

Medication Errors and Its Contributing Factors in Intensive Care Units

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Abstract

Background: Medication errors (MEs) can have a variety of different effects; they can lead to higher patient mortality and morbidity, longer hospital stays, and higher financial demands. These mistakes reduce the patients' pleasure and trust in the healthcare system, and they can be psychologically painful for the nurse who made them. **Objectives:** This study aimed to: (1) determine MEs and their contributing factors; (2) find out the association between MEs and contributing factors; (3) investigate the relationship between ME with regards to the nurse's socio-demographic characteristics such as age groups, gender, and marital status. **Materials and Methods:** A descriptive cross-sectional study was conducted in Hilla City. The study sample, consisting of 150 nurses working in critical care units, was selected according to the non-probability sampling approach as a convenience sample. The validity of the questionnaire was verified by experts, and its reliability was verified through a pilot study. The reliability testing as Cronbach's α was as follows: the most common kind of ME was 0.90, and contributory factors had an Cronbach's α coefficient of 0.81, which is statistically acceptable. Data were collected through the self-report and analyzed by applying descriptive and inferential statistical analysis. **Results:** The results showed that the wrong was the most common ME reported by the nurses, with 20% always, 59% sometimes, and a mean of 1.99 of the surveyed nurses agreeing that this error is frequently done. And the main contributing factor is workload, with 23.3% strongly agreeing, 48.7% agreeing, and a mean of 2.91. Consent means that these factors lead to MEs. The correlation indicates a significant relationship between ME and its contributing factors at $P = 0.000$. The results show that there are significant differences between sociodemographic data (gender, working hours, and working shift) and MEs. **Conclusions:** According to the nurses' perception of MEs, the most prevalent form is inappropriate time of medicine administration. Less frequently occurring types of MEs include wrong rate (too fast or too slow) and wrong concentration. Workload and the inability to read instructions due to the doctor's poor handwriting were the leading factors in medication administrations.

Keywords: Contributing factors, critical care nurses, medication errors

INTRODUCTION

Patient safety and high-quality care are essential components of efficient healthcare systems and the main goals of all healthcare professionals. Care that meets the unique requirements of patients improves patient safety, which raises the standard of care. The safety of medication administration (MAE) is seen as a major sign of healthcare quality among all patient centered requirements.^[1] One of the most significant elements that could endanger a patient's safety is a medication error (ME). MEs are the second most prevalent danger to patient safety, according to the World Health Organization.^[2] Owing to the high level of complexity of care, frequent use of high-risk medications, and patients' altered end-organ

function, which can affect the pharmacokinetics and pharmacodynamics of a drug. Patients admitted to the intensive care units (ICU) are more susceptible to MEs than patients in the other units.^[3,4] In critically ill ICU patients, the incidence of MEs is linked to an elevated risk of a number of negative outcomes. According to prior research, the ICU has a ME prevalence of between 9.4% and 73.43%.^[3,5,6] Additionally, it has been discovered that

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78% of all serious medical errors in the ICU are attributable to MEs.^[7] MEs are any patient safety incidents (PSIs) that occur during the prescription, preparation, dispensing, administration, monitoring, or advice-giving phases of the medication process. Any unintended or unanticipated event that could have or actually did cause harm to one or more patients getting medical care is referred to as a PSI.^[8]

Globally, unsafe drug practices are the main factors in patient damage. A vital step is the administration of medications to patients, as a mistake at this point could directly hurt a patient and have a significant negative effect on the staff member administering the medication.^[9] Different health care personnel may make MEs; doctors typically make them during the prescribing phase, whereas nurses more frequently do so during the administration phase.^[10] The most frequent drug errors that can harm patients, staff members, and facilities are those involving MAEs. The nurse can devote up to 40% of their time on dispensing medicines, which is their primary responsibility.^[11] MEs are also influenced by physical and environmental variables, such as a lack of medical equipment and space for making, storing, and documenting drugs.

Other factors that are connected to MAEs include the lack of privacy in nurses' work areas, which led to interruptions of medical staff by patients, family, visitors, and phone calls during the preparation and administration of medications were significantly impacted by poor communication between nurses and other healthcare professionals, including doctors and pharmacists.^[12] To reduce errors from the beginning of the medicine administration process to the moment of administration, nurses must be supported. Telephone calls, patients, or other staff members should not be made when nurses are administering medication. Encourage them to complete the necessary drug administration procedures, including the medication administration record and the correct identification procedure.^[13]

MATERIALS AND METHODS

The descriptive correlational study design technique was carried out in Babylon Province/Iraq during the period from October 1, 2022 to March 29, 2023. Sample of the study included all nurses who are work in critical care Units. sample is selected according to non-probability

Table 1: Socio-demographic characteristics

Demographic variables	Rating	N = 150	%
Age/years	20-29 years old	132	88.0
	30-39 years old	13	8.7
	40-49 years old	3	2.0
	50 and older	2	1.3
	Total	150	100.0
Gender	Male	69	46.0
	Female	81	54.0
	Total	150	100.0
Marital status	Single	82	54.7
	Married	64	42.7
	Divorced	2	1.3
	Widowed	2	1.3
	Total	150	100.0
Level of education	Trained nurse	13	8.7
	Diploma in nursing	51	34.0
	Bachelor in nursing	86	57.3
	Total	150	100.0
Years of experience	<5	115	76.7
	5-10	26	17.3
	>10	9	6.0
	Total	150	100.0
Working hours	Less than 8 h	79	52.7
	More than 8 h	71	47.3
	Total	150	100.0
Working shift	Morning shift	79	52.7
	Evening	71	47.3
	Total	150	100.0
Place of work	RCU	107	71.3
	CCU	43	28.7
	Total	150	100.0

RCU, respiratory care unit; CCU, cardiac care unit

Table 2: Type of common medication errors perceived by nurses

No.	Items	Always		Some times		Never		Mean \pm SD	Rank
		F	%	F	%	F	%		
1	Wrong time	30	20.0	89	59.3	31	20.7	1.99 \pm 0.640	1
2	Omission dose	9	6.0	49	32.7	92	61.3	1.45 \pm 0.609	5
3	Wrong rate	21	14.0	62	41.3	67	44.7	1.68 \pm 0.698	2
4	Wrong does	7	4.7	43	28.7	100	66.7	1.38 \pm 0.575	6
5	Wrong number of doses	6	4.0	40	26.7	103	68.7	1.37 \pm 0.586	7
6	Wrong concentration	17	11.3	66	44.0	67	44.7	1.67 \pm 0.672	3
7	Wrong medication	7	4.7	19	12.7	124	82.7	1.22 \pm 0.516	10
8	Wrong rout	8	5.3	27	18.0	115	76.7	1.30 \pm 0.576	8
9	Wrong patient	10	6.7	24	16.0	116	77.3	1.29 \pm 0.586	9
10	Prescribed the wrong medication	14	9.3	64	42.7	72	48.0	1.63 \pm 0.661	4

Table 3: Contributing factors of medication errors by overall domains

Factors	Level	No.	%	M (\pm SD)
Factors related to poor communication due to writing	Disagree	0	0	2.64 \pm 0.482
	Slightly agree	54	36.0	
	Agree	96	64.0	
	Total	150	100.0	
Factors related to the hospital	Disagree	0	0	2.68 \pm 0.468
	Slightly agree	48	32.0	
	Agree	102	68.0	
	Total	150	100.0	
Factors related to nurses	Disagree	0	0	2.51 \pm 0.501
	Slightly agree	73	48.7	
	Agree	77	51.3	
	Total	150	100.0	
Factors related to doctors	Disagree	0	0	2.52 \pm 0.501
	Slightly agree	72	48.0	
	Agree	78	52.0	
	Total	150	100.0	
Factors related to the pharmacy	Disagree	0	0	2.51 \pm 0.502
	Slightly agree	74	49.3	
	Agree	76	50.7	
	Total	150	100.0	
Factors related to the work environment	Disagree	0	0	2.59 \pm 0.494
	Slightly agree	62	41.3	
	Agree	88	58.7	
	Total	150	100.0	

sampling approach purposive sample with a total of (150) nurse who are in Hilla teaching hospital, Marjan Teaching Hospital and Imam Al-Sadiq Teaching Hospital in Babylon Province. This study instruments adopted^[13] after modification to make it suitable for intensive care units healthcare providers includes.

Part one: included nurses' socio-demographic characteristics includes eight items "age, gender, marital status, level of education, years of experience, working hours, working shift, place of work,"

Part two: nurses were asked to categorize the frequency of the different forms of ME. Each ME was given a set of 10 items, and nurses were asked to categorize each ME

according to how frequently it occurred, ranging from frequently to not at all.

Part three: the topic of discussion was about the factors of ME. A Likert scale was once more employed to categorize the nurses' perceptions of each element, from strongly agree to strongly disagree. It includes six domains to assess the contributing factors including the following: factors related to poor communication due to writing, factors related to the hospital, factors related to nurses, factors related to doctors, factors related to the pharmacy, and factors related to the work environment. Cronbach's α coefficient of MEs was 0.90, and contributory factors had an Cronbach's α coefficient of 0.81, which is statistically

acceptable. The researcher conducted data were collected using a questionnaire (Arabic version) and self-report methodologies with nurses after the appropriate approvals were completed. Individual self-report conducted each nurse for 15-20 min after completing the crucial stages that have to be part of the study design. All of the analyses that follow were performed using the Statistical Package for the Social Sciences (SPSS 20.0, The International Business Machines Corporation [IBM], Armonk, NY, US) program. SPSS provides data analysis for descriptive and bivariate statistics, numeral outcome predictions and predictions for identifying groups. The variables were classified using number and percentages (No. and %), while the continuous variables were described using the frequency, mean, and standard deviation (F , mean, and SD). To forecast the relationship between research variables and person correlation coefficient, use (t test and ANOVA). A two-tailed $P = 0.05$ was used to indicate statistical significance.

Ethical approval

The ethics of the Helsinki Declaration were followed during the research's execution. Before taking the sample, the patients verbal consent and analytical consent were obtained. To obtain this permission, a local ethics committee evaluated and approved the study protocol, subject information, and consent form using document number 271 on June 2, 2022.

RESULTS

Findings show participants characteristics in Table 1: the mean age is 23.86 ($SD = 5.79$), and the age group 20-29 who made up was 88.0%. More than half of nurses were women. It composes 54.0%, and the higher percentage (54.0%) were single, whereas most of the study sample (57.3%) were bachelor, and the higher percentage (76.7%) were with (less than 5 years), less than 8h. Where the large percentage (52.7%) and the morning shift were the more (52.7%). A last

point is that the vast majority of research participants were from respiratory care unit (RCU) (71.3%).

The result showed in Table 2 that the wrong time was the most common MEs reported by the nurses with (20%) always and (59%) sometimes and mean (1.99) of the surveyed nurses agreed that this error frequently done. This was followed by medication rate faster/slower rate than prescribed (push or slow) with (14%) always and (41%) some times and with mean (1.68) and wrong concentration reported by nurses with (11.3%) always and (44.0%) sometimes with mean (1.67).

The contributing factors in Table 3 of MEs among nurses include the following findings: first factors, (64.0%) of nurses expressed agree (mean = 2.64; $SD = 0.482$), second factors (68.0%) of nurses expressed agree (mean = 2.68; $SD = 0.468$), third factors (51.0%) of nurses expressed agree (mean = 2.51; $SD = 0.501$), fourth factors (52.0%) of nurses expressed agree (mean = 2.52; $SD = 0.501$), fifth factors (50.7%) of nurses expressed agree (mean = 2.51; $SD = 0.502$), and final factors (58.7%) of nurses expressed agree (mean = 2.59; $SD = 0.494$).

Table 4 shows that there is positive correlation between MEs and contributing factors, because the P value is less than (0.05), and (0.01) which indicates the existence of a positive significant between them.

The results in Table 5 demonstrated that nurses' age, marital status, educational level, work unit, and experience years had no significant relationship with MEs (P value > 0.05).

Whereas there was a significant link among the gender, working hours, working shift, and MEs (P value < 0.05).

DISCUSSION

In health care systems all around the world, unsafe drug practices are the main contributors to patient damage that may be prevented. The majority of them happen while

Table 4: Correlation between medication errors and contributing factors

No.	Parameters	R (Pearson correlation)	P value (0.05)
1	Medication errors	0.395**	0.000
	Factors related to poor communication due to writing		S
2	Medication errors	0.168*	0.040
	Factors related to the hospital		S
3	Medication errors	0.407**	0.000
	Factors related to nurses		S
4	Medication errors	0.283**	0.000
	Factors related to doctors		S
5	Medication errors	0.231**	0.004
	Factors related to the pharmacy		S
6	Medication errors	0.270**	0.001
	Factors related to the work environment		S

**correlation is significant at the 0.01 level (2-tailed)

*correlation is significant at the 0.05 level (2-tailed)

Table 5: Relationships between medication errors with regards nurse's sociodemographic data

Variables	Type of test	Test value	P-value	Sig
Age	ANOVA	0.549	0.650	NS
Marital status		0.092	0.964	NS
Educational level		1.497	0.227	NS
Experience years		0.677	0.509	NS
Gender	t test	3.583	0.000	S
Working hours		-2.251	0.026	S
Working shift		-2.251	0.026	S
Place of work		1.550	0.123	NS

using the medicine. Both the occurrence and prevention of medication delivery errors are significantly influenced by nurses. Findings show participant characteristics. The study's age group consisted of respondents aged 20-29 years old, making up 88% of the study's total participants. These results are supported by those of Ikol.^[14] In terms of gender, female nurses dominated and made up more than half of all nurses, as compared to male nurses, who make up 54.0% of all nurses. The data show that more than half of the study sample had a bachelor's degree (57.3%), and these results agree with Fathi *et al.*^[15] The results show that most of the sample (54.0%) was single. Regarding the experience years, the highest (76.7%) were with less than 5 years. This finding is in line with Kim *et al.*,^[16] who found that more than half of nurses had less than five years of experience. The majority of the study participants worked less than 8 h in the morning shift (52.7%) and were from RCU (71.3%). The most frequent error among nurses is wrong time, and this result is not consistent with the Feleke in Ethiopia,^[17] where the nurses showed that wrong time is the third most common type of ME, whereas it agrees with the study conducted by the USA,^[18] where it showed that 70% of the time error was the most common. The reason for this may be the heavy workload and undernourishment of nurses, which are reported contributing factors leading to MEs. As opposed to that, the frequency of its occurrence may lead nurses to regard it as normal practice and not report it.^[19] The improper rate (too fast or too slow) is the second most common error, and this is consistent with a study conducted by Kopp *et al.*^[20] The following types of MEs are less common: incorrect concentration as a result of a calculation error; the doctor prescribing the incorrect medication; missing the dose; administering the medication to the incorrect patient; and administering a different medication than what was previously prepared. This result does not correspond to what was stated in the study of Sharia.^[21] Finally, it is seen that giving a treatment contrary to what was prescribed is the less common error, and this result is contrary to what was reached by Aziz's study,^[12] where the wrong medicine was the fifth, and this can be explained because the majority of nurses in the sample are college graduates, and their knowledge of drugs is considered good in accordance with their academic studies. Most of the contributing factors to MEs

are related to poor communication due to writing, and the most frequent are (i) inability to read^[22] instructions due to the doctor's poor handwriting, (ii) not interpreting the doctor's instructions correctly, and (iii) the third factor is not understanding abbreviations. These results are similar to the Turkish study^[23] and agree with Ayorinde.^[24] The study demonstrates that 42.3% and 39.3% of respondents, respectively, would blame administration problems on abbreviations and trouble reading handwritten directives, yet the most frequent factors were related to the hospital. The first factor leading to MEs is workload; this result is similar to the Iranian study.^[25] The other factor is patient severity levels and insufficient staff. This result agrees with the fifth study, which shows that the lack of nurses is among the most important factors that lead to MEs.^[26] This factor is related to nurses' lack of knowledge of medicines. This result is similar to that in this study.^[27] Lack of sleep and being fatigued were the next two primary factors that contributed to the drug error that produced the same outcome as with turkey.^[28] Generally, tiredness and lack of sleep lead to stress, affect their functionality, and could lead to ME.^[29] Socio-demographic data show that 47% of nurses work shifts at night and work more than 8 h. Factors related to doctors are that doctors change medications the most frequently; it's the same result of this study.^[30] Medication orders for doctors are unread. This is similar to Gorgich study^[25] that shows the unread order third factor, poor communication between doctors and nurses (32.7 percentage), is similar to the study carried out by Kim *et al.*^[16] The least important aspect, as cited by 44% of the nurses, was their inability to understand the acronyms. The nurse may administer an extra dose, administer the medication through a different route of administration, or even administer the medication at a different concentration if the abbreviation is misunderstood, which could result in a highly dangerous adverse drug event. The factors contributing to medication mistakes related to the pharmacy: medications have similar names is the first factor; Medicines all have the same appearance is the second factor; and other following factors were that several medications use the same packaging. Medicines are written in a different language; communication between pharmacists and nurses is lacking [poor communication], whereas Aziz *et al.*^[12] revealed that the similar name was

the fifth, the same appearance was the third, and the other following factors were that the packaging of many medications was the second, medications written in different languages were the fourth, and the first factor according to this result was poor communication between pharmacists and nurses. Factors related to the work environment are: interruption, insufficient nursing staff, inadequate training, the presence of noise in the workplace, and others. These results were compatible with a study conducted by Karavasiliadou *et al.*^[31] In the association between types of MEs and their contributing factors, there is a relationship between medication mistakes and their contributing factors. These results agreed with the research conducted by,^[30] who found a number of factors that were significantly associated with MEs, including ignorance, poor communication with other nurses when faced with a problem, interruptions during the administration of medications, and a lack of guidelines. An institution-based, cross-sectional study carried out at two public hospitals in Southern Ethiopia found that there is a lack of training and other factors that are related to drug errors.^[32] The relationship between MEs and nurses socio-demographic characteristics Findings indicate that the educational level of nurses has no significant relationship with MEs. This result agreed with Mahmood *et al.*^[33] Also, the results of the most recent study revealed a statistically significant relationship between ME and gender. However, this information supports a finding made by Dornan *et al.*^[34] Additionally, there was a correlation between nurses' working hours and shifts, with results that were similar to those of a study done by Feleke *et al.*^[17] The results show that there is no correlation between the experience years of participants and ME occurrence. This result disagrees with Sears study.^[35]

CONCLUSIONS

According to the nurses' perception of MEs, the most prevalent form is inappropriate timing of medicine administration. Less frequently occurring types of MEs include wrong rate (too fast or too slow) and wrong concentration. The most common factors leading to MEs were workload, Inability to read due to handwriting, and level of patient severity. For answering the second study question, statistical analysis finds that there are significant relationships found between the MEs and contributing factors; according to the presented finding, there are significant differences between socio-demographic data (gender, working hours, and working shift).

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Conflicts of interest

There are no conflicts of interest.

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