Original Article

Survey of Medication Errors and Consequent Mental Reactions from the Perspective of Emergency Nurses in Northwest of Iran

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ABSTRACT

Background and Aim: A key step to enhancing the safety of patients is recognizing the occurrence of medication errors and underlying factors. Thus, this study was performed with the aim of determining the extent of drug error and Consequent mental reactions from the perspective of emergency nurses.

Materials and Methods: This study is a cross-sectional review that performed on all nurses working in emergency departments of Ardabil (N = 270). Data were gathered using a medical Error Questionnaire and analyzed in SPSS Statistics v22. by descriptive statistics, e.g., mean, standard deviation, frequency, as well as analytical statistics, e.g., One-way analysis of variance, t-test, and Chi-square.

Results: A total of 21.81% of hospital emergency nurses and 16.88% of pre-hospital emergency nurses reported medication errors at least once during the last six months. The mean medication error leading to injury per nurse in the hospital and pre-hospital emergency wards was 1.06 and 0.71, respectively. The most prevalent psychological reactions to medication errors were stress and fear.

Conclusion: Medication errors and consequent Psychological reactions are common among emergency nurses. Thus, continuous training courses, can play a crucial role in diminishing the rate of medication errors.

Keywords: Medication error, Psychological reactions, Emergency nurses

Introduction

The fundamental purpose of health care in the health care system is prevention and health promotion (1). Patient safety is among critical factors in health care and in improving the quality of care services (2). A key step to improving the level of patient safety is to recognize medical errors and underlying factors (3). Health care organizations increasingly focus on improving patient safety, but in pre-hospital emergency systems, not much information is available on care safety (4). Medication errors are among the most common medical errors (3,6) and account for 19% of all medical errors on average and are leading causes of mortality and morbidity of patients. They also impose a huge burden on family and members of the treatment and care team (7). Studies show that the worrying cause for the lack of detailed statistics on medical errors is inadequate reporting (8). The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) defines the medication error as a preventable event caused by the wrong use of drugs that can be managed by members of the treatment

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team and the patient (9). In the United States, more than 225,000 deaths happen each year due to medical errors alone, with an annual cost estimated from $37.6 billion to $50 billion (10). Studies show that nearly ten percent of hospital treatment in Iran leads to hospital complications, while in the United States the corresponding value is less than five percent (11). Studies in Europe show that 19% to 28% of hospitalized patients suffer from medication errors (12). The German Federal Institute for Drugs and Medical Devices (BfArM)[1] reported annual preventable drug errors of about 500,000 cases in the emergency departments (9). Medication errors occur in all hospital and pre-hospital wards, but the hospital and pre-hospital emergencies facilitate medication errors due to the existence of multiple variables (9). Patients are first victims of medication errors and undergo negative implications (13) . Patients are indeed twice as likely to be wrecked by medication errors, once in the aftermath of medical error and the second after the psychological reactions of the personnel to the medication error (14). Following medication errors, health care organizations give counseling services to patients and their families, but the emotional and psychological consequences on medical staff may be overlooked (15). Nurses are the second victims of medication errors (13). Simply put, the incidence of medication errors leads to different emotional responses and reactions from the treatment staff, including nurses, both in the short-term and long-term (16,17). Studies show that nearly ten percent of hospital treatment in Iran leads to hospital complications, while in the United States the corresponding value is less than five percent (11). Medical errors threaten the safety and health of patients (5).

Shock and fear are among primary emotions reported by some health caretakers immediately in the aftermath of medication errors (16). Next to errors, some medical staff feels that they have betrayed patients, the university, and even their families (18). For some health caretakers, the emotional distress due to medication error leaves long-lasting emotional fears, so that many personnel experience acute stress disorder frequently in the first months after the error (17). For adapting to the emotional distress, emergency nurses need supports from family, friends, the university, and the institution for which they work, as failure to adapt may have long-term consequences such as depression and burnout (14). Medication errors also affect nurses' self-confidence, frustration, stress, anger, turnover intention, and mental status, as their working conditions and functioning become unstable due to repeated errors (14,19). Human errors in medicine need to be studied because medical errors are expanding and deemed a global issue (20). The consequences of medication errors directly affect the health and lives of individuals and decrease public trust in the medical staff, especially physicians and nurses (21). Thus, identification of the rate of medication errors and resulted psychological reactions in emergency nurses can provide the necessary basis for reducing such errors. In order to enhance patient safety and promote more appropriate services by emergency nurses, This study was carried out with the aim of determining the extent of drug error and Consequent mental reactions from the perspective of emergency nurses in Ardabil.

Materials & Methods

This study is a cross-sectional review in which participants were all nurses working in the emergency departments of educational and medical centers (N = 185) and pre-hospital bases (N = 85) in Ardabil which were assessed by the census method. Working at least six months in the emergency ward, having an associate's degree or higher degrees, being eager to participate in the study and having conscious satisfaction were the inclusion criteria. The data collection tool was a three-item questionnaire, including the following parts:

1. Socio-demographic characteristics (20 questions; e.g., age, gender, educational degree, work experience, work shift, etc.)
2. Standard questionnaire for medication error measurements designed in 2015 by Mozaffari et al., including 19 questions on the effect of each item on the rate of a medication error, which are listed with items of Yes, No, Injured, and Reported (22).
3. Psychological reaction questionnaire of a medication error, including 14 psychological reactions after each medication error committed by the nurse. The intensity of the psychological reaction varies from zero (no psychological response) to ten (maximum intensity).

The validity and reliability of the questionnaire on medication error and psychological reactions have been confirmed in the study of Mozaffari et al., where the content validity of the instrument was determined using the Waltz and Basel content validity index (CVI = 0.91), and internal consistency was reported to be positive for the incidence of medication error and its psychological consequences, according to the test-retest method (22). Data were analyzed in SPSS Statistics v22. By descriptive statistics, e.g., mean, standard deviation, frequency, as well as analytical statistics, e.g., one-way ANOVA, t-test, and Chi-square.

Results: Out of all distributed questionnaires (N = 270), 242 were completed and submitted (rr = 89.62%). A total of 56.3% of hospital emergency nurses were female and 93.5% of pre-hospital emergency nurses were male. Other demographic characteristics are presented in Table 1.

[1] Bundesinstitut für Arzneimittel und Medizinprodukte

Table 1. Distribution of socio-demographic information of emergency nurses

[1]	Socio-demographic information		[2]	Hospital emergency (no. / %)	[3]	Pre-hospital emergency (no. / %)	[4]	Socio-demographic information	[5]	Answer	[6]	Hospital emergency (no. / %)	[7]	Pre-hospital emergency (no. / %)
[8]	Gender	[9]	Male	[10]	72 (43.6)	[11]	72 (93.5)	[12]	Attending basic drug preparation and administration education courses	[13]	Yes	[14]	139 (84.24)	[15]	58 (75.32)
		[16]	Female	[17]	93 (56.37)	[18]	5 (6.49)			[19]	No	[20]	26 (15.75)	[21]	19 (24.67)
[22]	Education	[23]	Associate's degree	[24]	17 (10.3)	[25]	32 (41.55)	[26]	Attending advanced drug preparation and administration education courses	[27]	Yes	[28]	120 (72.72)	[29]	43 (55.84)
		[30]	Bachelor's degree	[31]	146 (88.48)	[32]	43 (55.84)			[33]	No	[34]	45 (27.27)	[35]	34 (44.15)
		[36]	Master's degree	[37]	2 (1.21)	[38]	2 (2.59)	[39]	Total emergency nurses			[40]	165 (100)	[41]	77 (100)
[42]	Marital status	[43]	Single	[44]	55 (33.33)	[45]	21 (27.27)	[46]	Age (mean & SD)			[47]	34.28±0.56	[48]	34.43±0.69
		[49]	Married	[50]	102 (61.81)	[51]	56 (72.72)	[52]	Work experience (mean & SD)			[53]	11.23±0.56	[54]	10.92±0.65

The majority of the hospital emergency nurses (84.24% and %72.72) and pre-hospital emergency nurses (%75.32 and %55/84) had participated in basic and advanced drug preparation and administration courses.

Table 2. Distribution of the frequency of medication errors in the study samples

Question/ward		Hospital emergency (no. / %)	Pre-hospital emergency (no. / %)	p-value
Medication error	Yes	36 (21.81)	13 (16.88)	0.37
	No	129 (78.18)	64 (83.11)	
Medication error by co-workers	Yes	113 (68.48)	39 (50.64)	0.007
	No	52 (31.51)	38 (49.35)	
Error leading to damage	Yes	175 (34.17)	55 (26.82)	0.2
	No	337 (65.82)	150 (73.17)	
Reported medication errors	Yes	256 (50)	93 (45.36)	0.24
	No	256 (50)	112 (54.63)	
Total error		512 (100)	205 (100)	

A total of 21.81% of hospital emergency nurses and 16.88% of pre-hospital emergency nurses reported having medication errors during the last six months (p = 0/37). The observation of medication error of colleagues in the last 6 months in hospital emergency nurses (68/48%) was more than pre-hospital(50/48%) and this difference was statistically significant(p=0.007).

Table3. Distribution of the frequency of medication error leading to damage and medication error report in the study samples

• d/error	War	• rror leading to damage		• -value	• rrors report		• -value
		• ospital emergency (no. / %)	• re-hospital emergency (no. / %)		• ospital emergency (no. / %)	• re-hospital emergency (no. / %)	
• Forget to give patient's prescribed medication	1.	• (4.8)	• (2.6)	• .03	• 2 (7.3)	• (6.5)	• .91
• Giving OTC medications to the patient	2.	• (3)	• (2.6)	• .23	• (4.8)	• 2 (15.6)	• .0
• Dispensing medication later than what determined in the patient information card or the mission form	3.	• (3.6)	• (0)	• .2	• 5 (9.1)	• (2.5)	• .16
• Giving medication excluding the drug-food interaction	4.	• (3)	• (3.9)	• .75	• 2 (7.3)	• (3.9)	• .48
• Skipping safety measures before and after administration of special drugs	5.	• 0 (24.2)	• 1 (14.3)	• .05	• 6 (21.8)	• (11.7)	• .09
• Rapid injection of drugs need to be injected gently	6.	• 4 (8.5)	• (33.3)	• .09	• 2 (13.3)	• (11.7)	• .01
• Skipping allergy symptoms before and after drug administration	7.	• 2 (13.3)	• (18.5)	• .2	• 8 (10.9)	• (2.6)	• .07
• Simultaneous administration of oral drugs ignoring drug interactions	8.	• (1.8)	• (3.9)	• .01	• (13.6)	• (3.9)	• .02
• Drug administration less than the prescribed dose	9.	• (1.8)	• (3.9)	• .60	• (1.8)	• (3.9)	• .6
• Drug administration more than the prescribed dose	10.	• (3)	• (5.2)	• .01	• (1.8)	• (3.9)	• .9
• Giving medication to someone else	11.	• (1.2)	• (18.5)	• .01	• (3.6)	• (6.5)	• .28
• Intravenous injection of intramuscular drugs	12.	• (4.2)	• (2.6)	• .02	• (5.5)	• (5.2)	• .21
• Intramuscular injection of intravenous drugs	13.	• (1.2)	• (2.6)	• .52	• 4 (8.5)	• (5.2)	• .2
• Insufficient dilution of drugs	14.	• (4.2)	• (3.9)	• .20	• 1 (6.7)	• (5.2)	• .34
• Wrong registration of the physician's prescription in the patient information card or mission form	15.	• (0.6)	• (2.6)	• .21	• (2.4)	• (2.6)	• .19
• Errors in pharmaceutical calculations	16.	• 7 (10.3)	• (5.2)	• .39	• 6 (21.8)	• (12.2)	• .01
• Dispensing wrong drugs	17.	• (3)	• (1.3)	• .15	• (4.2)	• (2.6)	• .18
• Dispensing expired medications	18.	• (1.8)	• (5.2)	• .07	• 5 (9.1)	• (9.1)	• .62
• Administrating wrong drugs due to similar names or forms	19.	• 0 (12.1)	• 0 (13)	• .32	• 9 (11.5)	• (11.7)	• .82
•	Total	• 75 (34.17)	• 5 (26.82)	• .2	• 56(50)	• 3(45.36)	• .27

The results showed that Out of 512 errors committed by hospital emergency nurses (34/17%)and in pre-hospital out of 205 errors, (26/82%)have resulted in injuries, The mean medication error leading to injury per nurse was more in hospital emergency nurses (1.06) than pre-hospital emergency nurses (0.71), though this difference was not statistically significant (p = 0.2). The highest and lowest medication errors leading to injury in hospital emergency nurses included skipping safety measures before and after administration of special drugs (24.2%) and wrong registration of the physician's prescription in

the patient information card or mission form (0.6%), respectively. The highest and lowest medication errors leading to injury in pre-hospital emergency nurses included skipping allergy symptoms before and after drug administration (14.3) and dispensing medication later than what was determined in the patient information card or the mission form (0%), respectively. Medication errors report were more prevalent in hospital emergency nurses (50%) than pre-hospital emergency nurses (45.36%). The highest and lowest medication errors reported in hospital emergency nurses were skipping safety measures before and after administration of special drugs (21.8%) and dispensing drugs less or more than the prescribed dose (1.8%), respectively. In pre-hospital nurses, the highest and lowest medication errors reported were giving OTC medications to the patient (15.6) and dispensing medication later than what was determined in the patient information card or the mission form (2.6%), respectively. The frequency of medication errors including rapid injection of drugs that need to be injected gently, simultaneous administration of oral drugs ignoring drug interactions, and wrong drug calculations were significantly higher in hospital emergency nurses than pre-hospital emergency nurses ($p < 0.05$). Likewise, giving OTC medications to the patient was significantly more common in pre-hospital emergency nurses than hospital nurses ($p < 0.05$).

Table 4. Distribution of frequency and intensity of emergency nurses' psychological reactions caused by medication errors

Reaction/group	Hospital emergency (no. / %)	Pre-hospital emergency (no. %)	p-value	Hospital emergency (mean)	Pre-hospital emergency (mean)	p-value
Fear	80 (15.26)	33 (15.78)	0.41	5.33±0.26	5.00±0.43	0.51
Stress	106 (20.22)	41 (19.61)	0.1	5.26±0.18	6.12±0.27	0.68
Disappointment	22 (4.19)	10 (4.78)	0.94	4.91±0.46	5.71±0.86	0.41
Shame	16 (3.05)	9 (4.3)	0.63	5.67±0.39	5.00±0.36	0.33
Rage	7 (1.33)	23 (11.00)	0.001	5.33±0.52	5.20±0.17	0.76
Having guilty conscience	38 (7.25)	12 (5.74)	0.18	6.00±0.34	6.44±0.8	0.57
Self-reproach	47 (8.96)	11 (5.26)	0.01	5.69±0.29	6.73±0.58	0.12
Humiliation	21 (4.00)	7 (3.43)	0.41	5.82±0.5	5.00±0.7	0.82
Sleep disorder	14 (9.54)	5 (2.39)	0.59	4.79±0.5	5.00±0.7	0.82
Sorrow	50 (9.54)	19 (9.09)	0.39	5.42±0.24	5.37±0.42	0.91
Diminished job satisfaction	30 (5.72)	8 (3.82)	0.12	6.23±0.38	5.88±0.87	0.68
Apathy and insouciance	73 (13.93)	23 (11.00)	0.03	5.36±0.16	6.33±0.43	0.03
Obsess in drug administration	16 (3.05)	6 (2.87)	0.63	5.69±0.32	5.83±0.6	0.82
Career change	4 (0.76)	2 (0.95)	0.93	5.00±0.7	5.00±0.0	1.00
Total psychological reactions	524 (100)	209 (100)	×	5.33±0.26	5.00±0.43	0.51

A total of 524 and 209 psychological reactions were occurred in hospital and pre-hospital emergency nurses, respectively, in the aftermath of medication errors. The most common psychological reactions to medication errors were stress (20.22%) and fear (15.78%) in hospital emergency nurses and stress (19.61%) and fear (15.78%) in pre-hospital emergency nurses.

The frequency of rage ($P<0.001$), self-reproach ($P< 0.01$) and apathy and insouciance ($P< 0.03$), was significantly higher in hospital emergency nurses than pre-hospital emergency nurses. The highest and lowest intensity of psychological reactions to medication errors were observed into diminished job satisfaction (6.23±0.38) and sleep disorders (4.79±0.5) in hospital emergency nurses, as well as self-reproach (6.73±0.58) and career change (5.00±0.0). The mean and standard deviation values of the intensity of apathy were significantly higher in pre-hospital emergency nurses than hospital emergency nurses ($p < 0.05$).

Discussion

this study was performed with the aim of determining the extent of drug error and Consequent mental reactions from the perspective of emergency nurses in Ardabil. The most common medication errors were

skipping safety measures in hospital emergency nurses and giving OTC medications to the patient in pre-hospital emergency nurses. In agreement with our study, the most common medication error was dispensing the drug later or earlier than the prescribed time and skipping safety measures before and after administration of special drugs (Joolayi et al (23). rapid administration of the drug in the study of Pelliciotti et al (24) (2010), and wrong drug calculations in the study of Salmani et al (21). Mozaffari et al. (2017) reported early or late drug administration (41.1%) and dispensing OTC drugs to the patient (37.7%) as the most prevalent medication errors (22). Nawwar et al. (2015) reported errors with the number of administration and the technique of prescribing as the most common medication errors (25). In the study of Seki and Yamazaki (2006) in Japan, the most common medication error was ignoring the right time for drug administration (26). The average medication error leading to an injury per nurse was higher in hospital emergency nurses than pre-hospital emergency nurses. On average, 30.49% of medication errors led to an injury in our study. Contrarily, in the study of Mozaffari et al. (2017), 2.68% of errors led to physical injury to the patient (22). Such differences in results are mainly due to working at various wards, high stress, and less opportunity to decide on emergencies in the emergency department (11). Half of the hospital and pre-hospital emergency nurses report errors. The ratio of error report per nurse was 1.55 in the hospital emergency ward and 1.2 in the pre-hospital emergency ward. In the study of Joolayi et al., the average error report rate was 1.3 (27), while Rezaei Farsani et al. reported 1.8 errors per nurse (28), which is consistent with the results of our study. Mozaffari et al. (2017) reported an average error rate of 0.7 per nurse (22), which is less than what was observed in our study. Various reports can be due to different management processes, the duration of medication error in different studies, fear of dealing with emergency nurses upon reporting the error, and the ward. The incidence of psychological reactions in the aftermath of medication errors was higher in hospital emergency nurses than pre-hospital emergency nurses. The most psychological reactions to medication errors in hospital and pre-hospital emergency nurses were stress and fear, respectively. In agreement with the results of our study, O'Beirne et al. (2012) reported that physicians undergo more emotional stress than other personnel, with disappointment (48.3%) and shame (31.5%) that were the most common reactions (29). Mozaffari et al. (2017) reported stress (75.39%) and humiliation (66.49%) as the most common psychological reactions(22). In the study of Waterman et al. (2007), the most common psychological reactions to medication errors were anxiety (61%) and decreased confidence (0.44), respectively (19), in agreement with the results of our study. As a limitation, some nurses were not eager to complete the questionnaire due to fear of disclosure of information and their mistakes. Nurses were ensured that this is a study out of administrative procedures in the hospital and their information will be completely confidential.

Conclusion

Medication errors are common among emergency nurses and only half of the cases are reported by emergency nurses. Thus, providing in-service training and organizing advanced training courses can play a crucial role in reducing medication errors. Medication error reporting can be improved by studying the underlying reasons for not reporting, and facilitating and encouraging the process of reporting. Stress and fear are the most common psychological reactions in emergency nurses upon the medication error. Thus, psychological counseling after an error is crucial.

Conflict of interest

There is no conflict of interest in this manuscript.

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Ethics Statement: 1) Reviewing the research in the Research Council and obtaining ethical permission from the Ethics Committee of Ardabil University of Medical Sciences

2) Obtaining permission from the officials of Ardabil College of Nursing and Midwifery to conduct the research

3) Introducing yourself to the management of hospitals and emergency rooms in Ardabil in order to obtain permission from them

4) Full description of research objectives for participants

5) Assuring the participating nurses about the confidentiality of the available information

6) Being committed to publishing the results in the form of a scientific article

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