Correlation between workplace culture, learning and medication errors

Correlación entre la cultura del lugar de trabajo, el aprendizaje y los errores de medicación

Abbasi, Fatemeh[1], Pazokian, Marzieh[2], Borhani, Fariba[3], Nasiri, Malihe[4],
[1]Student Research Committee, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: fabbasi1111@gmail.com
[2]Department of Nursing/ Department of Midwifery and Reproductive Health, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: Pazokian@sbmu.ac.ir
[3]Associate professor, Medical ethics and law research center, school of Nursing and midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: faribaborhani@msn.com
[4]Faculty of Paramedical, Assistant professor, Department of Biostatistics, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: malihenasiri@gmail.com
Corresponding Author's: Pazokian, Marzieh, Department of Nursing/ Department of Midwifery and Reproductive Health, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran. E-mail: pazokian@sbmu.ac.ir

Abstract

The occurrence of medication errors in intensive care units can bring about irreparable damage and even lead to death in hospitalized patients. In this respect, numerous investigations have suggested that many factors including workplace culture and learning from error can affect the incidence rates of such errors in these units. Accordingly, the present study was to shed light on the correlation between workplace culture, learning from error, and reporting rate of medication errors among nurses in intensive care units affiliated to teaching hospitals of Shahid Beheshti University of Medical Sciences in Iran.

Methods: A descriptive-analytical study was conducted among 120 nurses working in intensive care units in four teaching hospitals in the city of Tehran. Then, the questionnaires developed by Gulley et al., Rybowiak et al., and Wakefield et al. were used to collect the data related to workplace culture, learning climate, and medication errors.

Results: The findings of this study indicated that increased learning from error in nurses working in intensive care units could lower reporting rate of medication errors (r=-0.312, p-value=0.001); there was also a significant relationship between workplace culture and reporting rate of medication errors, so that enhancing workplace culture could reduce reporting rate of medication errors (r=-0.239, p-value=0.012).

Conclusion: Improving workplace culture via supporting employee creativity and innovation as well as promoting learning environment through an employee reward system along with avoidance of punishments and reprimands for nurses during the occurrence of errors could be effective in mitigating the incidence rates of medication errors.

Keywords: Culture, Workplace, Learning, Medication Errors, Intensive Care Unit

Resumen

Antecedentes: la aparición de errores de medicación en unidades de cuidados intensivos puede provocar daños irreparables e incluso provocar la muerte de pacientes hospitalizados. A este respecto, numerosas investigaciones han sugerido que muchos factores, incluyendo la cultura del lugar de trabajo y el aprendizaje por error, pueden afectar las tasas de incidencia de tales errores en estas unidades. En consecuencia, el presente estudio arrojó luz sobre la correlación entre la cultura del lugar de trabajo, el aprendizaje del error y el índice de errores de medicación entre las enfermeras de las unidades de cuidados intensivos afiliadas a los hospitales de enseñanza de la Universidad de Ciencias Médicas Shahid Beheshti en Irán.

Métodos: se realizó un estudio analítico descriptivo entre 120 enfermeras que trabajan en unidades de cuidados intensivos en cuatro hospitales de enseñanza en la ciudad de Teherán. Luego, los cuestionarios desarrollados por Gulley et al., Rybowiak et al., y Wakefield et al. se utilizaron para recopilar los datos relacionados con la cultura del lugar de trabajo, el clima de aprendizaje y los errores de medicación.

Resultados: los hallazgos de este estudio indicaron que un mayor aprendizaje por error en las enfermeras que trabajan en unidades de cuidados intensivos podría disminuir la tasa de informe de errores de medicación (r = -0.312, valor de p = 0.001); también hubo una relación significativa entre la cultura del lugar de trabajo y la tasa de informe de errores de medicación, de modo que mejorar la cultura del lugar de trabajo podría reducir la tasa de reporte de errores de medicación (r = -0.239, valor de p = 0.012).

Conclusión: mejorar la cultura del lugar de trabajo mediante el apoyo a la creatividad e innovación de los empleados, así como promover el ambiente de aprendizaje a través de un sistema de recompensa para los empleados, junto con evitar castigos y amonestaciones para las

enfermeras durante la ocurrencia de errores, podría ser eficaz para mitigar las tasas de incidencia de los errores de medicación.

Palabras clave: cultura, lugar de trabajo, aprendizaje, errores de medicación, unidad de cuidados intensivos

Introduction

Patient safety is considered as one of the main components of quality of healthcare services at a global level (Kirwan, Matthews, & Scott, 2013). In this respect, patient safety contains safety measures and precautions taken to moderate or remove potential health-related adverse reactions during the course of medical diagnosis and treatment (Yilmaz & Goris, 2015). Moreover; nurses, as the largest workforce in healthcare systems across the world, can play a vital and important role in improving patient safety (Gorgich, Barfroshan, Ghoreishi, & Yaghoobi, 2016; Henneman et al., 2010; Kim, Lyder, McNeese-Smith, Leach, & Needleman, 2015). The most common problems affecting patient safety include incorrect diagnosis, medication errors, hospital infections, bedsore, complications during and after surgery, errors resulting from inadequate and broken equipment and tools, falls, as well as errors associated with air conditioning. In the United States (US), the overall annual cost of the occurrence of medication errors is estimated by 37.6 to 50 billion dollars. About 44000 to 98000 patients in the US hospitals are also losing their lives due to medication errors. Thus, mortality from medication errors are considered as the eighth leading cause of death in the world which accounts for the highest percentage in terms of the annual number of death from AIDS, breast cancer, and traffic accidents(Koehn, Ebright, & Draucker, 2016; Latif, Rawat, Pustavoitau, Pronovost, & Pham, 2013; Yilmaz & Goris, 2015).

In this domain, medication errors are a significant part of medical errors occurring in hospitals. For example, the results of a systematic study showed that the average incidence rate of accidents in a hospital was by 9.2%, which was mostly due to medication errors. Such errors could significantly increase medical errors and it was assumed that each patient hospitalized in the US could be exposed to at least a medication error during the day (Savenkova, Iryna, et al.2018).

Furthermore, medication errors may arise at any stage of medication therapy process from administration to implementation of medication orders. The given stages are not only one of their kinds because the sources of medication errors are often manifold. It has been also estimated in medical services but can also bring significant costs from 6 to 29 billion dollars a year to the healthcare system in this country. Besides, medication errors occurring in hospitals can increase the length of stay for 2 days on average per patient and also multiply the costs of hospitalization by 2000 to 2500 dollars per patient (Elden & Ismail, 2016). Studies conducted in Iran have further shown that medication errors can take place each year by 55000 cases which can result in mortality of about 10500 people as well as physical disabilities among 23000 individuals (Pazokian, Zagheri Tafreshi, & Rassouli, 2014). Therefore, due to the high prevalence of medication errors, they are used as an indicator for determining patient safety rate in hospitals (Noorian, Rassouli, & Kavousi, 2013).

On the other hand, intensive care unit (ICU) is considered as a critical department in a hospital, because patients admitted to these units are more seriously in need of permanent monitoring and control, wherein many advanced equipment and tools are used. For this reason, it is very likely that all patients hospitalized in these units encounter life-threatening errors during their stay. Nurses working in ICUs are the staff offering continuous care, preparing complex medications, and using various advanced equipment and tools for patients. Thus, ICU nurses can play a critical role in providing safe care services for patients (Corwin, Mills, Shanawani, & Hemphill, 2017; Stockwell & Slonim, 2006; Yilmaz & Goris, 2015). The occurrence of medication errors in ICUs is common. In this respect, 78% of medication errors can be observed in such departments. Among the causes of the high incidence of medication errors in ICUs are the complexity of the clinical status of patients admitted to these units (Di Muzio, Tartaglini, De Vito, & La Torre, 2016). Organizational researchers and experts have similarly considered the source of errors from two important factors: individual (human) factors and systematic ones. It seems that addressing individual factors causing errors such as fatigue, distraction, lack of concentration, etc., are not very effective in preventing errors due to their inevitability; but focus on the systematic approach can contribute to finding the causes of errors and providing useful prevention strategies. In fact, a systematic approach is a more effective way to prevent, control, and mitigate medication errors. For example, in a qualitative study in 2014 by Pazokian et al. in Iran, it was revealed that workplace culture was a factor causing medication errors which could provide strategies to reduce, prevent, and correct such errors and also help with assuming accountability and learning from error without any fears of their expression (Pazokian et al., 2014).

The main core of organizational culture is workplace culture which includes beliefs and behaviors that are visible in the future. The given culture covers six organizational characteristics such as integrity, efficiency, creativity, collaborative system, stability, and insistence on doing the work that can provide an environment with no punishments wherein healthcare team members are interested in interacting with each other (Gulley, 2007). An important question raised in this regard is how to manage errors to avoid negative or harmful consequences. In this domain, Gaba (2000) suggested strategies to manage errors including avoiding errors and reducing opportunities

for errors, trapping errors i.e. disclosing errors after their occurrence, and eliminating errors whose results could be removal of errors and learning from them Therefore, one of the other factors considered in relation to the rate of medication errors is learning from error or learning climate in a way that a unit with a positive learning environment can make nurses openly evaluate the potential factors affecting medication errors, which can improve learning from error, and as a result, decrease medication errors over time. When positive learning climate is dominant in a department, the nurses are more willing to learn from errors, because they can often communicate with each other in such an environment and think about them; but in negative learning climate, nurses are not encouraged to engage in activities, and also some gaps can arise in the system that cause errors, and ultimately bring about errors which remain unchanged (Chang & Mark, 2011). Likewise; some studies have demonstrated that wrong workplace culture could lead to fears in nurses and prevent reporting of medication errors; in contrast, some investigations have confirmed that supporting nurses as well as improving workplace culture could promote reporting rates of medication errors and reduce their incidence (Gulley, 2007; Sahay, Hutchinson, & East, 2015).

As well, learning from error is a critical element of safety culture which depends mainly on nurses involved in the process of reporting and sharing medication errors associated with medication therapy process (Chiang, Lin, Hsu, & Ma, 2010). However, the findings in this regard have been bound to Western nations which cannot be extended to other countries such as Iran. Studies in these countries revealed that appropriate workplace culture could improve learning and organizational climate; in fact, workplace culture was considered effective in learning process (Davis, White, & Stephenson, 2016; Firth-Cozens, 2001).

Also, other studies suggested that suitable learning environment as well as appropriate workplace culture could influence the incidence of medication errors (Chang & Mark, 2011; Sahay et al., 2015). It should be noted that Iran's population compared with that in Western countries is endowed with different cultures and beliefs which can shape workplace culture, rate of medication errors, as well as their reporting. Thus, investigating this issue in Iran is of utmost importance. Given the sensitivity of ICUs, investigating this issue among nurses employed in these departments is of great significance; thus, the present study was to examine the correlation between workplace culture, learning from error, and reporting rate of medication errors among nurses working in ICUs.

Aim: The purpose of this study was to determine the correlation between workplace culture, learning from error, and reporting rate of medication errors among nurses working in ICUs.

Methods

This study was a cross-sectional descriptive-analytic research carried out to determine the correlation between workplace culture, learning from error, and reporting rate of medication errors in ICU nurses. The study was conducted from August 2017 to November 2017.

Setting: This study was performed in four major teaching hospitals in the city of Tehran. Nurses working in the ICUs were selected as the statistical population. It should be noted that the given ICUs were general departments admitting various types of patients with different medical diagnoses. In the present study, the sample included nurses working in the general ICUs.

Sampling Process: Using the formula for calculating the sample size to examine the correlation of the variables, taking at least r=0.3 into account, and considering type I error with 5% alpha equal to 0.05 and type II error with 10%, as well as β=10 and power of 90%; the sample size was obtained by 113 individuals (Rezaiamin, Pazokian, Zagheri Tafreshi, & Nasiri, 2017). Considering the probability of sample loss or incomplete data, it was preferred to use convenience and purposive sampling methods and then the number of samples was calculated by 120 individuals.

Inclusion Criteria: The inclusion criteria for this study were having at least a bachelor's degree in nursing and a minimum of two years of work experience as a nurse. The nurses participating in the study also had at least one-year work experience in the ICUs of the given hospitals and they were employed as permanent full-time employees (Akoz A, Yildiz V, Orun S, Turkdogan KA, Duman A. 2018).

Measurement: In this study; the demographic characteristics of nurses such as age, gender, marital status (married/single), level of education (undergraduate/master's degree/PhD), work experience in ICUs (years), employment status (permanent full-time/contractual/fixed-term/project-based/casual), type of shifts (fixed morning/ fixed evening/ fixed night/ rotating), history of attendance in training programs related to workplace culture, history of participating in training programs related to medication errors, overtime working records and working hours (hours per month), type of organizational posts of nurses (nurse/ head nurse), history of performing administrative tasks in managerial positions and their types (head nurse/ clinical supervisor/educational supervisor/infection control director/nursing educator) were collected through a self-report questionnaire. Additionally; workplace culture, learning from error, and medication errors were measured by three self-report research instruments. In this respect, Workplace Culture Survey (WCS) by Gulley (2007) was used to gain access to workplace culture. The workplace

culture in this study referred to determining the dominant culture in the workplace. This instrument contained 43 items examining six domains associated with integrity/humanity culture, efficiency/quality culture, innovative culture, traditional/deliberative culture, established/stable culture, and urgent/seat culture; respectively. In this research instrument, the first item was not included in the overall rating process and it only showed the responses of individuals at the time of committing errors; the other 42 items could be completed in a true/false format. Accordingly, the correct answer was given one point and the wrong answer was assigned with zero. In each domain, an average score was obtained and the instrument showed that if the mean scores in each domain were closer to one, organizational or workplace culture was closer to the culture measured by that domain.

Error Orientation Questionnaire (EOQ) by Rybowiak, Garst, Frese, and Batinic (1999) was also employed to measure learning from error. This research instrument was developed in 1999 and included 13 statements rated with a six-point Likert-type scale from totally disagree (score 1) to totally agree (score 6), and there were also six options for each item. Therefore, the score for this questionnaire varied from 13 to 78, and higher scores indicated learning more from errors.

Moreover, the medication errors committed by nurses in the ICUs were measured using Medication Administration Error Reporting Survey (MAERS) by Wakefield, Uden-Holman, and Wakefield (2005). The errors in medication administration included wrong dose, wrong time, wrong patient, wrong prescription or administration, and those caused by forgetfulness measured via the 14-item scale including seven items related to errors in the use of intravenous medications and the next seven items associated with errors in non-venous medications. There were four options for each item in this questionnaire. Individuals were also required to choose one out of four options for each item. The instrument was scored based on the percentage of medication errors i.e. 0-25% with 1 point, 25-50% with 2 points, 50-75% with 3 points, and 75-100% with 4 points. Therefore, the score for reporting rate of medication errors in this instrument varied from 14 to 56, and higher scores reflected further reporting rates of medication errors by nurses.

Validity and Reliability of Research Instruments: The validity and reliability of the MAERS by Wakefield et al. were confirmed in the study on the Iranian population by Pazokian et al. (2013). In the given study, the scoring of the questionnaire developed by Wakefield et al. was adjusted through reviewing expert opinions in a way that the 10-part rating instrument was divided into four sections due to the close intervals of the scores (10) and the probability of errors (25 for each one). This change in scoring was also notified to the research instrument designer and their agreement was obtained. Moreover, confirmatory factor analysis was performed to measure its instrumental validity. To assess the reliability of this questionnaire, the internal consistency method was used via Cronbach's alpha coefficient in a sample of 100 nurses and the test-retest method was employed to examine the stability of the instruments in a sample of 12 nurses working in different departments of a hospital. The results indicated an appropriate reliability for the given instrument (intra-class correlation coefficient; ICC=0.65) and then its internal consistency (α=0.73) was obtained. Internal consistency was further calculated for this study and it was α=0.88.

The validity and reliability of the EOQ developed by Rybowiak et al. was also confirmed in the study by Pazokian et al. (2013). In this study, the construct validity of this research instrument was investigated by factor analysis. The results of the study revealed that the given instrument was endowed with construct validity. Also, in this study, the reliability of this research instrument was determined using ICC=0.93 and its internal consistency was obtained by α=0.85. The internal consistency with Cronbach's alpha coefficient was also calculated for this study, and it was equal to α=0.80.

The WCS developed by Gulley (2007) was in English. Accordingly, this research instrument was firstly translated by English language experts into Persian. After translation, it was submitted to 10 professors specialized in the related field of study and they expressed their opinions on this instrument, and then necessary modifications were made to it according to the views of the professors. Finally, face and content validity were obtained in a qualitative manner. To determine the reliability of this instrument, Cronbach's alpha coefficient of the questionnaires completed by 20 nurses was obtained for overall internal validation of the instrument and Cronbach's alpha coefficient for this research instrument was α=0.75.

Ethical Considerations: The study was approved by ethical committee in Tehran in 2016.The study samples also participated in this research with their full consent. The participants were similarly assured that the data collected will be used exclusively for scientific purposes. Besides, a special code was assigned to each person (without mentioning their names) to prevent the disclosure of information. Furthermore, a verbal consent was taken from the participants.

Data Analysis: All the data were analyzed using the SPSS software (version 21.0). Thus, t-test was used to obtain the correlation between workplace culture, learning from error, and reporting rate of medication errors based on gender, marital status, and level of education. Additionally, analysis of variance (ANOVA) was employed to evaluate workplace culture, learning from error, and reporting rate of medication errors based on employment status and type of working shifts. To obtain the correlation between age, work experience (as an ICU nurse (year)), workplace culture, learning from error, and reporting rate of medication errors; Pearson correlation coefficient was used. Moreover, to control the confounding variables for the analysis of the independent relationships between workplace culture, learning from error, and reporting rate of medication errors; linear regression model was employed.

Within the linear regression model, the p-value less than 0.05 was considered as the significance level.

Interpretation of the Results: A total number of 120 nurses working in the ICUs selected by convenience and purposive sampling methods participated in this study. The mean (standard deviation) of the total score of workplace culture, learning from error, reporting rate of medication errors among nurses participating in this study were 0.58±0.11, 50.15±10.39, and 22.48±7.17; respectively. The lowest and the highest scores for workplace culture were 0.21 and 0.95, respectively. According to the scoring of the EOQ by Rybowiak et al., the minimum and the maximum score was between 13 and 78 but the lowest and the highest scores in the present study were 20 and 75; respectively. Also, considering the scoring of the MAERS by Wakefield et al., the lowest and the highest scores for medication errors were between 14 and 56. In this study, the minimum score for this questionnaire was 14 and the maximum one was 46.

The relationship between demographic variables, workplace culture, learning from error, and incidence rate of medication errors were illustrated in Tables 1 and 2. The demographic variables including age, marital status, level of education, work experience in the ICU (year), and type of working shift were not also significantly correlated with workplace culture, learning from error, and reporting rate of medication errors (p-value>0.05); however, the variable of gender had a significant relationship with workplace culture, so that in the current study, men had a higher level of workplace culture than women (p-value<0.031). In this study, the results of Pearson correlation coefficient showed a positive relationship between age and learning from error in a way increased age could enhance learning from error (r=0.186 p-value=0.043); however, no relationship was observed between age, workplace culture, and reporting rate of medication errors. The findings also showed that a rise in age of learning from errors could increase work culture and vice versa (r=0.441, p-value<0.001). Moreover, the results revealed that the higher the rate of learning from error, the lower the occurrence of medication errors (r=-0.312, p-value=0.001); and the higher the level of workplace culture, the lower the incidence of medication errors (r=-0.239, p-value=0.012).

Table 1: The Association Between Demographic Data, Work place culture, Learning from error, and Reporting Rate of Medication Errors

variables	Work place culture		Learning from error		Total medication Error	
	Mean	P-(±SD) value*	Mean	P-(±SD) value	Mean	P-(±SD) value
Gender		0.031		0.16		0.68
Men		0.64±0.14		52.79±10.19		23.04±6.12
Women		0.64±0.14		49.48±10.39		22.34±7.43
Marital status		0.40		0.29		0.39
Single		0.59±0.12		51.13±8.76		21.91±6.14
Married		0.57±0.10		49.12±11.87		23.09±8.15
Education		0.77		0.85		0.15
Undergraduate(BSc)		0.58±0.11		49.97±10.82		22.12±7.21
Master's degree(MSc)		0.57±0.09		50.53±6.88		25.15±6.32
Employment status		0.84		0.23		0.59
Permanent full-time		0.58±0.12		52.47±9.27		22.58±7.43
Contractual		0.58±0.06		48.61±10.54		22.26±5.63
Fixed-term		0.62±0.17		55.14±10.05		18.85±5.17
Project-based		0.58±0.10		49.89±10.15		21.65±8.39
Casual		0.56±0.11		46.58±11.83		24.20±7.21
Working shift		0.66		0.40		0.62
Fixed morning		.55±.138		49.70±7.24		21.20±5.90
Fixed night		0.60±0.11		57.80±14.09		20.60±5.02
Rotating		0.58±0.11		49.78±10.46		22.63±7.40

*Obtained from Independent Sample t test or Analyse of Variance (ANOVA)

Table 2: The association Between Age, Work Experience, Work place culture, Learning from error and Reporting Rate of Medication Errors

Variables		Work place culture		Learning from error		Total Medication Error	
	Mean (±SD)	r	P-value*	r	P-value	r	P-value
Age(year)	31.68±6.79	-0.075	0.415	0.186*	0.043	-0.007	0.939
Work experience As a nurse in ICU(year)	6.1±5.14	0.018	0.847	0.155	0.094	0.023	0.809
Work place culture	0.58±0.11	1				-0.239*	0.012
Learning from error	50.15±10.39	0.441**	0.000	1		-0.312**	0.001

*Obtained from Pearson correlation

**P-value less than 0.05 considered as significant level

The correlation between workplace culture, learning from error, and reporting rate of medication errors were presented in Table 3. The linear regression model showed that only the variable of learning from error was significant among the variables of learning from errors, workplace culture, and other demographic variables; so that one-score increase in learning from error could reduce the incidence rate of medication errors by 0.19 (β=-0.26, p-value=0.013, B=-0.19).

Table 3: Multiple Linear Regression for the Association between Work place culture, Learning from errors, and Reporting Rate of Medication Errors Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	P-value
	B	Std. Error	Beta		
(Constant)	39.211	8.140		4.817	0.000
Total learning from error	-0.191	0.076	-0.265	-2.522	0.013
Age(year)	0.004	0.145	0.004	030.0	0.976
Gender	-1.691	1.749	-0.93	-.966	0.336
Work experience in ICUs (years)	0.086	0.189	0.062	0.458	0.648
History of attendance in training programs related to workplace culture	-0.009	1.647	-0.001	-0.005	0.996
History of participating in training programs related to medication errors	0.501	1.419	0.035	0.353	0.725
Work place culture	-9.503	6.977	-0.143	-1.362	0.176

a. Dependent Variable: medication errors

Discussion

The purpose of this study was to determine the correlation between workplace culture, learning from error, and reporting rate of medication errors among ICU nurses. According to the findings of this study, there was a positive correlation between workplace culture and learning from error, so that an increase in one variable could enhance the other one. This relationship also existed even by modifying the confounding variables. In a review study conducted by Davis et al. (2016), a close relationship was found between workplace culture and learning from error in way that factors associated with workplace culture could be very effective in the learning process culture. The two most important components of the workplace culture contributing to learning included organizational impacts and communication dynamics. In this respect, organizational impacts could lead to learning among nurses through empowering them to learn with the help of adequate resources, time, and staffing as well as appropriate supports; and communication dynamics could also influence learning in nurses through nurses' evaluations of peers, educators, and professionals as important elements in learning.

Moreover, consistent with the results of the present study, the findings of an investigation suggested that workplace culture was very effective in learning; in fact, it was reported that the cultural characteristics of workplace could contribute to learning process (Bell, 2013). Likewise, another study found that individuals, organizations, and teams within an organization needed to learn from errors as a way to improve patient safety although its prerequisite was the existence of appropriate workplace culture which could lead to a successful learning process. The workplace culture was also considered as the most suitable learning climate. In fact, the results of this study showed a relationship between workplace culture and learning that were in agreement with the findings of the present study (Firth-Cozens, 2001).

The results of this study also showed an inverse relationship between workplace culture and occurrence of medication errors, so that medication errors could be reduced with a proper workplace culture. In line with the findings of the present study, the investigation by Sahay et al. (2015) demonstrated that wrong workplace culture could cause fears in nurses and prevent reporting of medication errors; in contrast, several studies indicated that improving workplace culture could boost reporting rates of medication errors and consequently reduce such errors. Furthermore, the results of the study by Gulley et al. (2007) indicated that improving workplace culture could increase nurses' inclinations to report medication errors. Also, in a study by Kaissi et al. (2007) entitled as "The effect of the fit between organizational culture and structure on medication errors in medical group practices" showed that organizational structure could influence patient safety and its consequences through organizational culture; in fact, each organization with its unique culture could influence the occurrence rates of medication errors, and workplace culture needed to be considered in order to control medication errors; however, the difference between the findings of the given study and those of the present study was that organizational structure as one of the factors of organizational culture had not been addressed and organizational culture had been just generally considered.

In addition, the findings of the present study showed a significant relationship between learning from error and reporting rate of medication errors in a way that increased score of learning from error could decrease the incidence rates of medication errors. Some of the results of previous studies conducted by researchers were similar to those found in the present study; for example, in an investigation by Chang et al. (2011), a significant inverse relationship was found between learning from error and incidence rate of medications errors; so that the greater the learning from error, the lower the incidence rates of medication errors. It was mentioned that, in a context with better learning climate, communications between employees were stronger; such individuals would share errors with each other, and also they could learn about errors, which in turn could reduce the occurrence of subsequent errors.

The findings of another study also showed that the learning culture dominant in a system could be effective in preventing the occurrence of errors which could sequentially improve patient safety (Arnold, 2017).

Correspondingly, a study in contrast with the present research revealed a negative relationship between the variables of medication errors and learning climate, due to the lack of proper reporting and insufficient number of personnel (Zagheri Tafreshi, Rasoul, Zayeri, & Pazokian, 2014).

In the study by Zagheri et al. (2014), there was no significant relationship between age and learning from error; however, a significant relationship was reported between the demographic variable of age and rate of learning from error in the present study. Such a discrepancy would be due to differences in the sampling environments, but there was no significant relationship between other demographic variables, workplace culture, and medication errors. The reason for the lack of correlation could be due to differences in sampling methods.

In another research, one of the main objectives of error analysis was learning from error and it was stated that learning from error was likely to prevent or reduce the occurrence of future errors, but fears and pressures of committing errors were cited as barriers to learning (Gold, Wallage, & Van Dyck, 2016).

Limitations of the Study: Some nurses working in this research setting refused to participate in the study because they were not sufficiently assured of confidentiality of data. Via establishing friendly relationships and building trust with them, the participants were given adequate explanations of the research objectives, and they were reassured that the information about them would remain confidential, leading them to cooperate with the researchers. One of the other limitations was a very high workload in the ICUs preventing nurses from participating in the study and also responding with greater peace of mind and better concentration to the researchers' questions and consequently allocating more time to their answers. Some of the nurses involved in the present research stated that they could not fulfill the questions with proper care and attention. The high number of items was among the issues that led some nurses to avoid giving answers to questionnaires because of the high volume of items and lack of time to complete them. To control these limitations, the nurses were asked to answer the questionnaires at their rest time, at a time when their workload was low, or when they were at ease at home; in order to provide complete answers with more precision.

Conclusions

It is important to determine the relationship between workplace culture, learning from error, and reporting rate of medication errors among nurses working in ICUs. Because of the high prevalence of medication errors in medical departments, finding these correlations at an organizational level can effectively reduce the occurrence of medication errors.

Implications for nursing practice: Considering the results of this study, it can be concluded that hospital administrators and nursing directors are required to use strategies and approaches to promote workplace culture and learning from error in ICUs in order to reduce the occurrence of medication errors. To promote workplace culture and to increase learning from error, holding training courses for nurses working in ICUs and nursing students seems very useful. In fact, nursing systems should be such that the educational needs of nurses in relation to workplace culture and medication errors are met on time. Other strategies in this domain can include increased accountability through establishment of employee reward systems so that nurses reporting errors are not punished or reprimanded; in fact, error reporting is considered as a bonus not a means of blaming nurses committing errors. Friendly and trusting relationships between nursing directors, especially those between head nurses and nurses, can also contribute to the promotion of positive learning climate. The employee reward system can similarly increase nurses' motivations to report medication errors; thus, the reporting system needs to be such that the person reporting errors is not identified which can increase the reporting rates of errors. Accordingly, the approach and the functioning of reporting systems should be such that, instead of the individuals, the systems are investigated and evaluated repeatedly in order to discover and remove their problems and deficiencies on a timely manner.

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References

1. Akoz A, Yildiz V, Orun S, Turkdogan KA, Duman A. Management of Poisonous Snake Bites: Analysis of 29 Cases. J Clin Exp Invest. 2018;9(4):140-4. https://doi.org/10.5799/jcei/3998
2. Arnold, A. (2017). Building a learning culture and prevention of error - to near miss or not. Journal of Medical Radiation Sciences, 64(3), 163-164.
3. Bell, E. (2013). Organisational culture and learning: A case study. Nurse Education Today, 33(11), 1337-1341.
4. Chang, Y., & Mark, B. (2011). Moderating effects of learning climate on the impact of RN staffing on medication errors. Nursing Research, 60(1), 32.
5. Chiang, H.-Y., Lin, S.-Y., Hsu, S.-C., & Ma, S.-C. (2010). Factors determining hospital nurses' failures in reporting medication errors in Taiwan. Nursing Outlook, 58(1), 17-25.
6. Corwin GS, Mills PD, Shanawani H and Hemphill RR (2017). Root Cause Analysis of ICU Adverse Events in the Veterans Health Administration. Joint Commission Journal on Quality and Patient Safety 43(11): 580-590.
7. Davis, K., White, S., & Stephenson, M. (2016). The influence of workplace culture on nurses' learning experiences: A systematic review of qualitative evidence. JBI Database of Systematic Reviews and Implementation Reports, 14(6), 274-346.
8. Di Muzio, M., Tartaglini, D., De Vito, C., & La Torre, G. (2016). Validation of a questionnaire for ICU nurses to assess knowledge, attitudes, and behaviours towards medication errors. Ann Ig, 28, 113-121.
9. Elden, N. M. K., & Ismail, A. (2016). The Importance of Medication Errors Reporting in Improving the Quality of Clinical Care Services. Global Journal of Health Science, 8(8), 243.
10. Farag A, Blegen M, Gedney-Lose A, Lose D and Perkhounkova Y (2017). Voluntary medication error reporting by ED nurses: Examining the association with work environment and social capital. Journal of Emergency Nursing 43(3): 246-254.
11. Firth-Cozens, J. (2001). Cultures for improving patient safety through learning: The role of teamwork. BMJ Quality & Safety, 10(suppl 2), ii26-ii31.
12. Gaba, D. M. (2000). Anaesthesiology as a model for patient safety in health care. BMJ: British Medical Journal, 320(7237), 785.
13. Gold, A., Wallage, P., & Van Dyck, C. (2016). Learning from Errors: An Exploratory Study Among Dutch Auditors. Retrieved from …
14. Gorgich, E. A. C., Barfroshan, S., Ghoreishi, G., & Yaghoobi, M. (2016). Investigating the causes of medication errors and strategies to prevention of them from nurses and nursing student viewpoint. Global journal of health science, 8(8), 220.
15. Gulley, T. L. (2007). Investigation into workplace culture for medication error reporting in pharmacy: University of South Florida.
16. Henneman EA, Gawlinski A, Blank FS, Henneman PL, Jordan D and Mckenzie JB (2010). Strategies used by critical care nurses to identify, interrupt, and correct medical errors. American Journal of Critical Care 19(6): 500-509.
17. Kaissi, A., Kralewski, J., Dowd, B., & Heaton, A. (2007). The effect of the fit between organizational culture and structure on medication errors in medical group practices. Health Care Manage Rev, 32(1), 12-21.
18. Kim, L., Lyder, C. H., McNeese-Smith, D., Leach, L. S., & Needleman, J. (2015). Defining attributes of patient safety through a concept analysis. Journal of Advanced Nursing, 71(11), 2490-2503.
19. Kirwan, M., Matthews, A., & Scott, P. A. (2013). The impact of the work environment of nurses on patient safety outcomes: A multi-level modelling approach. International Journal of Nursing Studies, 50(2), 253-263.
20. Koehn, A. R., Ebright, P. R., & Draucker, C. B. (2016). Lessons Learned: Nurses' Experiences with Errors in Nursing.
21. Latif A, Rawat N, Pustavoitau A, Pronovost PJ and Pham JC (2013). National study on the distribution, causes, and consequences of voluntarily reported medication errors between the ICU and non-ICU settings. Critical Care Medicine 41(2): 389-398.
22. Noorian, M., Rassouli, M., & Kavousi, A. (2013). Nurses' perspectives on factors related to medication errors in neonatal and neonatal intensive care units. Iran Journal of Nursing, 25(80), 65-74.
23. Pazokian, M., Zagheri Tafreshi, M., & Rassouli, M. (2013). Factors Affecting Medication Errors from Nurses' Perspective: Lessons Learned. Iranian Journal of Medical Education, 13(2), 98-113.
24. Pazokian, M., Zagheri Tafreshi, M., & Rassouli, M. (2014). Iranian nurses' perspectives on factors influencing medication errors. International Nursing Review, 61(2), 246-254.
25. Rezaiamin, A., Pazokian, M., Zagheri Tafreshi, M., & Nasiri, M. (2017). The Relationship Between Work Commitment, Dynamic, and Medication Error. Clinical Nursing Research, 1054773817707290.
26. Rybowiak, V., Garst, H., Frese, M., & Batinic, B. (1999). Error orientation questionnaire (EOQ): Reliability, validity, and different language equivalence. Journal of Organizational Behavior, 527-547.
27. Sahay, A., Hutchinson, M., & East, L. (2015). Exploring the influence of workplace supports and relationships on safe medication practice: A pilot study of Australian graduate nurses. Nurse Education Today, 35(5), e21-e26.
28. Savenkova, Iryna, et al. "Large biological cycle duration in patients with respiratory organs disorders." Electronic Journal of General Medicine 15.6 (2018).
29. Stockwell, D. C., & Slonim, A. D. (2006). Quality and safety in the intensive care unit. Journal of Intensive Care Medicine, 21(4), 199-210.
30. Wakefield, B. J., Uden-Holman, T., & Wakefield, D. S. (2005). Development and validation of the medication administration error reporting survey.
31. Yilmaz, Z., & Goris, S. (2015). Determination of the patient safety culture among nurses working at intensive care units. Pakistan journal of medical sciences, 31(3), 597.
32. Zagheri Tafreshi, M., Rassouli, M., Zayeri, F., & Pazokian, M. (2014). Development of nurses' medication error model: Mixed method. Quarterly Journal of Nursing Management, 3(3), 35-50.