

Nurses' Perceptions of Medication Errors in Jordan

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Abstract

Background and Aims: The incidence of medication errors is growing and resulting in serious patients' consequences such as hospitalization and death. Worldwide, there is a proliferation of studies about medication errors; however, such studies are absent in Jordan. This is the first nursing study about medication errors in Jordan, and this is one of few international comparative studies about the studied concepts. This study described medication errors in Jordan, as perceived by nurses.

Methods: A survey method was used to collect data using the Modified Gladstone's Scale of Medication Errors. A convenient sample of 799 nurses was obtained from three types of hospitals at the Capital Amman and the northern part of Jordan.

Findings: Medication errors were high in governmental hospitals as compared to those in teaching hospitals. No differences were found across hospitals in regard to the rate of medication errors. In all hospitals, underreporting was evident; however, nurses in private hospitals seemed to underreport medication errors more than nurses in teaching and governmental hospitals.

Nurses in wards were at higher risks to commit medication errors more than nurses in Intensive Care Units (ICUs). There were no differences between nurses in ICUs and those in wards in term of the rate of medication errors. In general, nurses were usually sure when to report medication errors using incident reports; however, ICU nurses were slightly higher than ward nurses in this aspect.

Conclusions: High rates of medication errors should encourage the reformation process of health care systems. Recognizing medication errors is the first step to reduce, report, and even eliminate them, especially in acute care settings. Findings pinpoint that nurses have to have staff development about various issues related to medication errors, particularly defining and reporting these errors.

Keywords: Perceptions, Nurses, Medication Errors, Jordan.

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Introduction

A medication error is a preventable event that may cause or lead to inappropriate medication use or patient's harm while the medication is in the control of the health care professionals, patients, or consumers.

Such events may be related to professional practice, health care products, procedures and systems including: prescribing, ordering communicating, labeling and packaging of product, compounding, dispensing, distributing, administering, educating, monitoring, and using.¹

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"Medication errors" is a common problem in many health care systems. Causes and sources of medication errors are multi-factorial. Contributing factors include illegible handwriting; inaccurate follow up of drug history; confusion with names of drugs; inappropriate use of decimal points; of abbreviations; and of verbal orders.² The majority of medication errors result from unsafe systems rather than from individuals' incompetence.³ Medication errors may occur at any juncture in the medication process, from ordering and administering medications to how they are named and packaged.^{2,3}

Health care professionals share responsibility for medication errors. However, nurses play major roles because they have the longest and most direct contact with patients. Reducing medication errors requires a multidisciplinary-layered approach; it should be a mindset of every person involved in the medication process.

Although patients receive continuous monitoring of physiologic variables with concentrated patients' observation and care at ICUs, medication errors do occur.⁴ Regardless to types of hospitals, medication errors require immediate interventions.

Purposes and Significance of the Study

In this study, the researchers investigated the differences in causes, rate, and reporting of medication errors across three types of hospitals as perceived by nurses. Also, this phenomenon of interest was compared between ICUs and wards in these hospitals.

In Jordan, there were no nursing studies that addressed medication errors. Usually nursing studies compare between teaching and non-teaching hospitals.⁵⁻⁷ This is the first study that compared medication errors between governmental, teaching and private hospitals, as well as between ICUs and wards.

Research Questions

This study answered the following research questions:

1. What are the differences between teaching, governmental, and private hospitals in regard to causes of medication errors?
2. What are the differences between teaching, governmental, and private hospitals in regard to the rate of medication errors reported to nurse managers?
3. What are the differences in nurses' views about reporting medication errors in teaching hospitals as compared to governmental and private hospitals?
4. What are the differences between ICUs and wards in regard to causes of medication errors?
5. What are the differences between ICUs and wards in regard to the rate of medication errors reported to nurse managers?
6. What are the differences in nurses' views about reporting medication errors in ICUs as compared to wards?

Medication Errors

There is a plethora of research studies about medication errors.^{8-11,13-23} Medication errors are mistakes that professionals make and may involve injury and result in lawsuits.⁸⁻¹⁰ The incidence of medication errors in hospitals has been increasing over the years⁸⁻¹². Medication errors cause an extended length of stay, fatal outcomes, and increased cost of hospitalization and the risk for disciplinary actions.⁸⁻¹²

The most frequent types of medication errors were the inappropriate time of administering medications and miscalculation of doses.²⁴⁻²⁹ However, regardless to how cautious a professional is, errors may occur by chance and without evident patterns.¹³

"Medication errors" is a multidisciplinary practice issue.³ Because of their responsibility in the medication process and medication administration, nurses specifically are more prone to commit medication errors than any other health

care professionals.^{30,31} Consequently, nurses play important roles in the detection, prevention, and reporting of medication errors.

The literature review about medication errors in ICUs is conflicting.^{4, 28, 32-35} For example, while Girotti et al.²⁸ reported a low medication error rate of 2.2% in the ICUs, Jessee³⁴ reported a medication errors rate of 18% in these units. The rate of medication errors in general medical wards was 9.7%, while it was 10.8% in general surgical wards.²⁸

Medication errors are preventable; however, disagreement over the definition of an error is a major cause of not reporting or under-reporting medication errors when they occur.^{21, 36-43}

Methods

Sample, Settings, and Design

Data were collected during fall 2005. Using a sample of Jordanian nurses, the current study was a replication of Osborne et al.,²¹ and Mayo and Duncan's⁹ studies. Causes, rate, and nurses' views about reporting medication errors in Jordan were the main aims of this study.

This comparative study was conducted using a self-report survey method. A sample of 799 nurses was used with a response rate of 57%. The only sampling criterion was set as 'nurses who had worked at hospital settings for a minimum period of 6 months.' This criterion was set to assure the competency level of nurses. Nurses were selected from 24 teaching, governmental, and private hospitals. These hospitals covered the Capital Amman and the northern part of Jordan.

Research Instruments

Developed by the primary researcher, a demographic form was developed to collect data about characteristics of the sample. The form consists of questions about gender, age, level of education, length of period of administering medications, years of experience in nursing,

number of medication errors over the course of career, time commitment, shift worked, area of work, and types of hospitals.

Conceptually, medication errors were defined preventable events that may cause or lead inappropriate medications use or patients' harm.⁸ operationalize medication errors, the Modified Gladstone's scale was used.^{9,21} This instrument measures nurses' perceived causes of medication errors (10 items); rate of medication errors reported to managers (1 item); and nurses' views about reporting medication errors (6 items). A pilot study was conducted to assess the appropriateness of the tool in Jordanian health care settings, and modifications were done accordingly, including deleting the scenario of medication errors from the original scale.

The Modified Gladstone's scale has acceptable psychometric measures as evidenced by its content validity.^{9,21,38} Also, the tool is reliable as evidenced by the test-retest method (0.78).²¹ In the current study, the Cronbach's alpha of our tool was 0.65.

Ethical Issues

An approval to conduct the study was obtained from the university where the current researchers are working. Approvals were also obtained from hospitals' administrators. All nurses were invited to participate in the study. Anonymity and confidentiality of participants' information were assured. All questionnaires were numerically coded before being sent to subjects. All questionnaires were handled by the researchers only.

Data Analyses

The SPSS (Version 11.5) was used to analyze the data.⁴⁴ Descriptive statistics (means, standard deviations (SD), and frequencies) were presented for the studied variables. At alpha level of 0.05, inferential statistics were generated.

A mean for the reported frequencies was calculated to report the rate of medication errors.⁴⁵ Across hospitals and between ICUs and wards, using the total score of medication errors, chi-squares were used to perform the comparisons.⁴⁵

Results

Of possible 1400 respondents, 799 Registered Nurses (RNs) responded to the survey. The response rate of the current sample was 57%. In the whole sample, RN's mean age was 29.5 years, and the mean of recalled committed medication errors was 2.2 per nurse, and the rate of medication errors reported to nurse managers using incident reports was 42%.

Sample's Characteristics

In their gender, level of education, length of period of administering medications, years of experience in nursing, time commitment, shift worked and area of work, nurses in different types of hospitals were significantly different at $P = <0.001$. More female nurses who held the diploma degree were working in wards of governmental hospitals (37.0%) versus (16.3%) of nurses who were working in teaching and (18.2%) of nurses who were working in private hospitals. More nurses were working rotating shifts in governmental hospitals (88.4%). Fewer nurses were working in ICUs (43.3%) of governmental hospitals as compared to (56.3%) of nurses who were working in teaching hospitals and (66.7%) of those working in private hospitals. Almost 87% of full time nurses were working in private hospitals. More experienced nurses were employed at governmental hospitals (37.2%); those nurses had also more years of experience in administering medications (37.6%) (Table 1).

In their gender, age, level of education, length of period of administering medications and years of experience in nursing and types of hospitals, nurses in ICUs were different from those in wards. More male nurses were working in ICUs

($P=<0.001$); younger nurses were employed in ICUs ($P =0.009$); more diploma nurses were working in wards ($P =0.002$); longer periods of medication administration and more experienced nurses were common features in wards ($P =0.003$ for both variables), and 33.6% of nurses were working in ICUs as compared to 23.2% in wards of private hospitals ($P =<0.001$) (Table 2).

Medication Errors: Differences across Hospitals

The overall mean of medication errors in the whole sample was calculated, it was 5.74; in average each nurse committed nearly 6 medication errors over the course of their career. The overall mean of medication errors in teaching hospitals was 5.70, in governmental hospitals it was 5.74, and in private hospitals reached 5.83; there were no significant differences across hospitals.

As the highest, nurses at governmental hospitals reported that medication errors occur when nurses fail to check patient's name with the medication administration record ($P =0.048$); medication errors occur when physician's writing is difficult to read or it is illegible ($P <0.001$); medication errors occur when the medication labeling/packaging is poor or damaged ($P =0.048$); medication errors occur when physicians prescribe wrong doses ($P =0.045$); and medication errors occur when nurses miscalculate doses of medication ($P =0.016$). However; causes of medication errors in private hospitals were different and higher than those in governmental and teaching hospitals in terms of: medication errors occur when there is a confusion between 2 medications with similar names ($P =0.039$); and medication errors occur when nurses are confused by the different types and functions of infusion devices ($P =0.024$). There were no significant differences across different types of hospitals in the rate of medication errors reported to nurse managers using incident reports (Table 3).

Across hospitals, nurses' views about reporting medication errors were assessed. As compared to nurses in governmental and private hospitals, nurses in teaching hospitals were more sure about what constitutes a medication error ($P < 0.001$).

Nurses in governmental hospitals were more sure when to report medication errors using incident reports ($P = 0.022$). Nurses in private hospitals under-reported medication errors because they were afraid that they might be subjected to disciplinary actions or even lose their jobs ($P = 0.022$) (Table 4).

Table (1): Differences of sample's characteristics based on types of hospitals (N=799).

Variable	Nurses in teaching hospitals N=394		Nurses in governmental hospitals N=174		Nurses in private hospitals N=231		χ^2	Sig
	*N	%	*N	%	*N	%		
Gender							29.10	<0.001
Male	232	63.4	71	42.8	105	46.9		
Female	134	36.6	95	57.2	119	53.1		
Level of education							34.03	<0.001
Diploma	64	16.3	64	37.0	42	18.2		
Baccalaureate	308	78.4	105	60.7	179	77.5		
Master and above	21	5.4	4	2.3	10	4.3		
Length of period of administering medications							47.75	<0.001
6-12 months	112	28.6	42	24.3	34	14.7		
1-2 years	113	28.9	36	20.8	78	33.8		
3-4 years	103	26.3	30	17.3	57	24.7		
5-9 years	33	8.4	34	19.7	38	16.5		
10 years or more	30	7.7	31	17.9	24	10.4		
Years of experience in nursing							39.87	<0.001
6-12 months	124	31.8	39	22.7	35	15.2		
1-2 years	96	24.6	34	19.8	76	32.9		
3-4 years	87	22.3	35	20.3	55	23.8		
5-9 years	53	13.6	31	18.0	38	16.5		
10 years or more	30	7.7	33	19.2	27	11.7		
Time commitment							29.19	<0.001
Full-time	275	70.9	119	68.8	199	86.9		
Part-time	113	29.1	54	31.2	30	13.1		
Shift worked							96.50	<0.001
Day	143	36.8	7	4.0	33	14.3		
Evening	21	6.4	4	2.3	8	3.5		
Night	15	3.9	9	5.2	7	3.0		
Rotating	210	64.0	153	88.4	183	79.2		
Area of work							22.60	<0.001
Critical Care Units	230	56.3	74	43.3	154	66.7		
Wards	158	40.7	97	56.7	77	33.3		

* Some totals did not sum up to 799 because of missing values.

Table (2): Differences of sample's characteristics based on critical care units and wards (N=799).

Variable	Nurses in critical care units N=458		Nurses in wards N=332		χ^2	Sig
	*N	%	*N	%		
Gender					27.10	<0.001
Male	269	61.7	134	42.8		
Female	167	38.3	179	57.2		
Age					13.55	0.009
Less than 25 years	243	53.2	136	41.1		
25-34 years	163	35.7	147	44.4		
35-44 years	42	9.2	44	13.3		
45-54 years and above	9	2.00	4	1.2		
Level of education					14.53	0.002
Diploma	77	16.8	93	28.0		
Baccalaureate	357	78.1	227	68.4		
Master and above	23	5.1	12	3.6		
Length of period of administering medications					16.31	0.003
Less than 1 year	109	23.9	73	22.1		
1-2 years	149	32.7	77	23.3		
3-4 years	108	23.7	82	24.8		
5-9 years	54	11.8	50	15.1		
10 years or more	36	7.9	49	14.8		
Years of experience in nursing					16.36	0.003
Less than 1 year	115	25.3	77	23.3		
1-2 years	136	29.9	70	21.2		
3-4 years	101	22.2	75	22.7		
5-9 years	66	14.5	56	17.0		
10 years or more	37	8.1	52	15.8		
Type of hospitals					22.60	<0.001
Teaching	230	50.2	158	47.0		
Governmental	74	16.2	97	29.2		
Private	154	33.6	77	23.2		

* Some totals did not sum up to 799 because of missing values.

Table (3): Significant differences of causes of medication errors based on types of hospitals.

Variable	Nurses in teaching hospitals N=394		Nurses in governmental hospitals N=174		Nurses in private hospitals N=231		χ^2	Sig
	\bar{X}	S.D	\bar{X}	S.D	\bar{X}	S.D		
Medication errors occur when the nurse fails to check the patient's name band with the Medication Administration Record (MAR.)	5.14	3.28	5.71	3.54	4.83	3.31	31.54	0.048
Medication errors occur when the physician's writing on the doctor's order form is difficult to read or illegible	4.75	2.88	5.87	3.17	5.12	2.97	45.81	<0.001
Medication errors occur when the medication labeling/packaging is poor or damaged	5.37	3.08	6.22	3.16	5.92	2.99	31.59	0.048
Medication errors occur when there is a confusion between 2 medications with similar names	4.86	2.81	5.16	2.94	5.48	3.03	32.43	0.039
Medication errors occur when the physician prescribes the wrong dose	4.92	2.89	5.56	2.98	5.18	3.11	31.80	0.045
Medication errors occur when the nurse miscalculates the dose	5.07	2.84	5.45	3.14	4.76	2.97	53.78	0.016
Medication errors occur when nurses are confused by the different types and functions of infusion devices	5.50	2.81	5.65	3.03	5.76	2.87	31.73	0.024
Rate of all medication errors reported to the nurse managers by the completion of an incident report	42.77	24.10	39.98	25.06	42.43	27.40	113.24	0.297

Table (4): Significant differences in nurses' views of reporting medication errors based on types of hospitals.

Variable	Nurses in teaching hospitals N=394		Nurses in governmental hospitals N=174		Nurses in private hospitals N=231		χ^2	Sig
	\bar{X}	S.D	\bar{X}	S.D	\bar{X}	S.D		
Nurse usually sure what constitutes a medication error	1.23	.423	1.12	.329	1.10	.307	20.15	<0.001
Nurse usually sure when a medication error should be reported using an incident report	1.22	.418	1.25	.439	1.15	.359	7.63	0.022
Nurses failed to report a medication error because they were afraid that they might be subject to disciplinary action or even lose their job	1.59	.492	1.52	.501	1.65	.475	7.63	0.022

Medication Errors: Differences between ICUs and Wards

Using the total scores, the mean of medication errors was 5.74 in ICUs and 5.79 in wards; as there were no significant differences between nurses in both clinical settings (Table 5). Nurses in wards reported that medication errors occur when there is a confusion between 2 medications with similar names ($P = 0.022$).

There were no significant differences between ICUs and wards in the rate of medication errors reported to nurse managers using incident reports. In their nurses' views about reporting medication errors, nurses in ICUs were slightly higher than nurses in wards in term of being sure when medication errors should be reported using incident reports ($P = 0.048$) (Table 6).

Table (5): Significant differences of causes of medication errors between critical care units and wards (N=799).

Variable	Nurses in critical care units N=458		Nurses in wards N=332		χ^2	Sig
	\bar{X}	S.D	\bar{X}	S.D		
Medication errors occur when there is a confusion between 2 medications with similar names	5.02	2.92	5.24	2.91	26.15	0.002
Rate of all medication errors reported to the nurse managers by the completion of an incident report	43.11	24.75	40.95	26.09	62.51	0.174

Table (6): Significant differences of nurses' views of reporting medication errors between critical care units and wards (N=799).

Variable	Nurses in critical care units N=458		Nurses in wards N=332		χ^2	Sig
	\bar{X}	S.D	\bar{X}	S.D		
Nurse usually sure when a medication error should be reported using an incident report	1.21	.411	1.20	.402	.208	0.048

Discussion

Consistent with Mayo and Duncan,⁹ who reported that the recalled number of medication errors was 2-5 per nurse; Jordanian nurses recalled committing 2.2 errors over their career. Jordanian nurses committed 6 errors over their career as compared to 4.9 of American nurses.⁹ In Jordan, 42% of medication errors are reported to nurse managers as compared to a 25% rate in USA.²¹ This indicates that Jordanian nurses have a higher tendency to report medication errors than American nurses.

More male students are pursuing the nursing profession in Jordan, thus it is difficult to relate medication errors to gender because male nurses are overrepresented in hospitals and ICUs. Also, it is difficult to relate causes of medication errors at governmental hospitals to nurses' level of education; diploma nurses are also overrepresented in those hospitals. The majority of nurses were young nurses; thus the relationships between medication errors and age should be considered with caution. Few nurses had 5-10 years or more in nursing; thus it could be concluded that experienced and educated nurses are less prone to commit medication errors because they have more skills in administering medications.³⁷ Nurses who work on full time basis are expected to commit less medication errors, while they may commit more medication errors if they work on rotating shifts; this finding is supported in the literature and could be related to the continuity of care.²⁶ Before affirming any difference between ICUs and wards, it is important to mention that not all nurses who work in ICUs are specialized; thus differences should be explained with caution.

Consistent with other studies,^{9,21,38} this research identified differences in causes of medication errors and their reporting. Medication errors were higher in governmental hospitals; this could be related to nursing shortage and increased workload. The shortage in governmental hospitals involves physicians as well.

As a result, medication errors occur because of unclear handwriting of physicians. With a shortage of manpower, medication errors occur when the medication labeling/packaging is poor or damaged.²⁹ Miscalculated doses of medication should be managed in all hospitals,^{24,25} particularly in Jordanian governmental hospitals.

In private hospitals, medication errors occur when there is a confusion between 2 medications with similar names,¹⁶ and medication errors occur when nurses are confused by the different types and functions of infusion devices.⁴⁶ In Jordan, the financial status of private hospitals is better than the status of other types of hospitals; brand names of medications could be purchased and advanced technology could be acquired; consequently, a higher rate of medication errors may occur. Nurses in private hospitals were not sure of what constitutes medication errors, and were not affirmative about when to report medication errors. Furthermore, nurses in private hospitals were afraid to report medication errors because they were afraid from disciplinary actions against them or even losing their jobs.^{39,42}

Consistent with Girotti et al.,²⁸ ICUs and wards were not significantly different regarding the reported rate of medication errors.¹⁶ Working in ICUs requires specialized knowledge;⁴ it is expected that nurses in ICUs are more knowledgeable about medications, thus they may commit less medication errors than nurses in wards. Nurses in ICUs were slightly better than nurses in wards regarding reporting medication errors as they were sure when medication errors should be reported. This difference may be related to the fact that ICU nurses usually deal with more critical and acute cases than nurses in wards.⁴ In turn, medication errors at ICUs are dangerous and harmful and may need immediate interventions, thus these errors should be reported immediately.

Implications

Immediate interventions are warranted to decrease and eliminate medication errors, these include eliminating or minimizing punitive actions, providing orientation programs and extensive courses in pharmacology, and establishing a comprehensive, an accurate, and a timely reporting process.^{2,8,9,13,16, 20, 29, 43, 47-49}

Follow up studies of specific types of medications and random sampling techniques are needed. Moreover, medication errors should be explored from the perspectives of physicians and pharmacists.

Summary and Conclusions

This is the first nursing study about medication errors in Jordan, and this is one of few international comparative studies about this phenomenon. "Medication errors" is a serious practice issue that requires the immediate attentions of all health care professionals and decision-makers.

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إدراك الكادر التمريضي للأخطاء المتعلقة بالأدوية في الأردن

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الملخص

الأهداف: إن معدلات الأخطاء المتعلقة بالأدوية في تزايد مستمر، وهذه الأخطاء تؤدي إلى آثار جانبية سلبية كثيرة مثل دخول المستشفيات والوفاة، وبالرغم من وجود وفرة في الدراسات العالمية المتعلقة بأخطاء الأدوية إلا إن مثل هذه الدراسات غير متوفرة بالأردن، وعليه فإن هذا البحث يهدف إلى دراسة الأخطاء المتعلقة بالأدوية من وجهة نظر الكادر التمريضي.

طريقة البحث: تم جمع بيانات هذا البحث من خلال استمارة وزّعت على (799) ممرضاً وممرضة يعملون في ثلاثة أنواع من المستشفيات في العاصمة عمان وشمال المملكة.

النتائج: بينت نتائج هذه الدراسة أن أعلى مسببات للأخطاء المتعلقة بالأدوية كانت في المستشفيات الحكومية وكان أقلها في المستشفيات التعليمية، أما فيما يتعلق بمعدل الأخطاء المتعلقة بالأدوية فلم توجد أية فروقات ذات دلالات إحصائية بين المستشفيات، ولكن أشارت النتائج إلى أن التبليغ عن الأخطاء المتعلقة بالأدوية تبدو مشكلة عامة عند الكادر التمريضي بغض النظر عن نوع المستشفى، وأشارت النتائج أيضاً إلى أن مسببات الأخطاء المتعلقة بالأدوية كانت أعلى بالطواقم منها بالوحدات المتخصصة، ولكن لم توجد فروقات ذات دلالات إحصائية فيما يتعلق بمعدل هذه الأخطاء، ولقد وجد أن الكادر التمريضي بالوحدات المتخصصة يبلغ عن هذه الأخطاء أكثر من الكادر التمريضي الذي يعمل بالطواقم. وبالنظر إلى أهمية منع أو تقليل الأخطاء المتعلقة بالأدوية فلا بد من وجود حلول ناجعة تبدأ بتعريف الأخطاء المتعلقة بالأدوية، وكيفية تمييزها، والتبليغ عنها، وذلك من خلال التركيز على التعليم المستمر والدورات المتخصصة.

الخلاصة: إن ارتفاع معدلات حدوث الأخطاء المتعلقة بالأدوية تستدعي إعادة تشكيل النظام الصحي، ومن الجدير ذكره أن إدراك وتعريف الأخطاء المتعلقة بالأدوية هي الخطوة الرئيسية للتقليل ومنع هذه الأخطاء والتبليغ عن حدوثها.

الكلمات الدالة: إدراك، الكادر التمريضي، الأخطاء المتعلقة بالأدوية، الأردن.