual reported medication errors incidents.

Study results indicate that the reported medication errors incidents are the most common and consistent type of reported incidents and accounted for one third of the total reported incidents during the study time. This finding is consistent with Runciman *et al* (2003) and De Vries *et al* (2008) findings.

It is important to note that some progress yearly has been achieved and there was decrease in the incidents from 31.2% from the total medication incidents during the five years in 2009 to 14.3% in 2013. This is least due to implementation of several quality programs including Joint Commission International Accreditation Program and implementation of electronic medication prescribing, labeling and dispensing system for inpatients and outpatients.

It was interesting that 39% of incidents occurred between august and October of each year while the lowest reporting 16.3% was between January and March of each year, which could be due to the freshly starting resident physicians who usually enroll in residency programs. This could be seen clearly as incorrect medication dosing reached a maximum of 52.8% of the reported incidents during July. This findings regarding to the medication error type are similar to the results of Alsulami *et al.* (2013) in his systemic review about medications errors in the Middle East countries where medication incidents of incorrect dosage were the most common types followed by, improper order, incorrect rout, incorrect drug and timing which he attributed to poor knowledge of medicines by both physicians and nurses of Middle Eastern countries. Our findings were also consistent with Al-Shara, (2011) results in that more than two thirds of medication errors occurred during prescribing and administration phases. Our results indicated that most of medication incidents 57.85% were related to outpatients services while 42.15% reported incidents found related to inpatients services which is inconsistent with Jylha *et al* (2011) where 81% of adverse drug events were related to inpatients services. This could be due to the active role of clinical pharmacists in outpatient department in discovering medication errors particularly the incorrect dose. According to Dutton *et al.* (2003) errors reporting rates increased from 34.6% to 77.7% when a clinical pharmacist was actively involved in the assessment and monitoring of drug prescriptions

Another important finding of this study was the fact that most reporters were pharmacists, followed by nurses and then others including physicians. This is in contradiction with Harkanen *et al* (2013) who found that medication errors were mostly reported by nurses 82.6%, while pharmacists reported 5.4%. However, reporting by physicians was low as reported by Harkanen *et al* and our study 2.5% and 0.8%, respectively. This result could be due to the pharmacists significant role in overseeing the whole medication process and checking the prescribed orders for correctness and appropriateness according to the hospital policy in addition to the fact that about 57.85% of incidents did occur in outpatients services where pharmacists are practically the only health care providers involved in medication management following prescribing by physicians.

Our result support previous studies by Evans *et al* (2006) and Miller *et al* (2006) in which physicians have low participation in medication error reporting. Therefore physicians must be more involved and encouraged to report and make suggestions for improvement and correction of the processes that caused the error.

In United Kingdom, the National Patient Safety Agency (2009) reported that the most common type of medication errors were wrong dose or wrong frequency which is consistent with our findings where incorrect dose was that the most common types of reported errors 52.8%, which are also consistent with previous studies (Rudman *et al* 2005, Hicks *et al* 2004, Pierson *et al* 2007, Sheu *et al* 2008). Other types such as patient identification, improper order, incorrect drug, incorrect rout, adverse reaction, pharmacy dispensing error and timing accounted for 27.7% of errors. In their valuable systematic review study, Alsulami *et al.* (2013) reported that prescribing errors in the Middle Eastern countries were incorrect dose, wrong frequency and wrong strength that ranged from 0.15 % to 34.8 % of the prescriptions.

Our results indicate that around 86% of reported incidents were captured and intercepted before reaching the patient and did not cause harm to them but has the potential to cause significant patient harm. However 13.2% of errors reached the patient with the potentiality to cause harm but they did not and only 0.8% of reported incidents caused little to sever harm consequences for patients, which is consistent with Miller *et al* (2006) findings. In contradiction to our results Harkanen *et al* (2013) found two thirds incidents reached patients, while one third were intercepted before reaching patients. However, in both studies, the majority of the incidents caused no harm to patients, and only 0.3% were estimated to have caused severe harm to patients.

6. Conclusion and implications

Medication errors continue to be of main concern affecting patient safety as well as health care providers. Therefore understanding the characteristics and trends of medication errors will help hospitals leaders to understand why they occur and how to reduce or eliminate them. Effective reliable medication error reporting system is crucial and could provide direction on reducing medication management process errors. Physicians involvement in reporting incidents and leadership support at all levels to create blame free, openness and trust culture will increase reporting rate to uncover the hidden causes of errors and will provide priceless learning opportunities to prevent medication errors. The role of clinical pharmacists is essential in capturing the errors before reaching the patients. Quality improvement projects and electronic medication prescribing, labeling and dispensing can be utilized to assist in preventing errors. It is obvious that there is a need for further research to fully understand medication error incidents in Jordan.

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