

# Correlation between Nurses medication errors reporting with care complexity and work dynamics

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## ABSTRACT

**Introduction and Aims:** It is possible that Complexity of care and, work dynamics as two of the changing pattern in health care delivery associated with drug errors as the most common medical error in the hospital emergency department; thus, the purpose if this study was to determine the relationship between the medication error with complexity of care work dynamics as well among Nurses who are work in the Emergency Departments of Fasa's hospital. **Material and Method:** In this descriptive-correlational study was conducted by 100 of nursing working in in Emergency Departments in the hospitals affiliated to Fasa University of Medical Sciences in 2018. The data gathering tools in this study were demographic information checklist, Valsquezian nursing care complexity questionnaire (2005) and Wakefield et al questionnaire (2005 ) and the Salyar Work Dynamic Questionnaire (1996). Data were analyzed using SPSS software version 21 with statistical tests of analysis of variance, Pearson correlation test, independent t-test and linear regression. **Results:** According to the results of this study, the mean score of care complexity was  $38.59 \pm 14.4$  (out of 60) and the average work dynamics score among the nurses studied was  $25.85 \pm 5.69$  (out of 42 scores) the mean score of reporting medication errors was  $34.14 \pm 13.83$  (out of 100). There was a significant relationship between work dynamics and drug error reporting ( $r = 0.23$ ,  $P = 0.01$ ). There was no significant relationship between work dynamics and complexity of care ( $r = 0.11$ ,  $P = 0.25$ ). There was no significant relationship between complexity of care and reporting of drug errors ( $r = 0.9$ ,  $P = 0.033$ ). There was no significant relationship between the demographic characteristics of the studied nurses and job dynamics ( $r = -0.44$ ,  $P = 0.12$ ). Also, no significant relationship was observed between the demographic characteristics of the studied nurses and the complexity of care. There was a significant relationship between gender and level of education with the report of drug errors in nurses ( $P = 0.05$  and  $P = 0.01$ ). **Conclusion:** Based on the result of the complexity of care and work dynamics as well as status of the reporting of medication errors status in the emergency department, it is clear that that managers of this organization pay attention more and more that and must need to provide some approaches and strategies of appropriate guidelines to reduce level of medication errors.

**Keywords:** medication error, complexity of care, work dynamics, Nurses, Emergency Departments, hospital.

## Introduction

Medication errors is defined as occurrence of any errors in the dose or wrong prescribing and a mistake in prescribing the correct medication or medication formula for a particular disease

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or condition, using outdated medications, mistakes during prescribing medications, lack of knowledge about side effects of combination of certain medications<sup>[1]</sup>. The consequences and side effects of medication errors are the fifth leading cause of death after car accidents, diabetes, kidney disease, breast cancer and influenza in the United States<sup>[2]</sup>. In Iran, there is no accurate statistics available on the occurrence of these errors<sup>[3]</sup>. The importance of medication errors issue is so high that they have been considered in recent years as a criterion for determining the clinical competence of nurses working in the health care provision system<sup>[4]</sup>. Based on the report of Washington Health Institute of National Sciences University, more than one million

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medication errors occur annually, which 77000 of these errors are made by nurses<sup>[5]</sup>. The results of a systematic review study conducted by Vrbnjak et al. (2016) revealed that congestion of patients in the units and work-related fatigue were the most important factors in the occurrence of medication errors from the nurses' point of view<sup>[6]</sup>. Results of a study conducted by You et al (2015) suggest that the most common cause of medication errors from nurses' point of view was lack of a balance between the number of nurses and the number of patients hospitalized in each shiftwork<sup>[7]</sup>. Thus, identifying the factors associated with medication errors can be very helpful. One of the factors related to medication errors is care complexity and work dynamics. Care is the complexity of the organization and in fact the technologies used in the organization, influencing the occurrence of medication errors<sup>[8]</sup>. In the 21st century, an increase in the challenges of clinical activities in nursing tasks has resulted in the concept of complexity of care in health systems<sup>[9]</sup>.

Prescribing medication is one of the critical tasks of nurses. In terms of different forms of medication, great number and different patients' medications, policies, processes and new organizational technologies will affect each other<sup>[10]</sup>. Care complexity for hospitalized patients in acute and critical situations such as the emergency department increases and nurses are forced to simultaneously organize, prioritize, and manage changes in clinical information of different patients<sup>[10]</sup>. Workplace dynamics, as an environmental factor, can affect the occurrence of medication errors and as a result reporting of medication errors. Work dynamics include medication guidelines and instructions, caring plans, and clinical procedures that, if changed, nurses will be confused and the likelihood of error will increase<sup>[11]</sup>. Dynamics is a set of practices and methods that can respond to the inevitable changes in an environment by using valuable and appropriate strategies. Dynamics in large health centers such as hospitals is crucial to complete the mission of management and patient care with high quality, research and education and this feature plays a major role in economic and competitive challenges in health care institutions<sup>[12, 13]</sup>. Emergency department is one of the critical departments in hospitals. Hospital emergencies receive critically ill patients from pre-hospital emergencies or other medical centers and are responsible for stabilizing patients' vital signs to send him or her to inpatient and intensive care units and operating rooms of the same hospital and other hospitals<sup>[14]</sup>. Thus, they are crucial in the area of medication errors. In health care, the dynamics of work as a result of changes in the care program, procedures and medical instructions may cause confusion for nurses, resulting in medication errors.

Research results suggest that in an appropriate clinical environment with high dynamics, the level of distraction and confusion of health care providers, including nurses, is lower and as a result, the probability of medication errors will decrease<sup>[11, 13, 15]</sup>. In a highly-dynamic work environment, where the level of distraction and confusion is low, the likelihood of medication errors is relatively low<sup>[7]</sup>. Also, complexity of caring for critically

ill patients in emergency departments sometimes causes errors in the area of following the guidelines and treatment protocols, such as medication protocols for patients admitted to these units. In such conditions, the caring process must be comprehensive, simple and effective and bring necessary benefit for patients to prevent medications errors as much as possible<sup>[10]</sup>. Also, identifying adverse events of medication errors can result in development of practical methods and organizational policies to reduce the occurrence of the errors, minimize the side effects, and compensate medication errors timely. Identifying the causes of medication errors and taking measures to reduce them is crucial, since medication errors are one of the most important factors resulting in lower quality of care in patients in the emergency department of medical centers<sup>[16]</sup>.

Given the importance of work dynamics in medication errors by nurses and its role in providing solutions to prevent errors, care complexity as an organizational factor and non-reporting of medication errors, no research has been conducted and considering the possibility of medication errors in the emergency department due to congestion in this department, high workload of nurses and their work characteristics result in stress in nurses, which in turn increases the rate of errors. Hence, the present study aimed at evaluating the relationship between rate of reporting the medication errors and care complexity and work dynamics in emergency departments of hospitals affiliated to Fasa University of Medical Sciences.

## Methodology

This descriptive-correlational study was carried out with the participation of nurses working in the emergency departments of two educational and medical centers affiliated to Fasa University of Medical Sciences (Valiasr and Dr. Shariati Hospitals). They were selected due to access to research subjects, high frequency of samples and easiness of data collection. A convenience sampling was used in this regard in 2019. Inclusion criteria of the study included minimum of bachelor's degree in nursing, minimum of two years of employment history as a nurse, minimum of one year of full-time clinical activity in the emergency department. The sample size in the present study was obtained at 87 people by using the formula of  $n \geq \left[ \frac{(z_{1-\alpha/2} + z_{1-\beta})^2}{0.5 \times \ln \left[ \frac{1+r}{1-r} \right]} \right] + 3$  and considering the correlation of coefficient of at least  $r=0.03$  and Alpha value of 0.05 and test power of 80%. Also, considering the probability of 10% of dropout in samples, sample size was determined at 100 people ( $Z_{1-\alpha} / 2$ : 95% confidence interval equal to 1.96, interest coefficient  $Z=1.28$  and  $r$  was the correlation coefficient which was considered at least 0.03).

Data were collected using a demographic characteristics form, Velasquez Care Complexity Tool, Wakefield et al Medication Error Reporting Questionnaire, and the Salyar Work Dynamics Questionnaire (1996). Questions about demographic

information include age (year), gender (male / female), marital status (single / married), level of education (bachelor / master), employment history (year), employment status (official / in treaty / contract / project) and shift type (fixed morning / fixed evening / fixed night / rotational). Care Complexity was designed and developed by Velasquez (2005) [17]. This tool consists of 15 items scored on a 4-point Likert Scale (never, sometimes, most of time, always) ranging from one to four. Its minimum score is 15 and its maximum score is 60. Higher scores indicate more complex care. The validity of this questionnaire was examined by Pazokian et al (2015) based on factor analysis. To examine the reliability of this tool in the study conducted by Pazokian, internal consistency using Cronbach's alpha coefficient was used on a sample of 115 nurses and the test-retest method was used to examine the stability of tools in different hospital units. Results indicated appropriate reliability of the tool (ICC = 0.88) and its internal consistency was obtained at  $\alpha = 0.61$  [18]. Medication Error Reporting Questionnaire was designed and developed by Wakefield et al in 2005 [18]. This questionnaire includes 14 questions, 7 of which are related to intravenous medications and seven questions are related to non-intravenous medications. In this questionnaire, medication error is scored as a percentage of medication error in such a way that score 1 is assigned to 0-25%, score 2 is assigned to 25-50%, score 3 is assigned to 50-75%, and score 4 is assigned to 75-100% [18]. The validity of this questionnaire was evaluated by Pazokian et al. (2015) based on factor analysis. To evaluate the reliability of this tool, internal consistency using Cronbach's alpha coefficient was used on a sample of 100 nurses and the test-retest method was used to evaluate the stability of tools on a sample of 12 nurses working in different hospital units. Results showed appropriate reliability of the tool (ICC = 0.65) and also its internal consistency was obtained  $\alpha = 0.73$  [19]. To evaluate the work dynamics, the Salyar work dynamics questionnaire (1996) was used, which includes 7 items scored on a 7-point Likert scale (strongly disagree to strongly agree). Its lowest score is 7 and the highest score is 42. Higher scores indicate greater work dynamics [12]. After designing this tool, its content, construct, and face validities were examined in a study conducted by Chang and Mank (2011) study and Cronbach's alpha coefficient for internal consistency was obtained at 0.83 and was confirmed [19]. In Iran, the validity of this questionnaire was evaluated by Pazokian et al. (2015) using factor analysis. The alpha coefficient calculated in this study for consistency was 0.81 which has high reliability and the correlation coefficient between the two tests was 0.93, indicating the stability of the tool over time [20]. After approving this research by the ethics committee of Fasa University of Medical Sciences, the researcher obtained the letter of introduction from the Research Deputy of Shahid Beheshti University of Medical Sciences and referred to university security department and Deputy of Treatment of Fasa University of Medical Sciences and obtained the final letter of introduction. Then, he referred to two medical centers of Fasa and with the command of head of centers to head nurses of emergency

department with introduction of nursing service management, the research process started. Then, the researcher introduced himself to studied samples and provided explanation on the objectives of the research and if the research subjects were willing to participate in the study, after obtaining informed written consent from them, the questionnaires would be completed by them. Data were analyzed using SPSS21 software and descriptive tests (percentage, mean, and standard deviation), Pearson statistical analysis, analysis of variance, independent t-test, and P less than 0.05 was considered as a significant level.

## Results

In the present study, 100 nurses working in the emergency department were studied and all nurses completed the questionnaires (the response rate was 100%). The mean and standard deviation of age of participants in the present study was  $29 \pm 5.80$  years, with a maximum age of 52 years and a minimum of 21 years. Most of the nurses participating in this study were female (70 people: 70%). Table 1 presents other demographic characteristics of the nurses studied. As shown in Table 2, the mean score of care complexity was  $38.59 \pm 14.4$  (out of score 60 s) and the mean score of reporting medication errors was  $34.14 \pm 13.83$  and the mean score in the area of non-intravenous medications and intravenous medications was  $16.51 \pm 6.87$  and  $17.63 \pm 7.5$ , respectively, and the mean score of work dynamics among the studied nurses was  $25.87 \pm 5.69$  (out of score 42). Based on Table 3 and the results of Pearson correlation test concerning the relationship between the care complexity and medication errors in the studied nurses, results showed that there was no significant relationship between work dynamics and care complexity ( $r = 0.11$ ,  $P = 0.25$ ). Based on Table 4 and the results of independent t-test, Pearson correlation test and one-way analysis of variance, there was no significant relationship between gender ( $P = 0.98$ ), marital status ( $P = 0.94$ ), education level ( $P = 0.3$ ), shiftwork status ( $P = 0.44$ ), and employment type ( $P = 0.26$ ), and employment history of nurses ( $P = 0.2$ ) and care complexity score.

There was a significant relationship between gender and reporting of medication errors in nurses ( $P = 0.05$ ), so that the mean score of reporting medication errors in females was higher than that in males ( $35.85 \pm 14.51$  vs.  $30.71 \pm 11.80$ ). There was a significant relationship between the level of education of studied nurses and reporting of medication errors in them ( $P = 0.01$ ), so that the mean score of reporting medication errors in nurses with higher education level was higher. Relationship between marital status ( $P = 0.27$ ), shiftwork status ( $P = 0.38$ ), employment type ( $P = 0.20$ ) and nurses' employment history ( $P = 0.32$ ) and reporting medication errors was no significant. An inverse relationship was reported between reporting intravenous medication errors and general medication errors and nurses' work dynamics ( $P = 0.01$ ,  $P = 0.03$ , respectively), so that in nurses with higher scores of work dynamics, the rate of reporting

medication errors was lower (Table 3). Independent t-test results showed no significant relationship between gender ( $P = 0.25$ ), marital status ( $P = 0.48$ ) and education level ( $P = 0.56$ ) and work dynamics. Also, based on the results of analysis of variance test, there was no significant relationship between nurses' shiftwork ( $P = 0.20$ ) and nurses' employment type ( $P = 0.51$ ) and work dynamics. Pearson correlation test results also showed no significant relationship between nurses' employment history and work dynamics ( $P = 0.55$ ).

**Table 1: Demographic characteristics of the studied samples**

variable		mean (SD)
age (year)		29(5.80)
		n (%)
gender	male	30(30)
	female	70(70)
marital status	single	39(39)
	married	61(61)
level of education	bachelor	94(94)
	master	6(6)
employment type	official	15(15)
	in treaty	29(29)
	contractual	5(5)
shiftwork status	project	32(32)
	other	19(19)
	morning	3(3)
history of clinical activity	evening	3(3)
	rotational	94(94)
	under 5 years	70(70)
	over 5 years	30(30)

**Table 2: Mean and standard deviation of scores of care complexity, work dynamics and medication errors in the studied nurses**

variables	mean (SD)
Care complexity	38.59(4.14)
Work dynamics	25.87(5.69)
Non-intravenous medication errors	16.51(6.87)
Intravenous medication errors	17.63(7.50)
General medication errors	34.14(13.83)

**Table 3: Relationship between care complexity and work dynamics and medication errors in nurses studied**

variable	care complexity		work dynamics	
	R	P-value*	R	P-value*
Non-intravenous medication errors	0.10	0.26	-0.14	0.12
Intravenous medication errors	.07	0.41	-0.23	0.01
General medication errors	0.09	0.32	-0.19	0.03
work dynamics	0.11	0.25		

\* Pearson correlation test

¥ Spearman test

**Table 4: Relationship between demographic characteristics of the studied nurses and care complexity, medication error and work dynamics**

demographic characteristics		care complexity		medication error		work dynamics	
		mean ± SD	P-value	mean ± SD	P-value	mean ± SD	P-value
gender	female	38.60 ± 4.13	.98	35.85 ± 14.51	*0.05	25.44 ± 5.85	*0.25
	male	38.58 ± 4.23		30.71 ± 11.80		26.71 ± 5.33	
marital status	single	38.66 ± 3.46	*0.94	33.76 ± 12.77	*0.27	26.61 ± 5.59	*0.48
	married	38.72 ± 41.4		36.93 ± 15.55		25.75 ± 5.99	
level of education	bachelor	38.64 ± 4.19	*0.3	34.78 ± 13.95	*0.01	25.95 ± 5.64	*0.56
	master	37.12 ± 3.22		25.37 ± 8.61		24.75 ± 6.62	
shiftwork	morning	38 ± 3.50	£0.44	39 ± 9.68	£0.38	23.75 ± 4.34	£0.20
	evening	35 ± 1.41		45.50 ± 9.19		19.50 ± 2.12	
	rotational shiftwork	38.68 ± 4.19		33/76 ± 13/97		26.06 ± 5.71	
employment type	official	39 ± 3	£0.26	37.23 ± 13.59	£0.20	25.88 ± 5.67	£0.51
	in treaty	39.52 ± 4.66		32.67 ± 13.38		26.70 ± 5.64	
	contractual	38.70 ± 4.66		29.90 ± 13.03		24.10 ± 5.91	
	project	37.39 ± 4.22		37.26 ± 13.26		25.02 ± 5.25	
employment history	other	38.94 ± 3.33	α0.20	29.77 ± 14.94	α0.32	27.05 ± 6.63	α0.55
	below 5 years	38.28 ± 4.28		33.33 ± 13.43		26.07 ± 5.45	
	over 5 years	39.35 ± 3.74		36.11 ± 14.78		25.38 ± 6.29	

\*Independent T-test

α Pearson correlation test

£ANOVA analysis

## Discussion

The present study was an attempt to evaluate the relationship between reporting medication errors and care complexity in the emergency department of Fasa University of Medical Sciences. The mean score of reporting medication errors in the studied nurses indicated that in most cases, medications errors are not reported. Female nurses reported more medication errors than male nurses, and nurses with a master's degree reported more medication errors. It seems that the female nurses in the study reported their medication errors as an influential factor in reducing the occurrence of medication errors, so they reported their medication errors. Also, nurses with a master's degree have a higher and newer scientific knowledge and information in the area of medication errors, and it is clear that they commit less medication errors. These results are consistent with those of the study conducted by Castel et al (2016). Also, the results of a study conducted by Bjorksten et al (2016) showed that only 14-20% of medication errors are reported in the emergency department [21, 22]. In general, it can be stated that a very low percentage of medication errors are reported by nurses in different units of hospital. It might be due to issues such as fear of being blamed, being labeled incompetent clinically, and difficult process of reporting and management barriers and the fear of being involved with legal authorities as a result of patient complaints or hospital management. One of the reasons for low rate of reporting of medication errors is that nurses only report medication errors that pose a serious risk to patients. The results of present study also revealed no significant relationship between the rate of reporting medication errors and the care complexity among the studied nurses. In other words, the process of clinical care of patients cannot be considered as an effective factor in the rate of reporting medication errors.

Since limited studies have been carried out on care complexity concerning the medication errors, the present study was conducted to compare and discuss the care complexity with medication errors in nurses. In this regard, the articles and studies conducted to examine the concept of care complexity with medication errors were reviewed. Results of a study conducted by Sabzi et al. (2019) are inconsistent with those of the present study, which showed that there was a positive and significant relationship between the care complexity and occurrence of medication errors among nurses, so that with increasing the care complexity, the occurrence of medication errors increased [23]. The present study results are also inconsistent with those of the research conducted by Bidokhti et al. (2014), which showed lack of clear guidelines for reporting errors, and employees and management barriers were factors involved in non-reporting of medication errors [24]. The results of studies carried out by Hawang et al and McGlynn et al indicated that their results were inconsistent with the results of present study. Management of unit and the lack of a proper teamwork plan in the hospital units were reported as the most important reasons for medication errors and reporting of these errors [25, 26].

The results of a study conducted by Roth et al showed that loss of concentration due to large number of patients in the hospital units, lack of a balance between the number of nurses and the number of patients, and lack of rules for patient safety were reported among the most important reasons for medication errors by nurses [27]. It seems that factors such as sample size diversity, differences in employment places of samples, differences in economic, social, cultural conditions of nurses studied in domestic and foreign studies and even differences in management and care facilities in different medical centers are reasons for inconsistency between the results of the present study and those of other studies.

Different hospitals adopt different policies on the ratio of nurses to patients, the duration of each shiftwork, number of staffs in each unit and the arrangement of staff in each shift. Also, an inverse relationship between work dynamics and the rate of reporting medication errors in the present study suggests that a clinical setting with appropriate management and will reduce the rate of medication errors by nurses. It is clear that multicity of consecutive medication orders in the hospital emergency department and patients' emergency conditions can increase the rate of medical errors, including medication errors. The results of the study conducted by Heidari et al (2015) [28], in line with the results of the present study, revealed a significant relationship between the dynamics of hospital setting and the occurrence of medication errors in different units. In line with results of the present study, the results of the study conducted by Sabzi et al (2019) showed a significant relationship between the occurrence of medication errors and work dynamics among nurses working in different hospital units. The main reasons for not reporting the medication errors included hospital-related factors such as factors related to hospital management and also lack of knowledge about the process of reporting medication errors [29]. However, the results of a studies conducted by Pazokian et al (2013) [20] and Barat et al. (2014), [30] and Ramazanian et al (2017) [31] showed results inconsistent with the results of the present study and they showed no significant relationship between work dynamics and medication errors.

The reason for this inconsistency in results can be attributed to different age range, different level of education of participants in different studies and differences in questionnaires used to assess the work dynamics, different management conditions in different hospital units, including nurses' shiftwork and the ratio of nurses to patients. The factors influencing non-reporting of medication errors are almost same and the main factors are lack of clear guidelines on the way of reporting the errors, lack of a clear registration system and correct reporting of errors, fear, and problem reporting process, management and employee barriers. Hence, an association between work dynamics and rate of reporting medication errors in the present study and other studies is justified. One of the limitations of this study is collection of data through questionnaire, in which data were based self-report of nurses. Some nurses might not answer the questions honestly (to prevent disclosure of information although

researchers ensured them on confidentiality of data). Also, the samples studied in the present study were selected from a limited number of medical centers affiliated to a University of Medical Sciences (Fasa University of Medical Sciences), so it is not possible to generalize these results to other medical centers of Iran.

## Conclusion

Results of the present study revealed a low level of reporting medication errors among emergency department nurses and socio-individual factors such as gender and education level were involved in the rate of reporting medication errors. Although no association was found between medication errors and care complexity in the nurses studied, since care services are provided in group and pharmacotherapy process is also an interdisciplinary process, various factors might be involved in occurrence of the errors and rate of their reporting. Efforts to reduce and control them depend on the use of a systemic approach to improve the level of work dynamics in the clinical setting, eliminate the organizational factors raised in the area of work dynamics as much as possible and designing a system to increase the rate of reporting errors by nurses. Therefore, it is recommended for management to pay more attention to ratio of patients to staffs in the units, reducing the workload and reducing the working hours of nurses.

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## Conflict of interest

The authors of this study declared no conflict of interest for this study.

## References

1. Sneck S, Saarnio R., Isola A., Boigu R. Medication competency of nurses according to theoretical and drug calculation online exams: A descriptive correlational study. *Nurse education today*. 2016;36:195-201.
2. Medication Error [Internet]. National Coordinating Council for Medication Error & Prevention. 2012.
3. Tafreshi F, Rassouli M., Zayeri F., Pazookian M. Development of nurses' medication error model: mixed method. *Quarterly Journal of Nursing Management*. 2014;3(3):35-50.
4. Strbova P, Mackova, S., Miksova, Z., Urbanek, K. Medication errors in intravenous drug preparation and administration: a brief review. *Journal Nursing Care*. 2015;4(285):2167-1168.
5. Tirgar A, Haji Ahmadi M, Jafarpour HA, Samaei SE. Effective Factors on Occurrence of Drugs Mistakes from the Viewpoints of Nurses. *Archives of Occupational Health*. 2018;2(1):48-55.
6. Vrbnjak D, Denieffe S, O'Gorman C, Pajnkihar M. Barriers to reporting medication errors and near misses among nurses: A systematic review. *International journal of nursing studies*. 2016;63:162-78.
7. You M-a, Choe M-H, Park G-O, Kim S-H, Son Y-J. Perceptions regarding medication administration errors among hospital staff nurses of South Korea. *International journal for Quality in health care*. 2015;27(4):276-83.
8. Pazokian M, Tafreshi, M. Z., Rassouli, M., Zayeri, F. Psychometric characteristics of nursing care complexity scale in medication errors. *Journal of Research & Health*. 2015;5(1): 74-81.
9. Pazokian, MZTM, Rassouli M., Zayeri F. Testing Nurses' Medication Errors Model based on Reason Human Error Model. *Iran Journal of Nursing (IJN)*. 2013;26(85):1-14.
10. Sghiri S. Investigation of common nursing errors and development of error reduction strategies in nurses. *Journal of Army Nursing Faculty of the Islamic Republic of Iran*. 2012;10(2):35-40.
11. Chang, Y, Mark B. Effects of learning climate and registered nurse staffing on medication errors. *Journal of Nursing Administration*. 2012;41(7-8):6-13.
12. Salyer J. Development and psychometric evaluation of an instrument to measure staff nurse's preception of uncertainty in the hospital environment *Journal of Nursing measurement* 1996;4(1):33-48.
13. Andersson Å, Frank, C., Willman, A. M., Sandman, P. O., Hansebo, G. Factors contributing to serious adverse events in nursing homes. *Journal of clinical nursing*. 2018;27(1-2):354-62.
14. Pham JC, Story JL, Hicks RW, Shore AD, Morlock LL, Cheung DS, Kelen GD, Pronovost PJ. National study on the frequency, types, causes, and consequences of voluntarily reported emergency department medication errors. *J Emerg Med*. 2012;40(5): 485-92.
15. Strudwick G, Reisdorfer, E., Warnock, C., Kalia, K., Sulkers, H., Clark, C., Booth, R. Factors associated with barcode medication administration technology that contribute to patient safety: an integrative review. *Journal of nursing care quality*. 2018;33(1): 79-85.
16. Saki K. KAJ, Mohebbi I. Nursing error and its relation to fatigue in emergency department nurses. *The Journal of Urmia Nursing and Midwifery Faculty*. 2016;13(10):835-42.
17. Velasquez. D. *Measuring Nursing Care Complexity In Nursing Homes*. USA: The university of Arizona; 2005.

18. Wakefield. B, Uden-Holman T, Wakefield DS. Development and validation of the Medication Administration Error Reporting Survey. *Advances in Patient safety*. 2005;41:475-88.
19. Chang Y, Mark B. Effects of learning climate and registered nurse staffing on medication errors. *Journal of Nursing Administration*. 2011;41(7-8):6-13.
20. Pazokian M, Zaghari Tafreshi M., Rassouli M., Zayeri F. Assessing factor analysis, validity, reliability and psychometric characteristics of "work dynamic" scale in medication errors by nurses *Nursing research*. 2014;9(3):61-74.
21. Castel ES, Ginsburg, L. R., Zaheer, S., Tamim, H. Understanding nurses' and physicians' fear of repercussions for reporting errors: clinician characteristics, organization demographics, or leadership factors? *BMC health services research*. 2015;15(1):326.
22. Björkstén KS, Bergqvist, M., Andersén-Karlsson, E., Benson, L., Ulfvarson, J. Medication errors as malpractice- a qualitative content analysis of 585 medication errors by nurses in Sweden. *BMC health services research*. 2016;16(1):431.
23. Sabzi Z, Mohammadi, R., Talebi, R., Roshandel, G. R. Medication Errors and Their Relationship with Care Complexity and Work Dynamics. *Open Access Macedonian Journal of Medical Sciences*. 2019;7(21):3579..
24. BaloochiBeydokhti T, Mohamadpour A, shabab S, Nakhaee H. Cause of occurrence and Barriers of Report of Medication Errors among Nursing Personnel of Gonabad Hospitals. *Horizon Med Sci*. 2014;19(5):41-7.
25. Hwang JI, Ahn, J. Teamwork and clinical error reporting among nurses in Korean hospitals. *Asian nursing research*. 2015;9(1):14-20.
26. McGlynn EA, McDonald, K. M., Cassel, C. K. Measurement is essential for improving diagnosis and reducing diagnostic error: a report from the Institute of Medicine. *Jama*. 2015;314(23):2501-2.
27. Roth C, Wieck, K. L., Fountain, R., Haas, B. K. Hospital nurses' perceptions of human factors contributing to nursing errors. *JONA: The Journal of Nursing Administration*. 2015;45(5): 263-9.
28. Heydari H, Kamran, A., Novinmehr, N. Nurses' perceptions about causes of medication errors: A qualitative study. *Hayat*. 2015;20(4):19-34.
29. Jember A, Hailu, M., Messele, A., Demeke, T., Hassen, M. Proportion of medication error reporting and associated factors among nurses: a cross sectional study. *BMC nursing*. 2018;17(1):9.
30. Bratt MM, Felzer, H. M. Predictors of new graduate nurses' organizational commitment during a nurse residency program. *Journal for Nurses in Professional Development*. 2013;28:108-19.
31. Rezaiaimin A, Pazokian, M., Zagheri Tafreshi, M., Nasiri, M. The relationship between work commitment, dynamic, and medication error. *Clinical nursing research*. 2018;27(6):660-74.