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ORIGINAL RESEARCH

Medication Administration Error Perceptions Among Critical Care Nurses: A Cross-Sectional, Descriptive Study

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Purpose: This study aimed to investigate the medication administration error perceptions among Jordanian critical care nurses.

Methods: A cross-sectional, descriptive design was used among Jordanian critical care nurses. The total number of completed questionnaires submitted for analysis was 340. Data were collected between July and August 2022 in two health sectors (governmental hospitals and educational hospital) in the middle and north region in Jordan through a self-administered questionnaire on medication administration errors which includes 65 items with three parts.

Results: Nurses showed negative perceptions toward medication administration errors. The majority of participants agreed that "The packaging of many medications is similar" (76.7%), followed by "different medications look alike" (76.2%), as the main reasons for medication error occurrence. Two thirds of participants agreed that "when med errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error" (74.1%). Similarly, 73.5% of them believed nurses were blamed if something happens to the patient as a result of the medication error was the main reason for underreporting of MAEs. The highest reported levels of medication errors were in a range between 41% and 70%, for both types intravenous (IV) medication errors and non-intravenous (non-IV) medication errors.

Conclusion: Implement interventions centered on MAEs in particular among critical care nurses, owing to the proven significance of it in foretelling their crucial role in delivering safe care to patients, which will lead to quantifiable returns on both patient outcomes and nurse health, as well as the overall efficiency and image of the organization.

Keywords: medication administration errors, critical care nurses, perceptions, underreporting

Introduction

The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP) define medication administration errors (MAEs) as any preventable incident that may induce or inevitably lead to unsuitable medication use or patient injury while the medication is under the control of the healthcare professional and patient.[1] MAEs can increase the burden of care, cost of care, and length of stay of patients.[2] In 2017, the World Health Organization launched the Third Global Patient Safety Challenge (Medication without harm) which aims to decrease medication-related injury over the next five years.[3]

MAEs are a global challenge with 5% being fatal, and about 50% preventable in a routine clinical environment.[4] It has been discovered that 19% of MAEs in the intensive care unit (ICU) are life-threatening, and 42% are significant enough or clinically significant to justify extra life-sustaining treatment.[5] Furthermore, critically ill patients vary from the majority of hospital patients in that they have limited capacity to participate in their medical care and lack the physiological reserves to withstand further harm.[6] According to data, MAEs are the most common type of error,

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accounting for 78% of severe medical errors in the ICU.[7] Furthermore, the annual cost of managing patients with medication-related errors surpasses $40 billion.[8] MAEs, in agreement, lengthen hospitalizations by two days and raise expenditures by $2000–$2500 for each patient.[1]

Medication errors can occur in any parts of the medication process: during prescribing, preparing, or administering and dispensing.[9] The administration phase of the medication process revealed the most frequent occurrence of medication errors that were administered by nurses.[1,10] Several frequent types of MAEs include omission of doses, wrong route, wrong dose, lack of documentation, wrong time, wrong patient, wrong drug, and technical errors.[5]

Nurses, as members of multidisciplinary teams, play an important role in providing care in ICUs, where the treatment they deliver is often more complicated than that delivered in a different place in the hospital.[11,12] Working in a field that requires so much multitasking, as well as a heavy workload and the need to provide specialized care to seriously ill and dependent patients, can be intimidating for nurses.[11,13,14]

Despite increased global attention on this topic, the number of medication errors has not dropped considerably.[15] Personal variables,[16] institutional factors,[17] drug-related variables and unclear pharmacological information,[8,18] heavy workload, preparing the medication without double verifying,[19] and shortage of nurses and a deficiency of pharmacological knowledge[20–23] have all been identified as potential causes of MAEs. Addressing correct reporting practices of MAEs, and recognizing factors that contribute to the underreporting of MAEs, may assist to decrease the occurrence of MAEs and raise the reported error percentage. Therefore, this study aimed to investigate the MAEs among Jordanian critical care nurses.

Method

Research Design

A cross-sectional, descriptive design was used in the investigation.

Study Population and Sampling

The convenience sampling method was used to select the hospitals in the two health sectors (governmental hospitals and educational hospital) in the middle and north region in Jordan. The sample size was calculated using the G*Power 3.1.10 program.[24] Using a regression test, the minimal required sample size was 178 (power = 0.95, $\alpha = 0.05$, and medium effect size = 0.11 with 11 predictors). The inclusion criteria included the critical care unit (CCU) and at least one year of experience. The nurses who worked in the general department and trainees were excluded. The total nurses of the CCU were 400. A total of 366 out of 400 questionnaires were received with a response rate of 91.5%. The missing data and questionnaires not completely filled were excluded from analysis. The total questionnaires submitted for analysis was 340.

Instruments

Demographic data included participant's age, educational level, experience in CCU in years, and shift work and shift-work hours. To examine the critical care nurses' perception of MAEs, the researcher used the MAE self-reported questionnaire developed by Wakefield et al.[25] It includes 65 items with three parts; the first part comprises 29 items related to reasons for MAE occurrence, and the second part comprises 16 items related to underreporting of medication administration errors. A five-point Likert-type scale with fixed values ranging from 5 = strongly agree to 1 = strongly disagree was used to examine the perception of respondents of MAEs. The third part comprised 20 items related to the percentage of each type of medication error; non-intravenous (non-IV) medication errors 9 items, and intravenous (IV) medication errors 11 items. The estimated percentage of errors reported was represented by the frequencies for each percent increment. The pilot study was chosen from among the enrolled nurses working in critical care units (N = 40) to test the functionality of the forms. All questions were clear, simple, and understandable, according to the results. The pilot study was excluded from the main data.

In this study, the reliability of the subscales, reasons for MAE occurrence, underreporting of MAEs, percentage of non-IV MAEs, and percentage of IV MAEs scales were 0.957, 0.927, 0.925, and 0.955 respectively.

Data Collection

Data were collected through a self-administered questionnaire between July and August 2022. During data collection, each participant received a copy of the informed consent and questionnaire. Researchers avoided the periods when nurses were providing treatment and care to patients, to avoid stressing participants that could affect the proficiency of the data collection process. In addition, the optimal time to complete a questionnaire was 10–15 minutes. The principal researcher met the nursing director and participants to explain to them the purpose of the study and guaranteed them that the study was secret and availability to withdraw without any direct or indirect harm. The researcher took the responsibility to collect these data for privacy issues through reading literally the statements in the surveys without any additional explanations or delineation. All data were saved in the personal computer of the primary researcher.

Ethics Committee

Prior to data collection, ethical approval was gained from the faculty of nursing in Al-Zaytoonah University of Jordan and the ethical board to the target institutions with number 2022–2021\380103. Informed consent was obtained from the study participants. In this study, guidelines outlined in the declaration of Helsinki were followed.

Data Analysis

First, data cleaning and investigation were carried out to look for missing values and incorrect data entry. The descriptive and inferential statistics were used in the current study's statistical analysis. The descriptive analysis displays the mean, standard deviation, frequency distribution, and percentages. Logistic regression analysis was performed to identify significant factors associated with the reason for MAE, underreport of MAE, percentage of non-IV MAE, and percentage of IV MAE. *P*-values of less than 0.5 were considered significant.

Results

Table 1 shows the descriptive characteristics of the participants. Amongst the study participants, 42.9% (n = 146) were male and 57.1% (n = 194) were female and the mean age of the participants was 32.8 (SD = 6.92). The majority of the

Table 1 Participants' Sociodemographic Characteristics

Variables	N (%)	Mean (SD)
Gender		
Male	146 (42.9)	
Female	194 (57.1)	
Age (years)		32.8 (6.92)
Marital status		
Single	76 (22.4)	
Married	251 (73.8)	
Divorced	13 (3.8)	
Educational level		
Bachelors	292 (85.9)	
Postgraduate	48 (14.1)	
Experience in ICU (years)		7.0 (5.63)
Work shift		
Yes	291 (85.6)	
No	49 (14.4)	
Work shift hours		
8 hours	216 (63.5)	
12 hours	123 (36.5)	

participants (73.8%, n = 251) were married. The mean years of experience in the ICU was 7.0 respectively. Furthermore, the majority of the participants (63.5%, n = 216) worked an 8-hour shift.

The results in Table 2 show that nurses responded negatively to the medication administration error perceptions. The mean of reason for ME (4.10) was slightly lower than the mean of underreport ME (4.12). The mean of estimated percentage for non-IV ME (42.75) was slightly higher than the mean of estimated percentage for IV ME (41.35). Furthermore, the Cronbach's alpha of the subscales ranged from 0.925 to 0.957.

The highest frequencies were sum agree and total agree. The majority of participants agreed that "The packaging of many medications is similar" (76.7%), followed by "different medications look alike" (76.2%), as the main reasons for medication error. Then followed "Physicians change orders frequently" (75.8%), "Unit staff do not receive enough in-services on new medications" (75%), "Unit staffing levels are inadequate" (74.4%), "More than half of participants believed that errors are made in the Medication Kardex" (60.5%), "Nurse is unaware of a known allergy" (59.0%), and "Pharmacy does not label the med correctly" (57.4%) (Table 3).

Table 2 Level of Perceptions of Medication Administration Error Among Jordanian Critical Care Nurses

Medication Error (ME)	Mean (SD)	Subscale Cronbach's Alpha
Reasons	4.10 (1.07)	0.957
Report	4.12 (1.10)	0.927
Estimated percentage non-IV	42.75 (18.24)	0.925
Estimated percentage IV	41.35 (18.54)	0.955

Table 3 Reasons for Medication Error Occurrence

Statements	N	%
The names of many medications are similar	239	(70.3%)
Different medications look alike	259	(76.2%)
The packaging of many medications is similar	261	(76.7%)
Physicians' medication orders are not legible	228	(67.1%)
Physicians' medication orders are not clear	223	(65.7%)
Physicians change orders frequently	258	(75.8%)
Abbreviations are used instead of writing the orders out completely	250	(73.5%)
Verbal orders are used instead of written orders	246	(72.3%)
Pharmacy delivers incorrect doses to this unit	208	(61.1%)
Pharmacy does not prepare the med correctly	217	(63.8%)
Pharmacy does not label the med correctly	195	(57.4%)
Pharmacists are not available 24 hours a day	204	(60%)
Frequent substitution of drugs (ie, cheaper generic for brandnames)	225	(66.2%)
Poor communication between nurses and physicians	215	(63.2%)

(*Continued*)

Table 3 (Continued).

Statements	N	%
Many patients are on the same or similar medications	255	(74.9%
Unit staff do not receive enough in-services on new medications	255	(75%)
On this unit, there is no easy way to look up information on medications	248	(72.9%)
Nurses on this unit have limited knowledge about medications	219	(64.4%)
Nurses get pulled between teams and from other units	235	(69.1%)
When scheduled medications are delayed, nurses do not communicate the time when the next dose is due	224	(65.8%)
Nurses on this unit do not adhere to the approved medication administration procedure	207	(60.8%)
Nurses are interrupted while administering medications to perform other duties	239	(70.3%)
Unit staffing levels are inadequate	252	(74.4%)
All medications for one team of patients cannot be passed within an accepted time frame	243	(71.5%)
Medication orders are not transcribed to the Kardex correctly	215	(63.3%)
Errors are made in the Medication Kardex	206	(60.5%)
Equipment malfunctions or is not set correctly (eg, IV pump)	217	(63.9%)
Nurse is unaware of a known allergy	201	(59.0%)
Patients are off the ward for other care	206	(60.5%)

The highest frequencies were sum agree and total agree. Two thirds of participants agreed that "when med errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error" (74.1%). Similarly, 73.5% of them "believed nurses blamed if something happens to the patient as a result of the medication error" was the main reason for underreporting of MAEs. Followed by "Believed that other nurses will think they are incompetent if they make medication errors" (72.3%). Among the respondents, "nurses do not agree with hospital's definition of a medication error" (60.2%) and "The expectation that medications be given exactly as ordered is unrealistic" (61.1%) (Table 4).

Table 4 Underreporting of Medication Administration Errors

Statements	N	%
Nurses do not agree with hospital's definition of a medication error	205	(60.2%)
Nurses do not recognize an error occurred	215	(63.1%)
Filling out an incident report for a medication error takes too much time	212	(62.3%)
Contacting the physician about a medication error takes too much time	215	(63.3%)
Medication error is not clearly defined	224	(65.9%)
Nurses may not think the error is important enough to be reported	231	(67.8%)
Nurses believe that other nurses will think they are incompetent if they make medication errors	246	(72.3%)
The patient or family might develop a negative attitude toward the nurse, or may sue the nurse if a medication error is reported	226	(66.3%)

(*Continued*)

Table 4 (Continued).

Statements	N	%
The expectation that medications be given exactly as ordered is unrealistic	208	(61.1%)
Nurses are afraid the physician will reprimand them for the medication error	203	(64.9%)
Nurses fear adverse consequences from reporting medication errors	248	(72.9%)
The response by nursing administration does not match the severity of the error	235	(69.2%)
Nurses could be blamed if something happens to the patient as a result of the medication error	250	(73.5%)
No positive feedback is given for passing medications correctly	243	(71.4%)
Too much emphasis is placed on med errors as a measure of the quality of nursing care provided	251	(72.8%)
When med errors occur, nursing administration focuses on the individual rather than looking at the systems as a potential cause of the error	252	(74.1%)

Table 5 shows the percentage reported in medication errors for both types. The highest percentage reported level of medication errors were in a range between 41% and 70% for both types. For non-IV medication errors, "Medication is omitted" was the highest frequency reported (N = 181). Followed by "Given to patient with a known allergy" (N = 175), "wrong time of administration" (N = 174). For IV errors, the highest frequency was reported in the item "wrong rate of administration" (N = 194), followed by "wrong method of administration" (N = 179) and "wrong time of administration" (N = 178). The lowest

Table 5 Percentage Reported of IV Errors and Non-IV Medication Errors

Percentage Reported			
Types of Non-IV Medication Errors	**0–40%**	**41–70%**	**71% and Above**
Wrong route of administration	128	123	89
Wrong time of administration	115	174	51
Wrong patient	133	169	38
Wrong dose	130	165	45
Wrong drug	134	169	37
Medication is omitted	107	181	52
Medication is given, but has not been ordered by the physician	140	154	46
Medication administered after the order to discontinue has been written.	134	161	45
Given to patient with a known allergy	122	175	43
Types of IV Errors			
Wrong method of administration	123	179	38
Wrong time of administration	125	178	37
Wrong patient	141	168	31
Wrong dose	141	165	34

(*Continued*)

Table 5 (Continued).

Percentage Reported			
Types of IV Errors			
Wrong drug	128	173	34
Medication is omitted	132	176	32
Medication is given, but has not been ordered by the physician	134	170	36
Medication administered after the order to discontinue has been written	131	163	46
Given to patient with a known allergy	136	166	38
Wrong fluid	130	173	37
Wrong rate of administration	121	194	25

Table 6 Assessment of Factors Affecting Nurses' MAE Reporting Score

Variables	**COR (95% CI)**	***P***	**AOR (95% CI)**	***P***
Gender Male Female	 1.31 (0.83, 2.06) 1	 0.242		
Age (years)	0.99 (0.96, 1.03)	0.762		
Educational level Bachelors Masters	 0.96 (0.34, 2.66) 0.64 (0.18, 2.29)	 0.930 0.491		
Experience in CCU (years)	1.05 (1.01, 1.09)	0.020	1.05 (1.01, 1.10)	0.026
Work shift Yes No	 1.47 (0.75, 2.90) 1	 0.264		
Work shift hours 8 hours 12 hours	 1.61 (0.90, 2.89) 10.74 (4.32, 26.67)	 0.111 <0.001	 −1.68 (0.93, 3.05) 11.25 (4.44, 28.50)	 0.087 <0.001

percentage reported levels of medication errors were 71% or above for both types. For non-IV medication errors, "wrong patient" (N = 38) and "wrong drug" (N = 37). For IV errors, "wrong rate of administration" (N = 25).

Table 6 for the logistic regression analysis shows predictors of medication administration errors. For 1 year increased experience in the CCU the estimated percentage of non-IV ME will increase by 5% (AOR = 1.05, $P = 0.026$). For working shift hours: those with the 8-hour shift were 68% more likely to have high estimated percentage of non-IV ME than others (AOR = 1.68, $P = 0.087$); and those with the 12-hour shift were 11.3 times more likely to have high estimated percentage of non-IV ME than others (AOR = 11.25, $P < 0.001$).

Discussion

In the current study, participants demonstrated negative perception toward medication error reporting; these findings disagreed with a national study conducted among Jordanian nurses to evaluate their behaviour toward medication errors in which the nurses showed positive perception.[26] Also, in Saudi Arabia nurses reported positive perception in medication error,[27] and in the United States nurses reported positive perception in medication error.[28,29] Participants' negative perceptions confirm that nursing schools are the suitable place to increase awareness and behavior in terms of

medication error attitudes before graduation and the shifting in clinical practice necessary to improve nurses' decision-making skills.[30] In addition, they confirm that the hospital should offer special courses to nurses to enhance their perception of medication error and how to deal with the error and reduce the number of needle stick injuries.[31]

According to nurses, inadequate unit staffing, medications looking alike, and lack of in-services were the main reasons for underreporting of MAEs. Our finding was in agreement with other studies.[26,30] This result might be due to inefficient institutional regulations. Reporting adverse events is necessary for boosting patient safety through discovering mistakes and becoming the key element of patient safety.[32] Providing in-service education is important for medication errors decreasing and infection control that allows the nurses to adapt with recent guidelines of medication, and new administration techniques.[33,34]

The current findings demonstrated that estimated percentage medication errors were in a range between 41% and 70% for both types IV ME and non-IV ME. These findings are lower than those reported (73.43% and 80%) for the Iranian critical care nurses reporting the occurrence of medication errors.[8,19] However, the current results are parallel with those reported by Ehsani et al, who found that 46.8% of emergency department nurses reported the occurrence of medication errors during the past year, which is nearly similar to the current study's results.[20] Additionally, another study by Agalu et al found that Ethiopian critical care nurses report 51.8% levels of medication errors.[35] Further, our findings support the previous findings reported by Al-Shara, who found that the highest level of medication errors was 48.4% among Jordanian nurses which is relatively near to our findings.[36] Medication administration is nursing practice and has been promoted by experience. When experienced nurses can earn more knowledge and enhance their skills on medication administration practice it may contribute to the quality of nursing care improvement and reduce MAEs.[37–39]

The logistic regression analysis shows that only working shift hours was considered an important predictor of medication administration errors. Similar to our study findings[40]. Besides, Di Muzio et al identified that stress, fatigue, increased workload, night shifts, nurse staffing ratio, and workflow interruptions are significant predictors of MAEs, which are deemed particularly parallel to our findings in agreeing the working shift hours as a significant predictor.[41] Additionally, our findings are on the contrary to Shahrokhi et al, who concluded that the nurse's inadequate attention, the errors occurring in the transfer of medication orders from the patient's file to Kardex, and the ward's heavy workload were significant predictors of MAEs.[42]

Limitations

Some limitations were faced in this study. For example, because this was a cross-sectional study, the variables were only studied for a brief time; hence, the responses were mostly based on the participants' judgments of MEs only at the time of data collection, which may have contributed to selection bias. This study's generalizability is restricted because the sample was not chosen randomly and was chosen from a particular department. Moreover, because the study was cross-sectional, it was not possible to make conclusions regarding cause-and-effect correlations. Furthermore, researchers appeared to have some sample selection constraints since the sample only included critical care nurses; as a result, researchers may have overlooked a large number of other nurses, contributing to sampling bias.

Conclusion

Nurses showed negative perceptions toward medication administration errors. The main reasons for medication error occurrence were that packaging of many medications is similar and different medications look alike. The underreporting of MAEs were blamed and fear of adverse consequences. Implement interventions centered on MEs in particular among CCU nurses, owing to the proven significance of it in foretelling their crucial role in delivering safe care to patients, which will lead to quantifiable returns on both patient outcomes and nurse health, as well as the overall efficiency and image of the organization. Establishing a responsible department for reacting to nursing issues and errors, and establishing a punishment-free environment will boost the nurse's willingness to report errors.

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Disclosure

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