Assessment of Patient Safety Culture among Egyptian Healthcare Employees

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Abstract

A limited amount of data exists from developing and underdeveloped nations related to patient safety culture among diverse healthcare employees. This study aimed to identify baseline perceptions and attitudes towards patient safety across healthcare disciplines at two Egyptian hospitals using a validated survey tool to allow for comparison with international benchmarks. We conducted a cross- sectional study of 250 employees, who voluntarily completed the survey over a 14-day period. Results revealed that job satisfaction scored highest among the safety domains assessed and was significantly greater than the international benchmark. Job satisfaction was followed by teamwork climate, working conditions, safety climate, and perceptions of unit management and hospital management. All mean scores for these domains were significantly greater than the international benchmarks. In contrast, the mean score of stress recognition was significantly less than the international benchmark. Respondent demographics did not influence overall safety perception measured by the six domains; however, resident physicians perceived greater collaboration and communication among team members than other position types reported. Egyptian healthcare providers reported an overall positive perception of the culture of safety. However, recognition of the negative implications of stress on patient safety among Egyptians was lower than the international benchmark. Clinical Relevance: Our study provides insight into patient safety perceptions among diverse healthcare employees in a developing nation, establishes baseline data on safety culture at two hospitals, and offers a comparison between Egyptian healthcare workers' patient safety attitudes and international benchmarks.

Keywords: Patient safety; Survey; Cultural issues; Quality and safety

Introduction

In 1999, the Institute of Medicine (IOM) [1], released a revolutionary report, To Err is Human: Building a Safer Health System, which estimated that up to one million injuries and 98,000 deaths occur in the United States due to medical errors. This report resulted in widespread media attraction and newspaper headlines. The high risks associated with receiving care in hospitals and the incidence of preventable harm astounded consumers and moved hospitals to take actions to improve patient safety. However, before improvements in safety can be identified and implemented, the culture and attitudes of safety among the hospital's employees must be understood.

WHO [2] defines patient safety as "the prevention of errors and adverse effects to patients associated with healthcare." Ensuring patient safety requires focused efforts from every member of the healthcare team. Team members must be able to recognize potentially harmful situations to prevent error and mitigate the risk of unintended consequences [3]. Therefore, determining employee attitudes towards healthcare safety culture is one factor in developing a safer environment. The Joint Commission for the Accreditation of Healthcare Organizations (TJC) defines safety culture as the product of individual and group beliefs, values, attitudes, perceptions, competencies, and patterns of behavior that determine the organizations commitment to quality and patient safety [4]. TJC, the Agency for Healthcare Research and Quality, and the U.S. National Quality Forum encourage institutions to measure safety culture [5]. Despite growing interest in measuring safety culture, substantiated safety attitude survey tools are limited.

A way to measure safety culture is through administration of the Safety Assessment Questionnaire (SAQ). Research efforts in several countries have used the SAQ to assess their health care organizations and improve upon patient safety efforts. However, a limited amount of data exists from developing and underdeveloped nations related to patient safety. One Egyptian hospital published results from the SAQ administered to nurses. The study revealed that nurses were neutral regarding the safety of the work environment. Job satisfaction, team work climate, and stress recognition rated highest on the survey [6-8]. Perceptions of management and working conditions rated lowest. Baseline assessment of patient safety culture from other members of the healthcare team is lacking.

What does this paper contribute to the wider global clinical community?

- Provides insight into patient safety perceptions among diverse healthcare employees from a developing nation.

- Establishes baseline data on safety culture using a validated survey, the Safety Attitudes Questionnaire (SAQ) Short Form, among all members of the healthcare team.

- Compares safety culture among Middle Eastern hospital employees with international benchmarks.

The aim of the study was to conduct a baseline assessment safety culture among healthcare employees at two medical institutions

in Egypt using a validated survey tool to allow for comparison with international benchmarks.

Subjects and Methods

Participants and setting

This cross-sectional study took place in two medical centers, a non-profit organization that offers services for children with cancer and a hospital that offers medical services for military personnel and their families. Two medical centers with diverse patient populations were chosen to provide a more representative sample of Egyptian healthcare workers. Full-time and part-time employees, including physicians, nurses, pharmacists, and other clinical and non-clinical staff members, at the two medical centers were eligible to voluntarily participate. The survey was administered to employees working in both the inpatient and outpatient settings over a 14-day period.

Suggested reformulation: The purpose of the survey was explained to the participants and they were notified that it was anonymous, and a verbal consent was obtained from all participants.

Study instrument

The Safety Attitudes Questionnaire is a validated survey created by The University of Texas Center of Excellence for Patient Safety Research and Practice [9]. The SAQ is based on two conceptual models, Donabedian's conceptual model for assessing quality and the Vincent's framework for analyzing risk and safety [6,7]. The SAQ short form is an abbreviated version of the SAQ with 36-questions. 31 questions elicit caregiver attitudes in six domains: teamwork climate, perceptions of management, safety climate, stress recognition, job satisfaction, and work environment, and five questions measure perception of communication and collaboration. Unlike many other safety culture surveys, the SAQ survey has been widely used in diverse settings such as the intensive care unit, operation room, general inpatient settings, and ambulatory clinics. Because of the wide-spread use, benchmarking data is available [9,10]. Sexton et al published international benchmarking data involving 10,843 healthcare providers from 203 clinical areas across three countries [8]. A subsequent study pooled the international data and determined an overall mean and 95% confidence interval for each safety domain [9]. We chose to administer the SAQ short form because the SAQ has demonstrated sound psychometric properties and allows for a comparison with other institutions, it is adaptable to any practice setting, and the survey authors provide a scoring key for the questionnaire [11].

The survey was translated into Arabic for participants who were not proficient in English. The translation was completed by a hospital translator and tested on ten English and Arabic speaking employees to determine the consistency of the translation between the English and Arabic version, comprehension, and clarity of the survey. Participants were able to complete the survey either on paper or electronically. All paper surveys were transcribed electronically.

Each item on the SAQ is measured using a five-point Likert scale, organized as follows: 1) Disagree strongly, 2) Disagree slightly, 3) Neutral, 4) Agree Slightly, and 5) Agree Strongly; not applicable does not score. The 100-point scale score was calculated for individual responses with the conversion to the 100-point scale: 1=0, 2=25, 3=50, 4=75, and 5=100. Items 2, 11, and 36 were reversely scored as follows: 1=100, 2=75, 3=50, 4=25, and 5=0. Calculations were made by summing the answers of the items in each section and dividing the result by the number of all items in that domain. The score ranges from a scale of 0-100, with 0 corresponding to the worst perception of climate and 100 corresponding to the best perception.

Data analysis

Descriptive statistics for frequencies were used to compare participants' background information. To detect differences from other cultures, the safety scores of Egyptian healthcare employees were compared with international benchmark safety domains [9]. In addition, associations of mean scores of each SAQ safety domain were analyzed. To compare mean scores between the safety scores of Egyptian healthcare employees and SAQ international benchmark safety domains, 95% confidence intervals were produced. Independent t-test and one-way analysis of variance (ANOVA) were performed to detect any differences between the mean scores of each safety domain according to demographic characteristics. Tukey's multiple comparison tests were produced for each level of the main effect if the result of ANOVA was significant for each characteristic. In addition, Pearson's correlation coefficient was used to detect correlation between the safety culture dimensions. Analyses were performed with SAS version 9.4 (SAS Institute, Cary, NC).

Results

A total of 250 employees participated in the study with an overall response rate of 22.2% for the children's hospital and 26.7% for the military hospital. The majority of participants were female (53%),

Characteristics	Frequency (%)
Gender	
Female	126 (53.4)
Male	110 (46.6)
Years in specialty	
Less than 6 months	15 (6.0)
6-11 months	22 (8.8)
1-2 years	43 (17.2)
3-4 years	60 (24.0)
5-10 years	67 (26.8)
11-20 years	30 (12.0)
21 or more years	13 (5.2)
Position	
Administrative support	6 (2.4)
Attending/Staff physician	19 (7.6)
Dietician/Nutritionist	1 (0.4)
Fellow Physician	6 (2.4)
Manager	2 (0.8)
Nurse Manager/Charge Nurse	26 (10.4)
Pharmacist	65 (26.0)
Professional Nurse	70 (28.0)
Resident Physician	27 (10.8)
Technical Nurse	3 (1.2)
Technologist/Technician	4 (1.6)
Other	21 (8.4)
Primarily work with	
Inpatients	140 (56.0)
Outpatients	83 (33.2)
Other	27 (10.8)
Survey conducted before[2]	
Yes	65 (100)
[1]frequency missing=14, [2]Frequency missing=185	

Table 1: Baseline characteristics for the study population (n=250).

pharmacists and nurses (64%), caring for inpatients (56%) with three or more years of experience in their respective field (68%). Table 1 demonstrates baseline characteristics for the study population.

Table 2 compares the results of the Egyptian safety healthcare scores to the international benchmarks. Job satisfaction (81.1) among the Egyptian safety healthcare employees scored highest and was significantly greater than the international benchmark (63.6). Job satisfaction was followed by teamwork climate (78.2), working conditions (75.2), safety climate (73.9), perception of unit management (68.6) and hospital management (67.6). All mean scores were significantly greater compared to the international benchmarks (p<0.05). In contrast, the mean score of stress recognition (53.1) was significantly less than international benchmark (67.8, p<0.05). Table 3 shows the correlations between each safety domain scores. Overall and individually, the safety culture dimensions showed strong positive correlations (p<0.001).

As shown in Table 4, overall perception of safety did not vary by gender, years in practice, discipline, or work area. Though the overall mean scores for employees working with outpatients and in an area of other differed significantly between the work areas, the mean score was not significantly different than the overall mean score of 71.2. Attending and staff physicians reported being more satisfied with their jobs than the other study participants (p=0.001). A more positive perception of hospital management was reported by participants with less than six months in the specialty and a position type of other (p=0.03, 0.02, respectively). Participants working in a setting other than inpatient or outpatient reported a more favorable perception of unit management than the other study participants (p=0.04). Analysis of the collaboration and communication questionnaire items that were not assigned to one of the six domains revealed a difference in perception among caregiver type. Resident physicians (mean score=91.7) scored collaboration with staff physicians higher than their nursing colleagues (mean score=75.4, p=0.01) and the mean score of resident physicians was higher than

other participants (mean score=82.2, p=0.001), but the mean score of nursing colleagues was less than other participants (mean score=82.2, p=0.03). Resident physicians also scored communication higher than the other positions did (p=0.001). Overall mean scores for collaboration and communication were higher among resident physicians (p=0.005) (Table 4).

Discussion

This study assessed the safety culture among employees in two medical institutions in Egypt. A similar study was completed at a university hospital in Egypt; however, the SAQ was administered to single discipline-nurses [8]. Our study aimed to determine the perception of safety culture across all members of the healthcare team.

Our results indicate a collaborative work environment with strong teamwork and a positive culture of safety in the hospitals surveyed. We are encouraged because higher teamwork climate is associated with higher quality of care [10]. Specifically, hospitals with a positive safety climate show reduced post-operative complications, medication errors, and patient safety incidents [12-14]. Alternatively, hospitals with poor safety climate are known to provide poorer quality of care as evidenced by two studies that demonstrated that a worse perception of safety increased readmission rates and length of stay [15,16].

Participants showed positive perceptions of five domains including job satisfaction, teamwork climate, working conditions, management and safety climate. These results were congruent to similar studies conducted in the Middle East which also found a positive perception of these five domains [8,17-19]. Conversely, a study conducted in Iran revealed a negative perception of safety climate among physicians and nurses practicing in the Intensive Care Unit. This study found that all domains needed improvement. It also revealed several safety concerns within the hospital including under-reporting of errors due to fear of reporting, low job satisfaction, and poor communication between nurses and physicians. The authors suggested that these

SAQ Safety domain, mean (95%CI)							
International benchmark[1]	**Teamwork climate**	**Safety climate**	**Job satisfaction**	**Stress recognition**	**Perceptions of management (unit)**	**Perceptions of management (hospital)**	**Working conditions**
	68.5 (68.0-68.9)	65.9 (65.5-66.3)	63.6 (63.0-64.1)	67.8 (67.3-68.3)	46.4 (45.9-46.8)		55.9 (55.3-56.4)
Egyptian healthcare professionals	78.2 (76.1-80.3)* SD=16.1	73.9 (71.9-75.9)* SD=15.6	81.1 (78.8-83.5)* SD=18.5	53.1 (49.8-56.4)* SD=25.9	68.6 (66.0-71.3)* SD=20.7	67.6 (64.9-70.4)* SD=21.7	75.2 (72.4-78.0)* SD=22.3

Note: Additionally, the mean and standard deviation of overall dimensions was 71.2 and 12.1 respectively
*p<0.05, the means are significantly different from international benchmark when there is no overlap between CI

Table 2: Comparison of Egyptian healthcare professional safety scores with international benchmark for safety domain in SAQ [10][1].

	Teamwork climate	**Safety climate**	**Job satisfaction**	**Stress recognition**	**Perceptions of management (unit)**	**Perceptions of management (hospital)**	**Working conditions**
Teamwork climate	-	-	-	-	-	-	-
Safety climate	0.50**	-	-	-	-	-	-
Job satisfaction	0.36**	0.49**	-	-	-	-	-
Stress recognition	-0.30**	-0.23*	-0.037	-	-	-	-
Perceptions of management (unit)	0.29**	0.41**	0.33**	0.023	-	-	-
Perceptions of management (hospital)	0.24*	0.39**	0.39**	-0.012	0.78**	-	-
Working conditions	0.27**	0.43**	0.45**	-0.054	0.56**	0.59**	-

Note: Pearson correlation, **Correlation is significant (p<0.0001), *Correlation is significant (p<0.001)

Table 3: Correlation between safety culture dimensions.

Characteristics Mean (SD)	Teamwork climate	Safety climate	Job satisfaction	Stress recognition	Perceptions of management (unit)	Perception s of management (hospital)	Working conditions	Overall dimensions
Gender								
Female	77.6 (16.6)	74.6 (14.6)	80.2 (19.6)	51.0 (26.7)	69.8 (22.1)	69.0 (22.3)	74.0 (25.3)	71.1 (13.0)
Male	78.8 (15.9)	73.7 (16.6)	81.7 (17.9)	55.8 (25.0)	67.6 (19.6)	66.3 (21.2)	76.9 (18.9)	71.5 (11.2)
Years in specialty								
Less than 6 months	73.8 (19.0)	75.8 (14.1)	82.8 (17.3)	55.8 (27.2)	79.1 (14.9)	79.8 (15.4)[1]	74.4 (22.2)	74.5 (11.0)
6-11 months	78.0 (17.1)	75.3 (17.6)	83.1 (17.2)	54.2 (20.3)	62.0 (25.6)	62.3 (16.2)	77.7 (16.1)	70.4 (9.6)
1-2 years	81.4 (13.4)	73.4 (16.1)	80.3 (19.4)	56.7 (22.5)	71.6 (20.3)	66.2 (25.8)	72.9 (26.8)	71.9 (13.2)
3-4 years	77.6 (14.8)	73.2 (12.8)	76.3 (17.8)	51.1 (24.6)	67.2 (17.9)	64.9 (20.1)	72.3 (21.5)	69.4 (12.4)
5-10 years	75.9 (18.1)	72.5 (17.0)	80.7 (20.6)	53.7 (27.9)	69.2 (20.0)	68.6 (20.8)	77.5 (21.3)	71.1 (11.5)
11-20 years	81.9 (14.3)	76.3 (14.7)	87.8 (11.5)	43.9 (30.5)	65.6 (21.5)	69.4 (25.0)	76.4 (22.7)	71.2 (11.3)
21 or more years	79.2 (18.2)	76.8 (19.4)	87.3 (21.2)	63.1 (26.9)	68.1 (29.0)	70.6 (23.5)	78.2 (25.8)	74.4 (17.9)
Position								
Attending/Staff physician	85.2 (14.8)	76.7 (17.7)	90.7 (10.2)[1]	62.6 (25.7)	69.0 (18.0)	67.3 (14.9)[2]	82.7 (16.4)	76.1 (10.9)
Nurse Manager/ Charge Nurse	77.8 (15.4)	76.9 (12.4)	78.8 (17.2)	51.0 (22.9)	71.7 (15.4)	70.9 (19.9)[2]	78.5 (19.7)	73.3 (9.5)
Pharmacist	77.6 (13.9)	72.6 (16.5)	80.4 (17.5)	51.6 (26.5)	65.7 (19.7)	62.7 (21.4)*[2]	69.0 (25.1)	68.5 (11.4)
Professional Nurse	74.7 (15.8)	72.6 (14.2)	80.7 (15.8)	55.3 (23.6)	67.0 (21.8)	67.0 (21.3)[2]	76.2 (19.8)	70.6 (11.8)
Resident Physician	81.9 (14.3)	75.8 (14.2)	77.5 (20.4)	50.0 (24.5)	66.4 (20.7)	62.1 (13.1)*[2]	75.9 (14.3)	70.0 (9.4)
Other	79.7 (20.5)	73.7 (18.0)	82.2 (25.0)	50.8 (31.1)	74.9 (23.3)	77.6 (27.4)*[1,2]	77.1 (27.9)	73.7 (15.8)
Primarily work with								
Inpatients	80.0 (15.1)	75.1 (14.9)	82.3 (17.4)	51.7 (26.4)	68.6 (20.8)[2]	68.5 (20.0)[2]	76.0 (21.5)	71.9 (11.3)[2]
Outpatients	74.7 (14.4)	70.8 (15.6)	78.6 (17.5)	55.1 (24.1)	65.8 (19.1)*[2]	63.8 (23.7)*[2]	72.0 (22.7)	68.7 (12.8)*[2]
Other	79.4 (23.7)	77.3 (18.0)	82.4 (26.1)	54.4 (29.1)	77.1 (22.7)*[1,2]	75.2 (22.3)*[2]	80.7 (24.7)	75.2 (12.9)*[2]

Note: 6 subcategories of position with less than a frequency of 5% (Administrative support, Dietician/Nutritionist, Fellow Physician, Manager, Technical Nurse, Technologist/ Technician) were merged with subcategory (other) in position
*p<0.05, Tukey's multiple comparison tests were produced for each level of the main effect if the result of ANOVA was significant for each characteristic
[1] p<0.05, independent t-test was used for comparing mean scores between each level of main effect and each safety domain
[2] p<0.05, ANOVA
Table 4: Association of mean scores of each safety culture dimension according to demographic characteristics.

results were different from benchmarking data due to both cultural and organizational differences in Iran [20].

Perception of unit and hospital management was also positive and was scored highest among participants working in an area other than an inpatient or outpatient setting. This finding is consistent with a study that explored ways in which safety climate varied among healthcare employees in 92 hospitals in the United States [21]. They too found that non-clinical workers perceived senior management engagement in patient safety as more positive than clinical employees. Perception of unit and hospital management was also more positive among employees with less than six months in the specialty. This finding may be due to inadequate time in the hospital to fully assess safety climate. With more sufficient time in the hospital, perceptions may change. Additionally, new practitioners may be less sensitive to safety issues.

A negative perception of stress recognition was found and was similar to other studies completed in Egypt and the Middle East [8,18]. Notably, the stress recognition domain is different than the other domains. The purpose of this domain is for self-assessment in stressful situations that may place the individual at heightened vulnerability for committing an error while the other domains elicit perspectives about the work area and broader organizational unit. Similar to our findings, a study of nurses working at a tertiary hospital in Saudi Arabia revealed a negative perception of stress recognition and significantly positive correlations for the remaining safety domains [18]. Furthermore, a study of 65 nurses in Egypt showed a low score for stress recognition and significantly positive correlations for the remaining safety domains [9].

The influence of stress recognition on safety climate is debatable. Taylor et al. [22] found that stress recognition was a weak fit compared to the remaining five subsets, which were highly correlated, and suggested that the stress recognition domain should be excluded from the SAQ assessment. These findings are supported by the work of Gallego et al. and Pettker et al. [23,24]. Their studies also suggest that stress recognition may not be a useful subset to include in the SAQ because it may not offer an accurate evaluation of the overall safety climate in an institution. Despite evidence suggesting a lack of correlation between safety climate and stress recognition, it remains important to measure employees' understanding that high stress situations may place them at risk for harming patients.

Demographics did not influence perception of safety culture as measured by the six domains. Perceptions of communication and collaboration, which are measured outside of the six domains, did vary by position type. Resident physicians reported better interprofessional communication and collaboration than other team members expressed. Notably, resident physicians reported significantly better collaboration with staff physicians than other disciplines did while nurses scored the least among other disciplines regarding this questionnaire item. Because research indicates that interprofessional collaboration improves the quality and safety of patient care, further investigation into the reasons nurses perceive less positive collaboration with staff physicians is needed.

Limitations

No study is without limitations. 250 staff members from both centers participated in this study. Given the low response rate, the results cannot be generalized to other institutions in Egypt. Another potential limitation is the use of a combination of positively worded and negatively worded survey statements which may have affected the internal consistency of the rating scale. Last, variations among the two institutions were not accounted for while conducting the study.

Conclusion

Egyptian healthcare providers reported an overall positive perception of the culture of safety. However, recognition of the negative implications of stress on patient safety among Egyptians was lower than the international benchmark. Further work is needed to understand the low mean scores in the stress recognition domain. Additionally, this area may represent an educational opportunity. Gender, years in the profession, and position type did not influence the respondent's view of safety. Unfortunately, the survey response rate was low. Additional studies are needed in other geographic regions and varied health-care settings in order to generalize the results to other hospitals in Egypt.

Ethical Approval

Institutional Review Board or similar approval body was received from the institutions involved.

Relevance to Clinical Practice

This study provides additional data on the attitudes of all healthcare and non-healthcare staff members in two institutions in Egypt. The findings are important in order to identify areas of additional training and education to multidisciplinary teams and non-healthcare members in the institution. Our study revealed that Egyptian healthcare workers were less appreciative of the negative impact of stress on performance. Stress is known to result in poor work performance and decision-making, decreased concentration, lack of motivation and anxiety, all of which could result in errors caring for Ref. [25]. Given the negative implications of stress, implementation of strategies to promote recognition and reduction of stress are necessary. Stress recognition training sessions and continuous education, as well as avoidance of stress triggers like fatigue and inadequate staffing, are likely to improve patient care [26,27].

Funding

References

1. Kohn LT, Corrigan JM, Donaldson MS (2002) To err is human: building a safer health system. NAP 6.

2. The World Health Organization (WHO) (2017) Patient Safety. Denmark, World Health Organization.

3. Colla JB, Bracken AC, Kinney LM, Weeks WB (2005) Measuring patient safety climate: a review of surveys. Qual Saf Health Care J 14: 364-366.

4. https://www.jointcommission.org/sea_issue_57/

5. Nieva VF, Sorra J (2003) Safety culture assessment: a tool for improving patient safety in healthcare organizations. Qual Saf Health Care 12: 17-23.

6. Donabedian A (1988) The quality of care. How can it be assessed? J Am Med Assoc 260: 1743-1748.

7. Vincent CA, Adams ST, Stanhope N (1998) Framework for analyzing risk and safety in clinical medicine. BMJ 316: 1154-1157.

8. Abdou H, Saber KA (2011) Baseline assessment of patient safety culture among nurses at student university hospital. WJMS 6: 17-26.

9. Sexton JB, Helmreich RL, Neilands TB, Rowan K, Vella K, et al. (2006) The safety attitudes questionnaire: psychometric properties, benchmarking data, and emerging research. BMC Health Serv Res 6: 1- 44.

10. Relihan E, Glynn S, Daly D, Silke B, Ryder S (2009) Measuring and benchmarking safety culture: application of the safety attitudes questionnaire to an acute medical admissions unit. Ir J Med Sci 178: 433-439

11. https://med.uth.edu/chqs/files/2016/06/SAQ-Short-Form-Scale-Items_000-updated-6.27.16.pdf

12. Hofmann DA, Mark B (2006) An investigation of the relationship between safety climate and medication errors as well as other nurse and patient outcomes. Pers Psychol 59: 847-869.

13. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, et al. (2011) Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention. BMJ Qual Saf 20: 102-107.

14. Mardon RE, Khanna K, Sorra J, Dyer N, Famolaro T (2010) Exploring relationships between hospital patient safety culture and adverse events. J Patient Saf 6: 226-232.

15. Huang DT, Clermont G, Kong L, Weissfeld LA, Sexton JB (2010) Intensive care unit safety culture and outcomes: a US multicenter study. Int J Qual Health Care 22: 151-161.

16. Hansen LO, Williams MY, Singer SJ (2011) Perceptions of hospital safety climate and incidence of readmission. Health Serv Res 46: 596-616.

17. El-Jardali F, Jaafar M, Dimassi H, Jamal D, Hamdan R (2010) The current state of patient safety culture in Lebanese hospitals: a study at baseline. Int J Qual Health Care 22: 386-395.

18. Aboshaiqah AE (2013) Barriers in reporting medication administration errors as perceived by nurses in Saudi Arabia. Middle East J Sci Res 17: 130-136.

19. Aljadhey H, Al-Babtain B, Mahmoud M, Alaqeel S, Ahmed Y (2016) Culture of safety among nurses in a tertiary hospital in Saudi Arabia. Trop J Pharm Res 15: 639-644.

20. Abdi Z, Delgoshaei B, Ravaghi H, Abbasi M, Heyrani A (2013) The culture of patient safety in an Iranian intensive care unit. JNM 23: 333-345.

21. Singer SJ, Gaba DM, Falwell A, Lin S, Hayes J (2009) Patient safety climate in 92 US hospitals: differences by work area and discipline. Med Care 47: 23-31.

22. Taylor AJ, Pandian R (2013) A dissonant scale: stress recognition in the SAQ. BMC Res Notes 6: 302.

23. Pettker CM, Thung FS, Raab CA, Donohue KP, Copel JA, et al. (2011) A comprehensive obstetrics patient safety program improves safety climate and culture. Am J Obstet Gynecol 204: 216-e1.

24. Gallego B, Westbrook MT, Dunn AG, Braithwaite J (2012) Investigating patient safety culture across a health system: multilevel modelling of differences associated with service types and staff demographics. Int J Qual Health Care 24: 311-320.

25. Moustaka E, Constantinidis TC (2010) Sources and effects of work-related stress in nursing. Health Sci J 4: 210-216.

26. Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, et al. (2004) Effect of reducing interns' work hours on serious medical errors in intensive care units. NEJM 351: 1838-1848.

27. Garret C (2008) The effect of nurse staffing patterns on medical errors and nurse burnout. AORN 87: 1191-1204.