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## RESEARCH ARTICLE

# PERCEPTION OF MEDICATION ERRORS AMONG CRITICAL CARE NURSES IN JORDANIAN HOSPITALS: CAUSES AND REPORTING

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### ABSTRACT

**Background:** Nurses in the critical care setting know that the causes of medication errors are both varied and complex. Medication errors have serious direct and indirect results and consequences on patient outcomes and the healthcare system overall. Nurses are considered key players in the medication administration process and may cause or report different forms of medication errors. The perception of nurses about medication errors has not been well-investigated to date in Jordan. **Objectives:** This study sought to describe nurses' perceptions about medication errors in Jordanian hospitals, including what constitutes a medication error, causes of medication errors, what is reportable, the percentage of reporting, and what barriers to reporting exist. **Methods:** This descriptive cross-sectional study employed a self-report survey method to assess the perception of 300 critical care registered nurses from three governmental hospitals in Jordan who were selected using a cluster random sampling method. **Results:** Study findings revealed that the nurses surveyed had different perceptions about the causes and reporting of medication errors. Most of the nurses reported incidence of medication errors during their clinical practice. The estimated average of medication errors reported to the nurse manager using incident reports was about 61%. Using six clinical scenarios reflecting medication errors to assess the perception, 77% of nurses perceived the clinical scenarios to be medication errors, 68% of nurses believed that the events should be shared with the physician, and 57% believed that formal incident reports should be written for those events. The most prevalently perceived cause of medication errors was a failure of the nurse to check the patient's identification band when administering medications. The majority of participants suggested that nurses are usually sure when medication errors should be reported; however, the failure of them to report a medication error was largely because they did not think the error was serious enough to warrant reporting. **Conclusions:** Reporting medication errors should be recognized as opportunities for improvement rather than means for penalty. Medication errors indicate a defect in the healthcare system of the hospital, not individuals. Open channels of communication should be established between nurses and their managers in order to enhance medication error reporting. Moreover, special educational courses in medication handling should be included in the nursing undergraduate education and hospital orientation programs.

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## INTRODUCTION

A medication error is defined as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labeling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring,

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and use" (Mercer, Furler, Moffat, Fischbacher-Smith, and Sanci, 2016). Medication errors could also be defined as any event occurring during drug prescription, preparation, administration, or follow-up and which is usually preventable. They are caused by the improper use of medications by patients themselves, health care providers, or consumers and may cause significant harm to the patient (Definition). The two most common and major types of medication errors mentioned in the literature occur during the preparation stage or during the administration stage, respectively (Agyemang and While, 2010). However, medication errors can happen at any stage of drug administration, prescription, communication, labeling, dispensing, distribution, education, and observation. The

incidence of medication errors to date has not decreased significantly despite the growing interest in this issue worldwide (Chang and Mark, 2009; Mrayyan, Shishani, Al-Faouri, and Ammouri, 2008). Indeed, medication errors are increasing around the world and represent the most recurrent cause of hospital-related undesirable events (Agyemang and While, 2010). Most patients in intensive care units (ICUs) are exposed to at least one kind of medication error, especially of a drug ordering or administration nature. As reflected in the results of a study about the incidence of medication errors in the ICU of an educational hospital in North Africa, it was clear that the incidence of medication errors in developed countries is significantly high (Jennane *et al.*, 2011). Errors appear to occur in approximately 6% of hospital medication use episodes. Among critically ill adults, the rate of medication errors ranges from 1.2 to 947 errors per 1,000 patient ICU days. In children, 100 to 400 prescribing errors were reported per 1,000 patients (Miller, Robinson, Lubomski, Rinke, and Pronovost, 2007). The impact of medication errors can be extensive and may involve patients, families, health care professionals, hospitals, and even whole organizations. Medication error effects run from no notable effects to death; in this regard, medication errors represent one important cause of patient morbidity and mortality. In some cases, a new condition can arise as a result of a medication error that is either temporary or permanent in nature, such as itching, rashes, or skin disfigurement. Many affected patients experience costly and prolonged hospital stays, and some patients never fully recover to their premorbid status (Moyen, Camiré, and Stelfox, 2008).

The impact of medication errors extends also to the healthcare provider, as healthcare providers who unintentionally give the wrong medication to patients could suffer from guilt, shame, and self-doubt. In this manner, these individuals can be referred to as the second victims, and the effect of this phenomenon can be life-threatening, extending to suicide. Additionally, the patient or patient's family members may pursue a personal injury lawsuit against the health care provider for negligence, which may threaten the latter's career advancement and professional license (Pham *et al.*, 2011). Separately, hospitals may face legal counsel and possible settlement costs as a result of medication errors. Hospitals may furthermore need to bear the loss of productivity from the staff involved in the error as well as the increased costs of unplanned prolonged hospitalization and treatment of the affected patients. On the other hand, it may be time-consuming to deal with correcting the medication errors as well as the related investigation, litigation, and settlement (Daniel and Makary, 2016). It was estimated that the annual cost of serious medication errors in American hospitals was \$2.9 million per hospital and that a 17% decrease in incidence would result in a savings amount of \$480,000 per hospital (Daniel and Makary, 2016). Many factors have been reported as causes of medication errors, including personal factors such as a knowledge deficit on the part of the health care provider regarding the patients or a communication failure in the drug order due to bad handwriting, confusion resulting from similar drug names, confusion about metrics and/or dosing units, and the use of unclear or nonstandard abbreviations (Henneman *et al.*, 2010). Institutional factors of medication errors may include a staff shortage, overbearing workload, high stress levels, inadequate team component, instability, and poor leadership behaviors and/or organizational environment (Keers, Williams, Cooke, and Ashcroft, 2013). Drug related

factors including a failure or mistake in the labeling, inadequate drug information, an unavailability of medications, deficient equipment, and prescription quality failure are usually associated with medication errors (Agyemang and While, 2010). Currently, self-reported medication errors provide minimal information to organizations because of the wide discrepancy that exists between actual and reported rates (Mayo and Duncan, 2004). Medication errors are still markedly underreported in hospitals. The reasons for the limited reporting of medication errors in hospitals are numerous and include but are not limited to a fear of penalty and a lack of agreement on one definition of a medication error between nursing staff (Mrayyan and Al - Atiyyat, 2011). At this time, addressing medication errors has become a health priority in the world. In Jordan specifically, different studies have been conducted to date on the subject of medication errors in Jordanian hospitals (Mrayyan and Al - Atiyyat, 2011; Mrayyan *et al.*, 2008; Mrayyan, Shishani, and AL - FAOURI, 2007; Zena Hilal Sulaiman, 2014; Zena H Sulaiman, Hamadi, Obeidat, and Basheti, 2017). However, most of these studies have had limitations in terms of the number of hospitals (e.g., one hospital) or units (e.g., one medical and surgical unit) included. In these prior investigations, it was difficult to determine to what extent the local culture influenced nurses' perceptions about medication errors. The use of nonrandom sampling and small sample sizes raise additional methodological issues. Nurses are considered to be key players in the medication administration process and may cause or report different forms of medication errors. The perception of nurses regarding medication errors has not been well-investigated at this time in Jordanian hospitals; thus, the present study desired to elucidate Jordanian nurses' perceptions about medication errors. The use of a reporting system by nurses in hospitals depends on different factors such as the nurse's ability to recognize that an error has occurred, the nurse's belief that the error warrants reporting, the nurse's belief that they has committed an error, and the nurse's willingness to face the accountability and embarrassment that will occur due to committing a medication error (Kapborg and Svensson, 1999). More specifically, the purpose of the study was to explore nurses' perceptions about medication errors in Jordanian hospitals, including what nurses believe constitutes a medication error, the causes of medication errors, what is reportable, the percentage of reporting, and what barriers to reporting exist. The results of the study may be useful by providing a general picture about current medication errors in critical care settings in Jordan; additionally, the findings will hopefully help to minimize medication errors by increasing nurses' awareness and activating some key concerns at the levels of reporting, surveillance, and policymaking.

## MATERIALS AND METHODOLOGY

**Study design:** This descriptive cross-sectional study sought to describe the perceptions of staff nurses in the critical care settings of different governmental hospitals in Jordan regarding medication errors.

**Sample and setting:** The target population was composed totally of registered critical care nurses working at governmental hospitals in Jordan. The participants specifically were 300 registered nurses chosen from various critical care departments of three governmental hospitals. A cluster random sampling method was used to randomly select three hospitals

out of the 30 governmental hospitals that exist in Jordan. The critical care departments of the sample selected were the emergency room, medical ICU, surgical ICU, pediatric ICU, neonatal ICU, and general ICU. The sample selection inclusion criteria were (1) registered nurses with an experience of more than three months in a critical care setting and (2) willing to participate in the study upon selection.

**Data collection tool:** The Modified Gladstone's scale was used to gather data about medication errors including the causes, perceptions, and reporting of medication errors (Mayo and Duncan, 2004). A modified form was used to gather data about the demographic characteristics of the participants (e.g., age, gender, level of education, experience, and position). The causes of medication errors according to the perceptions of the registered nurses were covered by 10 items rated from 1 to 10, where 1 is the least recurrent and 10 is the most recurrent. On the other hand, the percentage of reported medication errors to the administrators was only assessed using one item. Six clinical scenarios were employed to assess nurses' perceptions about medication errors in term of whether the medication error occurred or not, the physicians should be notified or not, and an incidence report should be completed or not, respectively. Nurses' views about reporting medication errors were assessed using six statements that could be answered by "yes" or "no." The content validity of the instrument was confirmed by the investigators (Mayo and Duncan, 2004). The tool's reliability was checked using the test-retest method in another prior study (0.78) (Osborne, Blais, and Hayes, 1999). This instrument was used previously in Jordan, so the former results supported the validity and reliability of this instrument in the present study (Mrayyan and Al - Atiyyat, 2011; Mrayyan *et al.*, 2007). Permission was obtained to use the modified Gladstone's scale for data collection.

**Data Collection Procedure:** As English is the official language for nursing education, documentation, and communication in clinical areas of Jordanian hospitals, a self-reporting survey was used to gather the required data using the original English instrument without translation (i.e., the modified Gladstone's scale). Institutional review board approval from the Ministry of Health in Jordan was obtained in order to perform the study in the selected governmental hospitals. Participation in the study was voluntary; furthermore, participants were assured that their responses would be kept confidential and only used for research purposes. All ethical considerations inherent in scientific studies were considered in implementing the present study. The study was implemented in the critical care departments and emergency rooms of the selected hospitals. The data collection phase occurred over three months (March 2018 to May 2018). Each registered nurse was given an envelope containing a cover letter and a questionnaire to be placed after completion in a box and collected by the investigator.

### Statistical analysis

The software program used for analysis was the Statistical Package for the Social Sciences version 22 (IBM Corp., Armonk, NY, USA), with an alpha significance level of 0.05. The collected data were tabulated, scored and analyzed. Descriptive (e.g., mean, standard deviation, and frequency) and inferential statistics analyses were carried out involving the data.

## RESULTS

The sample of this study included 300 registered nurses, with more than half of them being female ( $n = 180$ , 60%) and with an age of between 26 years and 35 years (64%). The majority of participating nurses had bachelor's degrees (86.7%), while others had master's degrees. More than two-thirds of the study population sample had more than five years of experience in clinical nursing practice (73%). Almost one-third of the participating nurses participated in a fixed-day shift work system ( $n = 110$ , 36.7%), while a similar proportion of nurses worked via a rotation system. A major portion of the nurses included in the present study were working in critical care departments (73%) versus in the emergency departments (27%). Almost all participating nurses (96.7%) reported that they had been involved in at least one medication error during their clinical nursing practice (Table 1). Most nurses reported that the majority of medication errors occurred during the day shift, followed by the night shift and then the evening shift (43.3%, 33.3%, and 23.3%, respectively).

**Table 1. Demographic characteristics (N = 300)**

Variables	n	%
Gender		
Female	180	60
Male	120	40
Age	27	9
21-25	80	27
26-30	110	37
31-35	50	16
36-40	33	11
41 and above		
Level of education		
Bachelor degree	260	86.7
Master degree	40	13.3
Years of experience in nursing		
Less than 5 years	80	27
More than 5 years	220	73
Working system		
Day	110	36.7
Evening	20	6.7
Night	60	20
Rotating	110	36.7
Primary work setting	220	73
Critical Care Settings	80	27
Emergency unit		
Most frequent shift of errors		
Day	130	43.3
Evening	70	23.3
Night	100	33.3
Number of medication errors over the course of nursing career		
0	10	3.3
1	30	10
2	80	26.7
3	40	13.3
4	10	3.3
5	40	13.3
6	10	3.3
8	30	10
10	20	6.7
15	20	6.7
50	10	3.3

Study findings reveal that 170 out of the 300 nurses (57%) believed that the percentage of medication errors reported to the nurse manager ranges between 51% and 80% of the total number of medication errors committed in the clinical setting. Additionally, the mean of the percentage of medication errors reported to nursing managers was 60.7% (Table 2). Table 3 reflects the nurses' perceptions of medication errors according to six clinical scenarios by indicating whether or not each

situation is considered to be a medication error, should be shared with the physician, and should be reported via an incident report, respectively. By calculating the weighted mean, it was found that 77% of the participating nurses perceived the selected clinical scenarios to be medication errors, with reports regarding the second and third scenarios (delay in medication time and wrong drug dose, respectively) being highest (90%). Additionally, more than two-thirds of nurses believed that the events reflected in the clinical scenarios should be shared with the physician (68%), with the highest rate of such being for the first clinical scenario (77%) (Missed drug dose).

On the other hand, only 57% of the participating nurses held the view that formal incident reports should be written for the events reflected in the clinical scenarios, with the highest degree of support being for the second clinical scenario (delay in medication time). Using the ranked scores from 1 to 10 and from the nurses' point of view, the highest perceived cause of medication errors was the failure of the nurse to cross-check the patient's identification band with the medication administration record ( $X = 6.83$ ). The next perceived cause of medication errors was illegible handwriting of the physician order, followed by exhaustion of the nurses during the service provision in third place.

**Table 2. Estimated Percentage of Medication Errors Reported to Nurse Managers by Incident Reports ( $N = 300$ )**

% of reported medication errors	<i>n</i> (%)
0	0(0%)
1–10	30(10%)
11–20	10(3.3%)
21–30	20(6.7%)
31–40	10(3.3%)
41–50	20(6.7%)
51–60	40(13.3%)
61–70	80(26.7%)
71–80	50(16.7%)
81–90	30(10%)
91–100	10(3.3%)

**Table 3. Clinical Scenarios of Medication Errors for the Whole Sample ( $n = 300$ )**

Clinical scenarios	Drug error		Notify physician		Incident report	
	Yes <i>n</i> (%)	No <i>n</i> (%)	Yes <i>n</i> (%)	No <i>n</i> (%)	Yes <i>n</i> (%)	No <i>n</i> (%)
A patient misses his mid-day dose of oral ampicillin because he was in X-ray for 3 hr.	210(70)	90(30)	230(77)	70(23)	160(53)	140(47)
Four patients on a busy surgical unit receive their 6:00 p.m. doses of IV antibiotics 4 hrs late.	270(90)	30(10)	220(73)	80(27)	190(63)	110(37)
A patient receiving TPN feeding via an infusion pump is given 200 mL/hr instead of the correct rate of 125 mL/hr for the first 3 hr of the 24-hr infusion. The pump was reset to the correct rate after the change of shift at 7:00 a.m. when the oncoming nurse realized that the pump was set at the incorrect rate.	270(90)	30(10)	200(67)	100(33)	180(60)	120(40)
A patient admitted with status asthmaticus on August 13, 1997, at 2:00 a.m. is prescribed Ventolin nebulizers every 4 hr. The nurse omits the 6:00 a.m. dose on August 13, 1997, as the patient is asleep.	210(70)	90(30)	180(60)	120(40)	160(53)	140(47)
A physician orders Percocet 1–2 tabs for post-op pain every 4 hrs. At 4:00 p.m., the patient complains of pain, requests one pill and is medicated. At 6:30 p.m. the patient requests the second pain pill. The nurse administers the pill.	220(73)	80(27)	210(70)	90(30)	160(53)	140(47)
A patient is receiving a routine 9:00 a.m. dose of digoxin every day. Yesterday's digoxin level was 1.8 (the high side of normal). A digoxin level was drawn at 6:00 a.m. today. At 9:00 a.m., the nurse holds the digoxin because the lab value is not available yet.	200(67)	100(33)	190(63)	110(37)	180(60)	120(40)

IV = intravenous; TPN = total parenteral nutrition.

**Table 4. Causes of Medication Errors for the Whole Sample ( $N = 300$ )**

Causes of medication errors	$\bar{X}$	SD
1. Medication labels/packaging are of poor quality or damaged.	5.77	2.47
2. Nurses set up or adjust an infusion device incorrectly.	5.03	2.84
3. Nurses are confused by the different types and functions of infusion devices.	3.97	2.62
4. Nurses fail to check patient's name band with the medication administration record.	6.83	3.49
5. Nurses are distracted by other patients, coworkers or events on the unit.	4.50	3.31
6. Physicians prescribe the wrong dose.	5.37	2.14
7. Nurses are tired and exhausted.	6.40	2.56
8. Physician's writing on the doctor's order form is difficult to read or illegible.	6.43	3.20
9. There is confusion between two medications with similar names.	5.30	2.02
10. Nurses miscalculate the dose.	5.60	2.73

**Table 5. Nurses' Views about Reporting Medication Errors ( $N = 300$ )**

Views about reporting medication errors	Yes <i>n</i> (%)	No <i>n</i> (%)
Nurses failed to report a medication error because they did not think the error was serious to warrant reporting.	250(83)	50(17)
Nurses failed to report a medication error because they were afraid that they might be subject to disciplinary action or even lose their job.	190(63)	110(37)
Nurses usually sure when medication errors should be reported using incident reports.	260(87)	40(13)
Nurses usually sure what constitutes a medication error.	230(77)	70(23)
Nurses did not report medication errors because nurses are afraid of the reaction they will receive from their coworkers.	210(70)	90(30)
Nurses did not report medication errors because nurses are afraid of the reaction they will receive from the nurse manager.	200(67)	100(33)

Conversely, the lowest perceived cause of medication errors was confusion among nurses when using different types and functions of medication infusion devices ( $X = 3.97$ ) (Table 4). Regarding reporting medication errors, the majority of respondents believe that nurses are usually sure when medication errors should be reported using incident reports (87%). Moreover, 77% of them reported that nurses are usually sure of what constitutes a medication error. Beyond this, most nurses indicated that the failure of nurses to report a medication error is the result of them not thinking the error was serious enough to warrant reporting (83%). The next most frequent cause of the failure of nurses to report a medication error, as per respondents' perceptions, was being afraid of the reaction nurses will receive from their coworkers (70%), which was followed by being afraid of the reaction they will receive from the nurse manager (67%). Only 63% of the respondents attributed the failure of nurses to report a medication error to the possibility of receiving disciplinary action or even losing their job (Table 5). The correlations between nurses' perceptions about medication errors using clinical scenarios and the demographic characteristics (e.g., gender, age, experience, educational level, and working unit) were studied. The results revealed no significant difference in nurses' perceptions in relation to their sociodemographic characteristics.

## DISCUSSION

Females constituted more than half of the participating nurse population in the study, and this is congruent with the results of some studies implemented in Jordan in this regard (Mrayyan and Al - Atiyyat, 2011; Mrayyan *et al.*, 2008). Additionally, it's also consistent with the statistics of the Ministry of Health in Jordan, which indicated that the female gender is the dominant gender in the nursing profession in the governmental hospitals of the Hashemite kingdom of Jordan. However, this proportion is in contradiction with the results of a similar study conducted in Addis Ababa, which reported that more than half of the participants were males (Jember, Hailu, Messele, Demeke, and Hassen, 2018). The majority of participating nurses were bachelor's degree holders, which reflects the minimum level of education required for nurses to work in the emergency rooms and ICUs of Jordanian hospitals. Separately, the clinical nursing experience of the participants was appropriate, as the experience of more than two-thirds of them exceeded five years. The factor of nursing experience has a significant effect on the medication administration process in hospitals, as a lower incidence of medication errors has been attributed to increasing nursing levels of experience (with the trend beginning at five years or more) (Zena Hilal Sulaiman, 2014). The fact of a high number of participants reporting that they had been involved in at least one medication error during their clinical practice reflects the fact that medication errors are almost inevitable and common in various forms in the clinical setting, even if not reported properly; therefore, cooperation and collaboration to minimize medication errors is of a high importance in clinical practice. Regarding the timing of medication errors, most of the participants believe that the majority of medication errors occur during the day shift. This perception is probably due to the monitoring and over-reporting or the increased work load present during the day shift. In a six-month monitoring study conducted in Jordan, it was reported that the rate of errors detected during the morning shift was as high as 12.6% of the total nursing medication handling practices (Zena H Sulaiman *et al.*, 2017). In the

current study, the mean of the percentage of drug errors reported to nurse managers using incident reports was as high as 60.7%, which is relatively higher than the percentages reported in any previous study (Mayo and Duncan, 2004; Mrayyan and Al - Atiyyat, 2011; Mrayyan *et al.*, 2008; Mrayyan *et al.*, 2007; Zena H Sulaiman *et al.*, 2017; Unver, Tastan and Akbayrak, 2012). Regarding the analysis of the clinical scenarios, although all medication handling scenarios presented to the participants reflected medication errors that require informing physicians and they should be reported formally via incident reports, the results of the study indicated that most of the participants recognized the scenarios as medication errors, but a lesser percentage of the participants thought that physicians should be informed about them and an even smaller percentage of the participants believed that the events should be reported formally using incident reports. As compared with other Jordanian studies, a study by Mrayyan found that most of respondents believed that physicians should be informed about the events mentioned in the scenarios, while a lesser proportion of the participants perceived the scenarios as medication errors and the smallest percentage of them indicated the need to complete incident reports (72%, 60%, and 44%, respectively) (Mrayyan, 2012).

Most nurses in the current study considered an inaccurate Total Parenteral Nutrition rate and the giving of intravenous antibiotics four hours late to be medication errors. On the other hand, the least percentage of nurses considered that holding digoxin dose because of late laboratory results, missing the mid-day dose of oral ampicillin for a patient in X-ray, and omitting Ventolindose as the patient was asleep as being medication errors. These findings were congruent with the results of similar studies (Mayo and Duncan, 2004; Mrayyan, 2012). The medication errors may be affected by factors related to situations like the patients being asleep or in the X-ray department at the same time of the scheduled drug dose or there being a delay in the laboratory results that determine the drug dose; so these medication errors can be said to be related to the healthcare organizational system more than actual nurses' performance as per participants' perceptions. The major cause of medication errors in this study was the nurse failing to check the patient's name band against their medication administration record; notably, this finding was consistent with most of the worldwide drug-related error results. Checking patients' identification bands is becoming a patient safety goal, and identification bands are becoming one of the main identifier of patients, especially during medication administering. Moreover, the use of a technology like an electronic or computerized system to check the identity of patients is recommended to minimize human-associated errors (Mrayyan and Al - Atiyyat, 2011). Electronic medical records and using computerized medications orders is recommended to decrease medication errors associated with illegible physicians handwriting (O'malley, Grossman, Cohen, Kemper, and Pham, 2010). According to the current study, illegible physicians' handwriting constitutes the second largest perceived cause of medication errors. Additionally, increasing the number of nurses and decreasing the nurses' workload in the critical care units is of a vast importance to reduce medication errors related to exhaustion and work overload (BRADY, MALONE, and Fleming, 2009), which is the third highest perceived cause of medication errors. Regarding medication error reporting, a high proportion of the participants pointed out that they are usually sure what constitutes a medication error. Besides, most nurses reported that they are typically certain as to when they

need to write an incident report for a medication error. On the other hand, when comparing these findings with nurses' responses regarding the medication error scenarios and the need to write an incident report, there was a contradiction, as the real overall responses of the nurses on the medication handling scenarios indicated a significantly fewer percentage of nurses identifying medication errors (77%) and believing the necessity of writing incident reports (57%). However, these differences may be related to the disagreement on one definition of medication errors and the multiple forms and various types of medication errors in the clinical setting (Gatasheh, 2017; Mayo and Duncan, 2004; Unver *et al.*, 2012). The belief of Jordanian nurses that some medication errors were not serious enough to warrant reporting was the main cause behind the underreporting of medication errors as per nurses' perceptions; another cause was their fear of the reaction of their coworkers and/or nursing managers for reported medication errors. This finding was partially supported by the results of an American study that found that the underreporting of medication errors by nurses was due to their fear of the nursing manager's reaction, followed by their worry about their coworkers' reactions, and then their belief that the medication error was not serious enough to warrant reporting (Mayo and Duncan, 2004). Additionally, similar findings of perceived underreporting causes were found in studies implemented involving Jordanian nurses (Mrayyan, 2012; Mrayyan *et al.*, 2008).

**Implications:** All healthcare professionals should cooperate and work to minimize the incidence of medication errors. Decreasing medication errors will not happen suddenly—it is a process that requires effort, time, and the establishment of clear policies. Conversation between the staff and nurse managers about medication errors should be encouraged and continued to avoid the underreporting of medication errors by nurses due to their worry about their managers' reactions. Reporting medication errors should be perceived as an opportunity for improvement and lesson-learning rather than for punishment and penalty. In the same vein, using no punitive strategies of reporting medication errors should be promoted and encouraged by hospital management to increase transparency in communication (Mrayyan, 2012; Mrayyan and Al - Atiyyat, 2011; Mrayyan *et al.*, 2008). As another preventive strategy, special extensive educational courses in pharmacology about handling medications should be integrated in the education system for all nurses at the undergraduate and graduate levels (Members of EMERGE *et al.*, 2009); Moreover, including proper medication handling in nursing orientation program at hospitals will have a great effect on reducing medication errors during clinical nursing practice (BRADY *et al.*, 2009). The shortage of nurses at the critical care departments may play a crucial role that definitely will affect the number of medication errors in Jordanian hospitals. To illustrate, nurses who work with a large number of patients with different acuity levels will be more prone to make medication errors under stressful conditions (Gatasheh, 2017).

**Recommendations:** Not all causes of medication errors are well-elucidated; a longitudinal study is recommended to better explore the concept of medication errors in-depth. Furthermore, other healthcare professionals and the complexity of patients' disease should be included in future studies to understand the effect of such factors on medication errors. Qualitative studies could be utilized to identify the reasons behind the high rate of medication errors in critical care

settings, especially in the morning shifts, and to overcome these reasons for medication errors. There is a need to monitor nurses during their clinical practice and observe drugs' handling in order to identify their performance and compare their perceptions regarding medication errors with their daily clinical practice.

## Conclusion

The purpose of this study was to explore nurses' perceptions about medication errors in Jordanian hospitals. As the rate of medication errors reported has increased over the years, strategies to reduce medication errors are mandated. All health professionals should work together to promote safety measurements that ensure safe medication administration and management. Medication errors should be recognized as an opportunity for improvement instead of penalty. Medication errors indicate a defect in the healthcare system of the hospital, so focusing on reasons related to system failure is more important than focusing on reasons related to individuals' errors.

**Conflict of Interest:** The authors declare that there are no conflicts of interest to report pertaining to this research.

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