



The Impact of Patient Safety Climate on Medical Errors in a Sample of Nurses: Creating Safer Health Care.

Seyed Bagher Mortazavi¹, Morteza Oostakhan^{2,*}, Amirabbas Mofidi², Aliakbar Babaei³

¹ Department of Occupational and Environmental Health, Faculty of Medical Sciences, Tarbiat Modares University, Tehran, IR Iran

² Department of Occupational Health Engineering, Faculty of Medical Sciences, University of Tarbiat Modares, Tehran, IR Iran

³ Department of Industrial Design, School Of Architecture And Environmental Design, University of Science and Technology, Tehran, IR Iran

* Corresponding author: Morteza Oostakhan, Department of Occupational Health Engineering, Faculty of Medical Sciences, University of Tarbiat Modares, Tehran, IR Iran. Tel.: +98-9357900672, Fax: 982128427900, E-mail: morteza_avesta@yahoo.com.

ABSTRACT

Background: Patient safety is one of the major issues which are concerned with the World Health Organization (WHO) and the medical community in developing and developed countries. Based on Studies, about 10 % of patients admitted in hospitals will be damaged.

Objectives: The aim of this study was to evaluate patient safety climate among nurses and their roles for predicting medical errors.

Patients and Method: Questionnaire responses were obtained from 122 nurses. The questionnaire comprised four parts included 20 items related to patient safety climate, 6 items to Organizational factors, 15 items to influential factors on the incidence of medical errors and overall level of patient safety. The relationship between patient safety climate and factors in medical errors was evaluated by regression analysis using SPSS 17 software.

Results: According to the results, there was a negative relationship between patient safety climate and factors affecting the incidence of medical errors ($\beta = -0.22$, $P < 0.05$). Also, poor safety climate was established among nurses (average of less than 3.5).

Conclusions: As the nurses play direct roles associated with family members and healthcare professionals for providing safe and quality, therefore full attention to the safety climate is recommended for reducing medical errors and improving patient safety. The quality of Interactions among therapeutic members and assessing patient conditions and full dominance on treatment process will be extremely effective in health care.

Keywords: Patient Safety; Organizations; Medical Errors; Climate; Questionnaires

► Article type: Research Article; Received: 30 Sep 2012, Revised: 15 Jan 2013, Accepted: 20 Jan 2013;

► Implication for health policy/practice/research/medical education:

We believe that our work, as described in this manuscript, would be very much of interest to patient safety climate, but especially to scientists in the field of patient safety climate. Our aim is to show how health care organizations can benefit from patient safety climate. Therefore, we devise further development and application of this work to accelerate discoveries concerning patient safety climate.

► Please cite this paper as:

Mortazavi SB, Oostakhan M, Mofidi A, Babaei A. The Impact of Patient Safety Climate on Medical Errors in a Sample of Nurses: Creating Safer Health Care. *Health Scope*. 2012; 1(4):158-164. DOI: 10.17795/jhealthscope-8384

► Copyright © 2014, Health Promotion Research Center. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

1. Introduction

Patient safety is considered as an important issue in the high quality treatment systems (1). According to the report of the UK National Patient Safety Agency in 2004 and America Institute of Medicine (IOM) in 2000, medical errors cause death tolls annually (2). Medical errors are the most preventable factors for preventing patients from damage, so data analysis showed that 75% of these injuries are preventable. This error indicates a lack of focus from the therapeutic team on the current situation leading to decreasing the quality level of accountability to patient demand. Also studies show that injury-related hospitalization is between 2.9 % to 16.6 % (3). In developed countries like America, from every 100 thousand patients, 44 thousand are victims of medical errors during surgery and treatment (4). Hence the issue of patient safety climate in all healthcare centers is particularly important because it can reduce the likelihood of accidents of health system. The improvement of safety climate in the hospital needs to know about parameters such as units and personnel capabilities and the interactions among them. Patient safety is considered as a task for each person being in charge (5). Widely it has been accepted that the safety climate is an influential factor on patient safety. Influential factors in the management of adverse events in health care organizations are rooted in individual, organizational and cultural matters. Also, growing the complexity of medical services, including advanced technology, dangerous drugs, a variety of patients, multiple work processes and varied fields with high levels of expertise suggests a multi-dimensional approach in patient safety study Aase et al. (3). Factors such as the patient - nurse ratio, nursing training and hospital procedures have been known as important risk factors in patient safety (6). Generally, factors affecting the incidence of medical errors are grouped in two categories: systematic errors and individual errors (7). Hospitals are complex systems with human and technological aspects. Systematic errors may be made in the components of system such as design, equipment, procedures, operators and the environment. Conversely, Individual errors included operations that affect specialist operations.

Medical treatment management is a complex process, involving various stages and different people. As a result, medical errors are common in hospitals. Although a large proportion of errors occur during the treatment, management fall (8). Nurses are the important parts of medical errors as they are keys to care for patients in hospital.

2. Objectives

In this study, it is attempted to survey the patient safety climate among nurses and its role in forecasting medical errors in safer health care services.

3. Patients and Methods

3.1. Sample

Of approximately 475 potential nurses in a general hospital in Tehran, about 122 completed questionnaires were collected with a 26% response rate. In this study, Hospital department heads are not considered because of influx of questions surrounding supervisors. Demographic data of nurses participating in the study are presented in Table 1.

Table 1. Demographic Data of Respondents (n = 122)

Characteristics of Respondents	Frequency (%)
Age, y	
Less than 30	41 (34)
30-34	19 (15)
35-39	27 (22)
40-44	25 (21)
More than 45	10 (8)
Gender	
Female	108 (88)
Male	14 (12)
Experience	
Less than 5 years	38 (31)
6-15 years	56 (46)
16-25 years	27 (22)
More Than 26 years	1 (1)

3.2. Questionnaires

3.2.1. Patient Safety Climate

In the first part of the survey, 20 items related to patient safety climate questionnaire developed by E. KhoBHSc et al (9) was applied to conduct among the nurses. Respondents were asked to give their preferences on five points Likert scale (1 = strongly disagree to 5 = strongly agree) in order to evaluate the subject's agreement with each item. The instrument had acceptable validity and reliability ($\alpha = 0.87$).

3.2.2. Organizational Factors

Perceived organizational support (POS) and communication are the most important organizational factors always mentioned in safety climate literature (10, 11). Three items for the POS factors with the highest load factor from 0.74 to 0.83 based on the study Eisenberger, et al. 'S (12) and three items for communication factor based on the study of Hofmann and Morgeson's (11) were selected. To answer these questions, the Likert scale (1 = strongly disagree to 5 = strongly agree) were used. The reliability

test revealed proper consistency of items ($\alpha = 0.72$).

3.2.3. Factors Affecting the Incidence of Medical Errors

In this sector, the nurses were asked to identify the most important factors affecting the incidence of medical errors based on the scale (1 = very low to 5 = very high). These factors were designed for Systematic and individual factors (totally 15 items) based on the study by McBride-Henry (2005). The reliability test revealed proper consistency of items ($\alpha = 0.88$).

3.2.4. The Overall Level of Patient Safety

In this section, for comparing the safety climate level of respondents, this question was used to collect information about the nurses on patient safety: "How do you generally evaluate the patient safety level at this center?". Response options along with the 5-point scale ranged from 1 = very low to 5 = very high.

3.3. Data Analysis

Multiple hierarchical regression analysis was used to investigate the role of safety climate as a tool for identifying the factors affecting the incidence of medical errors. This analysis was conducted in two parts. In the first part of the analysis for determination of the rela-

tive impact of demographic data, factors affecting the incidence of medical errors, organizational factors and safety climate were used. Variables were entered in each step in the analysis. Demographic data were entered in the first Step and patient safety climate in the second Step. At this stage, medical error was entered as the dependent variable in SPSS software. In the second part, the overall level of patient safety as the dependent variable was entered. The demographic variables were entered in the first stage, organizational factors in the second stage and safety climate in the third stage of the program.

4. Results

The participants completed 20 items related to patient safety climate, the rate of agreement is between scales of disagree (2) and agree (4) (are averaged over 2 items). Highest level of agreement is related to an item 17 and 14 which is more than 4 (Table 2). In contrast, items 11, 6, 3, 13, 2, 10 have the lowest agreement among respondents (average less than 3). Figure 1 and 2 display the nurses' perceptions of the influential factors in the incidence of medical errors. As it is seen in the figures, Lack of adequate staffing factor and Workload is estimated to 75% and 80% respectively and have the highest impact on the incidence of medical errors.

Table 2. Respondents' Agreement With Safety Climate Attributes

Safety Climate Items	Mean±SD
1 The culture of this clinical area makes it easy to learn from the mistakes of others.	3.28 ± 0.99
2 Medical errors are handled appropriately in this clinical area.	2.65 ± 1.09
3 The senior leaders in my hospital listen to me and care about my concerns.	2.71 ± 1.14
4 Supervisors in my areas listen to me and care about my concerns.	3.69 ± 1.10
5 Leadership is driving us to be a safety-centered institution.	3.51 ± 1.03
6 My suggestions about safety would be acted upon if I expressed them to management.	2.98 ± 0.98
7 I am encouraged by my colleagues to report any safety concerns I may have.	3.26 ± 1.09
8 I know the proper channels to direct questions regarding patient safety.	3.24 ± 1.09
9 I receive appropriate feedback about my performance.	3.12 ± 1.24
10 I would feel safe being treated here as a patient.	2.45 ± 1.18
11 Briefing personnel before the start of a shift is an important part of safety.	2.98 ± 1.15
12 Briefing is common here.	3.66 ± 0.89
13 The availability of Physician is satisfactory.	3.48 ± 1.02
14 The availability of Nursing is satisfactory.	4.12 ± 0.81
15 The availability of Pharmacy is satisfactory.	3.63 ± 0.90
16 This institution is doing more for patient safety now, than it did one year ago.	3.34 ± 0.91
17 I believe that most adverse events occur as a result of multiple system failures and are not attributable to one individual's actions.	4.14 ± 0.87
18 The personnel in this clinical area take responsibility for patient safety.	3.69 ± 0.79
19 Personnel frequently disregard rules or guidelines that are established for this clinical area.	2.67 ± 1.05
20 Patient safety is constantly reinforced as the priority in this clinical area.	3.24 ± 1.07

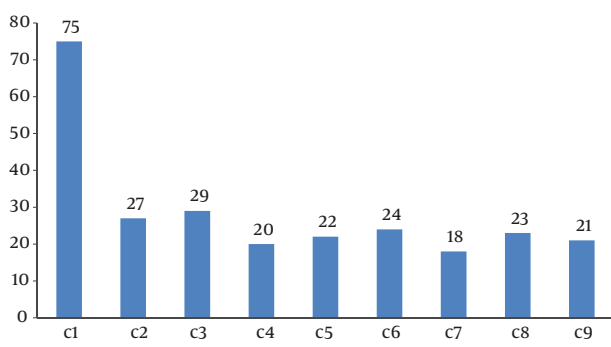


Figure 1. Percentage of People Responds to Systematic Factors as Very High

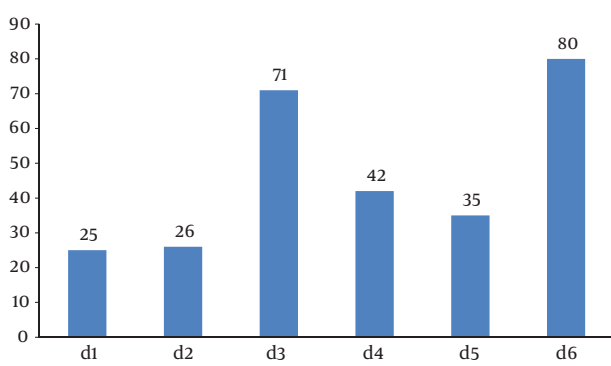


Figure 2. Percentage of People Responds to Individual Agents as Very High

Lack of adequate staffing (c1), Patient acuity levels (c2), Inadequate access to policy and medication information (c3), Physical environment (c4), Organizational culture (c5), Organizational communication channels (c6), Organizational routines (c7), Pharmaceutical related issues (c8), Incident reporting culture (c9). Understanding that how errors occur (d1), Failure to adhere to policy and procedure documents (d2), Number of

hours on shift (d3), Lack of knowledge about medications (d4), Dosage calculating (d5), Workload (d6). Mean, standard deviation and Cronbach Alpha values for each variable are shown in Table 2. Alpha values were above 0.80, indicating adequate internal consistency (13-15)(Table 3).

Table 3. Means, Standard Deviations and Cronbach Alpha

Variable	Mean ± SD	α
Age	2.54 ± 1.36	-
Gender	-	-
Work Experience	11.11 ± 6.51	-
Safety Climate	3.33 ± 0.57	0.87
Organizational Factors	3.03 ± 0.78	0.72
Medical Errors	3.93 ± 0.679	0.88

Table 4 shows that after controlling the demographic variables, there was a significant relationship between patient safety climate and influencing factors in the incidence of medical errors ($\beta = -0.22, P < 0.05$). So the hypothesis that the influential factors in the incidence of medical errors will be negatively related to patient safety climate was supported. Also, as it is indicated in Table 4, only one organizational climate factor had a significant positive relationship with influential factors in the incidence of medical errors (Communication, $\beta = 0.186, P < 0.05$; Perceived organizational support, $\beta = -0.216, p < 0.05$). The hypothesis that the influential factors in the incidence of medical errors will be negatively related to organizational climate factor, received partial support. As it is shown in Table 5, after entering the control variables, medical errors were significantly related to patient safety ($\beta = -0.225, P < 0.05$). In addition, both Communication ($\beta = 0.186, P < 0.05$) and Perceived organizational support were significantly related to patient safety.

Table 4. Hierarchical Regression Analyses – Predicting Medical Errors

Variables	B	SE	β	R ²	AdjR ²
Step 1: Controlling Variables					
Age	0.11 ^a	0.04	0.23	0.1	0.06
Gender	-0.23	0.18	-0.19		
Work Experience	0.02 ^a	0.01	0.21		
Step 2: Organizational Factors					
Communication	0.108	0.052	0.186 ^a	0.05	0.04
Perceived Organizational Support	-0.122	0.050	-0.216 ^a		
Step 3: Safety Climate					
	-0.24 ^a	0.09	-0.22 ^a	0.04	0.03

^a P < 0.05

Table 5. Hierarchical Regression Analyses – Predicting Patient Safety

Variables	B	SE	β	R ²	AdjR ²
Step 1: controlling variables					
Age	0.11 ^a	0.04	0.23		
Gender	-0.23	0.18	-0.19		
Work Experience	0.02 ^a	0.01	0.21		
				0.1	0.06
Step 2: Organizational factors					
Communication			0.186 ^a	0.052	0.108
Perceived Organizational Support	0.04	0.05	-0.216 ^a	0.050	-0.122
Step 3: Safety Climate					
	0.03	0.04	-0.22 ^a	0.09	-0.24 ^a

^a P < 0.05

5. Discussion

The main objective of this study was to investigate the relationship between patient safety climate and the incidence of medical errors in hospitals. As the findings showed, there was a significant relationship between patient safety climate and factors in the incidence of medical errors. In the present study, this amount is equal to -0.22 which expresses poor communication between the atmosphere to patient safety and medical errors in hospitals. Hence, in comparison with previous studies of safety climate (3, 9, 16) in which a positive patient safety climate was identified, there was poor safety climate in the hospital (mean = 33.3, SD = 57.0), affecting the reduction of medical errors. In other words, the weak patient safety climate will impact upon reducing medical errors. So the poor safety climate among nurses can influence on the quality of health care as one of the weaknesses. In such studies, (17, 18) it is understood that the patient safety climate among nurses was in the lower level than that of physicians and unfortunately in this study for impossibility of reviewing the patient safety climate among physicians, there was virtually no possibility of comparison between these two groups as it is the same issue of the limitations of this study. On the other hand, effective leaders play a fundamental role in promoting team performance and safety. Effective leadership is characterized by clear and unambiguous behavior which is adaptable to situational demands and shared between team members (19).

Nowadays, healthcare rapidly changes in technology, medicine and surgical and non-surgical procedures. In such complex system, managers should give priority to safety culture committee at work to achieve the best output according to prearranged goals. Nurses have Moral obligation to provide safe and quality care for their patients. Safety should be considered as a primary of medical services. There is an emphasis on understanding the structure of the

health care environment from the perspective of the treating team and reducing the damage with regard to the predictability of all the details of treatment process leading us to create more favorable environment.

Acknowledgements

The Authors Are Grateful To Faculty Of Medical Sciences Of Tarbiat Modares University For Providing Scientific And Administrative Support. The Authors Also Greatly Appreciate The Hospital Clinical Governance Office And All Nurses For Their Kind Cooperation And Participation In The Study.

Authors' Contribution

Seyed Bagher Mortazavi (30%), Morteza Oostakhan (30%), Amirabbas Mofidi (30%), Aliakbar Babaei (30%)

Financial Disclosure

None declared.

Funding/Support

None declared.

References

1. Leendertse AJ, Egberts AC, Stoker IJ, van den Bemt PM. Frequency of and risk factors for preventable medication-related hospital admissions in the Netherlands. *Arch Intern Med.*2008;**168**(17):1890-6.
2. Williams DJ. Medication errors. *J Royal College Phys Edinburgh.*2007;**37**(4):343-6.
3. Aase K, Hoyland S, Olsen E, Wiig S, Nilsen ST. Patient safety challenges in a case study hospital—of relevance for transfusion processes? *Transfus Apher Sci.*2008;**39**(2):167-72.
4. Kohn LT, Corrigan JM, Donaldson MS, America CQHC, Medicine I. *To Err Is Human: Building a Safer Health System.*2000; p.
5. Krenzischek DA, Clifford TL, Windle PE, Mamaril M. Patient safety: perianesthesia nursing's essential role in safe practice. *J Peri-anesth Nurs.*2007;**22**(6):385-92.

6. Grayson D, Boxerman S, Potter P, Wolf L, Dunagan C, Sorock G, et al. Do Transient Working Conditions Trigger Medical Errors? (Findings). 2005; p.
7. K M. Medication Administration Errors: understanding The Issues. *Adv Nurs*.2005;**23**(3):33-41.
8. R C. What Nurses Can Do Right Now to Reduce Medication Errors in the Neonatal Intensive Care Unit. *Newborn Infant Nurs Rev*.2008;**8**(2):72-82.
9. Kho ME, Perri D, McDonald E, Waugh L, Orlicki C, Monaghan E, et al. The climate of patient safety in a Canadian intensive care unit. *J Crit Care*.2009;**24**(3):469 e7-13.
10. Hofmann DA, Stetzer A. The role of safety climate and communication in accident interpretation: implications for learning from negative events. *Acad Manage*.1998;**41**(6):644-57.
11. Hofmann DA, Morgeson F. Safety-related behavior as a social exchange: the role of perceived organizational support and leader-member exchange. *Appl Psychol*.1999;**84**(2):286-96.
12. Eisenberger R, Stinglhamber F, Vandenberghe C, Sucharski IL, Rhoades L. Perceived supervisor support: contributions to perceived organizational support and employee retention. *J Appl Psychol*.2002;**87**(3):565-73.
13. Nunnally JC. *Psychometric theory*.1978; p.
14. Churchill GA, Iacobucci D. *Marketing Research: Methodological Foundations*.2009; p.
15. Sekaran U. *Research Methods for Business*.2003; p.
16. Kho ME, Carbone JM, Lucas J, Cook DJ. Safety Climate Survey: reliability of results from a multicenter ICU survey. *Qual Saf Health Care*.2005;**14**(4):273-8.
17. Sexton JB, Helmreich RL, Neilands TB, Rowan K, Vella K, Boyden J, et al. The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC Health Serv Res*.2006;**6**:44.
18. Huang DT, Clermont G, Sexton JB, Karlo CA, Miller RG, Weissfeld LA, et al. Perceptions of safety culture vary across the intensive care units of a single institution. *Crit Care Med*.2007;**35**(1):165-76.
19. Barbara Künzle, Michaela Kolbe, Gudela Grote. Ensuring patient safety through effective leadership behaviour: A literature review. *Safe Sci*.2010;**48**:1-17.

