



INVESTIGATING GENERAL HEALTH AMONG TECHNOLOGISTS IN THE OPERATING ROOM

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ARTICLE INFO

Received:

14th July 2016

Received in revised form:

02th Apr 2017

Accepted:

28th Apr 2017

Available online:

29th May 2017

Keywords: general health, technologists, operating room .

ABSTRACT

Background: general health of operating room technologists who work as part of the medical team directly affects the provision of high quality and safe care for patient and reduces medical errors. This study was conducted to examine the general health of technologists of operating room in educational hospitals of Iran University of Medical Sciences has been made.

Methods and materials: In this study, 194 technologists of operating room in educational hospitals of Iran University of Medical Sciences in 2016 were studied. Data were collected through two questionnaires of demographic information and GHQ-28 general health and they were analyzed using F (ANOVA) test, Scheffe test, and independent t-test.

Results: The mean age of operating room technologists was 31.5 years. In this study, 154 people (79.4%) were women and 40 people (20.6%) were men, out of which 155 (79.9%) had bachelor degree in operating room and 39 people (20.1%) had an associate degree in operating room. In this study, 129 (66.5%) operating room technologists had severe degree of general health dysfunctions and 65 of them (33.5%) had a favorable general health state. The most frequency related to social dysfunction (60.8%) and the lowest was related to depression area (12.9%). Mean scores on the general health of men and women was statistically different ($P = 0.014$) so that women had lower level of general health compared to men, but no significant difference was found in mean scores of general health of people in terms of education level ($p=0.162$) and marital status ($p=0.078$).

Conclusion: according to the results obtained from this study, the majority of the operating room technologists have the dysfunction in general health level, therefore, it is suggested to take measures to prevent or reduce occupational hazards to increase general health among operating room technologists by providing a variety of educational programs and strategies.

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To Cite This Article: Fariba Nasir Ziba, Mohammad Faryab Asl ¹, Sedigeh Hanani, Hamid Haqqani (2017), "Investigating General Health Among Technologists In The Operating Room", *Pharmacophore*, **8(3)**, 11-18.

Introduction

According to the World Health Organization, health is not just the absence of disease and disability, but it is a state of complete physical, mental and social welfare (1). Mental health, as one of the aspects of general health, plays an important role in the life of every person and it is defined as an emotional and social state in which one is able to understand his abilities, to control natural stresses of his life, to perform the tasks effectively, and to play his role in society (2-4). One of

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the factors affecting the health is stress that the type and nature of each person's job is among the factors creating it. In this regard, the profession of nursing, especially operating room nursing (Operating room technologist), is considered among the stressful professions (5-6). In the operating room as a social environment, there are various factors contribute to stress such as the technical complexities in surgical procedure, unforeseen problems such as bleeding, and defect in operating room equipment, time limitation and distracting factors (7-9). These factors could potentially affect all people in a team and cause negative effects on mental health and the performance of people, so they lead to medical errors, reduced quality in the care of the patient, and endangered safety of patients (10-13). Another important issue in mental health of nurses is depression in these professional groups. (14) Work shift especially night shift leading to sleep disorders can lead to depression even in people who have no history of depression (15-18). Depression reduces the concentration of people, reduces their performance in doing the tasks and reduces interpersonal functioning (19-20). The interpersonal functioning considered as an important cognitive skills and interpersonal relationships in operating room means work effectively in a team consisting of several specialties, having control on communications and stressful events that is considered as an effective factor on the quality of surgery (21-25). Another dimension of general health is physical dimension. Daily, a large number of people who work in the operating room is affected by several injuries and damages (26). Damages caused by the sharp tools are the second common cause of damage in health-medical centers in the world, and about 384000 damages created by needle in hospitals, 23% of them occurs during surgery in the operating room (27-28). Operating room technologists may experience damage caused by needles and sharp objects and tools through doing works like injection, separating the needle head, helping the surgeon during the operation, the cleaning of surgical instruments and other related activities. In addition, technologists in the operating room are at high risk of other physical damages such as damage through contact with blood and body fluids and musculoskeletal injuries that these injuries lead to reduced productivity and spending much for treatment. American Community of Safety Engineers in 2013 released a report that says: health sector employees have spent 2 millions dollars per working day equivalent to 13.1 Millaird dollars due to damages to them in their working environment (29-31). As technologists of operating room should fulfill their responsibilities under physical and mental damages, these damages could have a negative impact on patient safety. As it seems that no research has been conducted so far on general health of technologists in operating in Iran, researchers in this study examined the general health of technologists of operating room in Iran educational hospitals of Medical Sciences.

Methods And Materials

The study is part of results of a master's thesis conducted in a descriptive – analytical way to examine the general health of operating room technologists in educational hospitals of Iran University of medical sciences in year 2016-2016. Sample of research in this study included 194 technologists in the operating room that this number of sample was determined at 95 percent confidence level, and 80% test power assuming that the correlation between research variables is at least $r = 0.2$, so that the relationship to be considered statistically significant. It was calculated according to the formula: ($r=0.2$)

$$\omega = \frac{1}{2} \ln \frac{1+r}{1-r} \quad \omega = \frac{1}{2} \ln \frac{1+0.2}{1-0.2} = 0.202$$
$$n = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2}{\omega^2} + 3 = \frac{(1.96 + 0.84)^2}{(0.202)^2} + 3 = 194$$

Inclusion criteria of study in this research included having associate degree and bachelor degree in operating rooms and the exclusion criteria of study included non-cooperation in filling out the questionnaire, incomplete filling out of the questionnaire, and lack of returning the questionnaire during the study. Data were collected using demographic information questionnaire and general health questionnaire of Hiller and Goldberg (GHQ-28) and all questionnaires were completed by the participants in the study and with their consent.

1- The demographic information questionnaire including questions on gender (male / female), age (in years), work experience (in years), marital status (single / married), work shifts (morning / afternoon / evening / morning and afternoon / evening and night / in rotation), education (associate degree in operating room / bachelor degree in operating room), and working hours (in hours per week).

2-The order to assess the general health of the subjects, General Health Questionnaire of Goldberg and Hiller (GHQ-28) was used. 28 items-General Health Questionnaire was developed by Goldberg and Hiller in 1979, which has 4 subscales of physical symptoms, anxiety symptoms and sleep disorders, disorder in social functioning and depression symptoms (32- 33). Out of 28 items of questionnaire, items 1 to 7 related to physical symptoms scale, items 8 to 14 related to anxiety symptoms and sleep disorders, items 15 to 21 related to assessing the symptoms of social functioning and finally, items 22 to 28 measures symptoms of depression.

All questions have 4 options in which scores zero, 1, 2, and 3 are assigned to options A, B, C, and D, respectively. In each scale, score 6 and higher and in total, score 22 and higher represent symptoms of a disease. Therefore, one's score varies from 0 to 84 (34). Nazifi et al in their study to determine the validity, reliability and factor structure of Persian version of this questionnaire announced Cronbach's alpha of subscale of physical symptoms (0.865), anxiety and sleep disorder (0.883), disorder in social functioning (0.746) and severe depression (0.897) and it was reported 0.923 for overall scale (35).

In the present study, the validity of the questionnaire was obtained 0.928 using Cronbach's alpha and to determine the content validity of tool, content validity relative (CVR) and content validity index (CVI) were used. In this study, 10 experts were used to determine the validity that acceptable CVR for this number is 0.62 and the minimum acceptable value for CVI is equal 0.79 (36-37). According to the results obtained from all questions of General Health Questionnaire of Goldberg and Hiller (GHQ-28), the minimum acceptable CVR was obtained (0.62), so there was no need to remove any of the questions and content validity index (CVI) obtained from mean of questions acceptable for General health questionnaire of Goldberg

and Hiller is $CVI = 0.83$. To conduct the research, after the final approval of the proposal, researcher referred to the Department of Education of University and received the introduction letter required to provide it for educational hospitals of Iran University of Medical Sciences. After referring to research subjects, to get the permission of officials, the required explanations on the implementation of this study were provided for hospital management and nursing office. Then, researcher referred to operating room department and the objective of research was explained for technologists and their informed consent to participate in the study was taken. In the next stage, to complete the questionnaires, questionnaires were distributed by observing moral considerations and after completing the questionnaires, they were collected on the same day.

For data analysis, descriptive and inferential statistical methods were used. To describe the subjects of the study, frequency distribution tables, and central and dispersion indices were used and in inferential statistics, F (ANOVA) test, Scheffe test, and independent t-test were used. Data were analyzed through spss 19 software.

Results

Results showed that the mean age of subjects was 31.5 years, that majority of them were under 30 years of age, and (43.8) 85 of them were single and (56.2) 109 of them were married. In this study, (79.4%) 154 subjects were female and (20.6%) 40 of them were male. Among them, (79.9%) 155 subjects had bachelor degree in operating rooms and (20.1%) 39 of them had associate's degree in the operating room. In terms of work experience, (41.8%) 81 of subjects were less than 5 years of old, (26.3%) 51 subjects had work experience between 5 and 9 years, and the rest of them had work experience for 10 years and over 10 years in the operating room, and the majority of the subjects ($n = 100$) (51.5%) had working hours between 50-40 hours per week and had rotation shift (58.8%) 114 (table 1). Investigating the general health of the subjects in the study showed that (66.5%) 129 of operating room technologists have a degree of health disorders and 65 (33.5%) of them have good general health. Among the areas of general health questionnaire GHQ-28, the highest frequency was related to social dysfunction (60.8%) and the lowest was related to depression area (12.9%) (Table 2). To determine the relationship between general health and three variables of gender, marital status and education level, independent t-test was used. The results suggest that the mean scores of general health in both men and women had statistically significant differences ($P = 0.014$) and women compared to men had lower general health, so that 1.3% of the population of women had severe disorders and general health, while none of the men had severe health disorders. In addition, in mean scores of general health of people, statistically significant differences were not observed in terms of education ($P = 0.162$) and marital status ($P = 0.078$) (table 3). To determine the relationship between the general health and other individual and occupational variables, analysis of variance (ANOVA) and Scheffe test were used. The results of Scheffe test in terms of the age showed that people less than 30 years compared to people over 30 years had lower general health ($p < 0.001$), while the mean general health in people between 30-39 years and that in people over 40 years had no statistically significant difference ($P = 0.076$). Investigating the work experience using Scheffe test showed that the mean general health score in people with work experience of less than 5 years and people with work experience of 5-9 years and that in people with work experience of more than 10 years was statistically significant different ($P\text{-value} = 0.003$) so that people with work experience less than 5 years and people with work experience between 5-9 years had a lower general health (symptoms of a disease) compared to people with work experience over 10 years, but the mean general health among people with work experience less than 5 years and that in people with work experience of 5-9 years had no statistically significant difference ($p = 0.996$). Investigating the amount of working hours using Scheffe test showed that the mean score of general health in people with working hours between 40 and 45 hours per week and that in people with working hours more than 50 hours had statistically significant difference ($p = 0.009$), so that people who have working hours more than 50 hours a week had a better general health than those with working hours between 40 and 50 hours. The mean general health in people with working hours between 30 and 40 and that in people with work experience higher than 40 hours had no statistically significant differences ($p = 0.414$). Scheffe test results showed that the mean score of the general health in any other work shifts had no significant differences with each other ($p = 0.122$) (table 4).

Discussion

The results of our research suggest that most of the operating room technologists (66.5%) have some degree of disorder in general health and only 33.5% of them are healthy. There are several factors that have a negative and destructive impact on mental health of operating room technologists, including the damage caused by sharp instruments, needles, and being faced with blood and body fluids that may carry contagious and infectious diseases. These events occur frequently in hospitals (29)(38), and studies show that the operating room is a place where the highest skin damages caused these cases occur (39). In addition, technologists in the operating room due to nature of some operations are affected with various types of muscular and skeletal injuries. For example, studies show that in laparoscopy operations as most of people use neck and trunk during surgery are affected with shoulder stiffness (40). Therefore, these reasons can be justification for physical disorders (40.2%). In the present study, 90 persons experienced anxiety and sleep disorder that this issue could be due to the shift nature of the work in the operating room. From the perspective of mental health staff who work in shift have more mental illnesses and they affected with more psychological disturbances such as anxiety (15)(41). In addition, the operating room technologists are faced with many stress causing factors such as varying working shifts, dealing with ill and dying people, coping with the demands of doctors and patients and change in health care policies (42). In our study, the lowest mean score related to depression disorder with frequency of 12.9%, and the highest one related to social dysfunction with frequency of 60.8%, respectively, which it is in line with results of the studies conducted by Raessi (43), Badri Zadeh (44), and Mmagsudi (45). In the present study, the scope of depression had the lowest mean score, which it is inconsistent with results of the studies conducted on nurses in the hospitals of France and Taiwan in which high level of moderate to severe depression was reported (46-47). In the present study, these differences can be justified due to a lack of personnel (operating room technologist) who are working regularly on the night shift, since sleep disorders causes depression even in people who had no history of these disorders (18). The second point is that Goldberg's general health questionnaire (GHQ-28) was developed in order to assess the level of depression in severe level and it is unable to assess the mild and moderate depressions, so it is

able to identify people with mild and moderate depression in this study. With regard to disorder in social functions that had the highest mean score, khaghani Zadeh considered the shift nature of nursing job and thus disorder in social functioning arising from it which causes people to be deprived of social interactions as reasons for it (48).

In our study, women compared to men have lower general health, which it is in line with the results of studies conducted by Sahebi (49), Asad Zandi (50) and Shahraki Vahed (51), which its reason may be due to other social responsibility of women as maternal, spouse role in addition to their professional career, which causes additional pressure on them and endangers their health (48). With regard to age and work experience, results of Scheffe test in our study showed significant correlation between these two variables and mental health that it is in line with the results of Hojjati. Hojjati in his research (quoted in cooper) stated that the stress level ages lower than 30 years is at the highest level and also (quoted in Dimer) stated that work experience is among the effective factors with regard to stress and mental health in nurses (52).

Conclusion

According to the results of this study, most technologists in operating room had a disorder at the level of general health. Given the importance of health of technologists in operating room as part of the medical team dealing directly with the patient and as any physical and mental damage to them that reduces the quality of their performance, increases medical error, and finally endangers the safety of patient, it is recommended that steps to be taken to improve the care of patients and reduce the high costs for treatment of damages imposed to technologists of operating room by providing diverse educational programs and strategies.

Acknowledgement

The authors of this study appreciate all the officials of educational hospitals of Iran University of Medical Sciences and technologists who cooperated with us in completion of these questionnaires.

Table 1: frequency distribution of demographic information of research subjects

	Individual and occupational factors	f	%
gender	Male	40	20.6
	Female	154	79.4
age	>30	104	53.6
	30-39	64	33
	40=<	26	13.4
Work experience	>5	81	41.8
	5-9	51	26.3
	10=<	62	32
Education level	Associate of operating room	39	20.1
	Bachelor of operating room	155	79.9
Working hours (per week)	30-40	44	22.7
	40-50	100	51.5
	50=<	50	25.8
Working shift	Morning	35	18
	Evening	41	21.1
	Morning and evening	4	2.1
	In rotation	114	58.8
Marital status	Single	85	43.8
	married	109	56.2

Table 2- frequency distribution of general health of research subjects

Areas	Mental health	N	(%)	Sub-scale	f	%
Physical disorder	Diseases symptoms Health symptoms	78 116	40.2 59.8	None or minimum level	116	59.8
				Mild	60	30.9
				Moderate	13	6.7
				Severe	5	2.6
Anxiety and insomnia	Diseases symptoms Health symptoms	90 104	46.4 53.6	None or minimum level	104	53.6
				Mild	68	35.1
				Moderate	14	7.2
				Severe	8	4.1
Disorder in social functioning	Diseases symptoms Health symptoms	118 76	60.8 39.2	None or minimum level	76	39.2
				Mild	115	59.3
				Moderate	3	1.5
				Severe	0	0
Depression	Diseases symptoms Health symptoms	25 169	12.9 87.1	None or minimum level	169	87.1
				Mild	20	10.3
				Moderate	3	1.5
				Severe	2	1
Total general health	Diseases symptoms Health symptoms	129 65	66.5 33.5	None or minimum level	2	1
				Mild	12	6.2
				Moderate	51	26.3
				Severe	129	66.5

Table 3- Determining the relationship between general health and gender, marital status, and education level

Health	General health level											Total general health	p.value	
		None (minimum level)		Mild		moderate		Severe		Total				SD ± mean
		N	(%)	N	(%)	N	(%)	N	(%)	N	(%)			
Gender	Male	31	77.5	6	15	3	7.5	0	0	40	100	17.8±10.2	0.014	
	Female	98	63.6	45	29.2	9	5.8	2	1.3	154	100	22.8±11.7		
Marital status	Single	51	60	26	30.6	6	7.1	2	2.4	85	100	23.4±12.9	0.078	
	Married	78	71.6	25	22.9	6	5.5	0	0	109	100	20.4±10.2		
Education	Associate	36	92.3	0	0	3	7.7	0	0	39	100	19.4±8.6	0.162	
	Bachelor	93	60	51	32.9	9	5.8	2	1.3	155	100	22.3±12.1		

Table 4- determining the relationship between general health and some of individual and occupational variables

Individual and occupational variables		General heath		F (ANOVA) test results	
		Mean	SD	P-value	F
age	>30	25.0673	12.5962	P< 0.001	12.780
	30-39	19.6562	9.76749		
	=<40	13.8462	5.12010		
Working shift	Morning	23.4286	12.53533	0.122	1.959
	Evening	24.7317	12.21275		
	Morning and evening	16.7500	1.50000		
	In rotation	20.3860	11.02813		
Work experience	>5	23.7778	12.35213	0.003	6.027
	5-9	23.5882	10.84652		
	=<10	17.6774	10.09102		
Working hours per week	30-40	21.2500	12.34980	0.009	4.948
	40-50	23.9800	12.81963		
	=<50	17.8400	5.94656		

References

1. World Health Organization (WHO) [Investing in mental health]. Geneva (CH): WHO; 2003. [cited 2013 August 28]. [Internet] Available from:http://www.who.int/mental_health/en/investing_in_mnh_final.pdf.
2. Farhady Y, Ashtari Z, Sadeghi A. Level of Mental Health in a Sample of psychiatric centers professionals. *teb & taz kieh* 2005;14(56):18-23. (In persian)
3. Kaur S, Niwas R. A Study of Mental Health in Relation to Emotional Intelligence and Personality Factors of 10th Class Students. *Indian Journal of Applied Research*. 2016;6(1).
4. Barrey.M, (2011). Promoting Mental Health and Well being :Concept. Practice, and Policy. World health organization collaborating center for Health promotion research center (HPRC).
5. Ellis KR, Griffith DM, Allen JO, Thorpe RJ, Bruce MA. "If you do nothing about stress, the next thing you know, you're shattered": Perspectives on African American men's stress, coping and health from African American men and key women in their lives. *Social Science & Medicine*. 2015 Aug 31;139:107-14
6. Hashemi M, Garshad A. Assesment job stress it in nursing personal in a selected teaching hospital of North Khorasan University of Medical Sciences 2008. *Journal Of North Khorasan University Of Medical Sciences*. 2012;4(1):95-103.(Persian).
7. Arora S, Tierney T, Sevdalis N, Aggarwal R, Nestel D, Woloshynowych M, et al. The Imperial Stress Assessment Tool (ISAT): a feasible, reliable and valid approach to measuring stress in the operating room. *World journal of surgery*. 2010;34(8):1756-63.
8. Jones LK, Jennings BM, Goelz RM, Haythorn KW, Zivot JB, de Waal FB. An Ethogram to Quantify Operating Room Behavior. *Annals of Behavioral Medicine*. 2016;50(4):487-96.
9. Wetzel CM, Kneebone RL, Woloshynowych M, Nestel D, Moorthy K, Kidd J, et al. The effects of stress on surgical performance. *The American Journal of Surgery*. 2006;191(1):5-10
10. Girzadas Jr DV, Delis S, Bose S, Hall J, Rzechula K, Kulstad EB. Measures of stress and learning seem to be equally affected among all roles in a simulation scenario. *Simulation in Healthcare*. 2009;4(3):149-54.
11. Nooryan K, Gasparyan K, Sharif F, Zoladl M. Controlling anxiety in physicians and nurses working in intensive care units using emotional intelligence items as an anxiety management tool in Iran. *Int J Gen Med* 2012;5:5-10
12. Hendren, R. (2010). Linking-medical-errors-nurses-12hours-hifts Health Leaders Media. <http://www.healthleadersmedia.com/page-3/NRS-257296/Linking-Medical-Errors-Nurses-12Hour-Shifts>
13. Gempeler R. Educación en Anestesia ¿Cambio de paradigma? *Rev Colomb Anestesiol*. 2014;42:139–41.
14. Shields, M. & Wilkins, K. (2006). Findings from the 2005 National Survey of the Work and Health of Nurses (Rep. No. Catalogue no. 83-003-XPE). Ottawa: Statistics Canada.
15. Wickwire EM, Geiger-Brown J, Scharf SM, Drake CL. Shift Work and Shift Work Sleep Disorder. *Chest*. 2017 May 1;151(5):1156-72.

16. Drake CL, Roehrs T, Richardson G, Walsh JK, Roth T. Shift work sleep disorder: prevalence and consequences beyond that of symptomatic day workers. *Sleep* 2004 Dec 15;27(8):1453-1462
17. G.P. Krueger, Fatigue, performance, and medical error, in: M.S. Bogner (Ed.), *Human Error in Medicine*, L. Erlbaum Associates, Hillsdale, NJ, 1994, pp. 311–326.
18. Barbara Kirchheimer, Cathryn Domrose, Medication-related errors: a literature review of incidence and antecedents, *Annual Review of Nursing Research* 15 (24) (2009) 19–38.
19. Baba, V. V., Galperin, B. L., & Lituchy, T. R. (1999). Occupational mental health: a study of work-related depression among nurses in the Caribbean. *International Journal of Nursing Studies*, 36,163-169
20. Burton, W. N., Pransky, G., Conti, D. J., Chen, C. Y., & Edington, D. W. (2004). The association of medical conditions and presenteeism. *Journal of Occupational & Environmental Medicine*, 46,S38-S45
21. Moulton CA, Regehr G, Lingard L, Merritt C, MacRae H. Slowing down to stay out of trouble in the operating room: remaining attentive in automaticity. *Acad Med* 2010;85(10):1571e7
22. Yule S, Flin R, Paterson-Brown S, Maran N, Rowley D. Development of a rating system for surgeons' non-technical skills. *Med Educ* 2006;40(11):1098e104
23. Flin R, Patey R, Glavin R, Maran N. Anaesthetists' non-technical skills. *Br J Anaesth* 2010;105(1):38e44
24. Mitchell L, Flin R. Non-technical skills of the operating theatre scrub nurse: literature review. *J Adv Nurs* 2008;63(1):15e24.
25. Kurmann A, Tschan F, Semmer NK, Seelandt J, Candinas D, Beldi G. Human factors in the operating room—The surgeon's view. *Trends in Anaesthesia and Critical Care*. 2012 Oct 31;2(5):224-7.
26. Safety and Health Topics, US Department of Labor. (<https://www.osha.gov/SLTC/healthcarefacilities/>) Accessed 07.03.14.
27. Adams S, Stojkovic SG, Leveson SH. Needlestick injuries during surgical procedures: a multidisciplinary online study. *Occup Med (Lond)*. 2010;60:139–144.
28. U.S. Food and Drug Administration (FDA). Blunt-tip surgical suture needles reduce needle stick injuries and the risk of subsequent blood borne pathogen transmission to surgical personnel: FDA, NIOSH and OSHA Joint Safety Communication. FDA; 2012 [accessed 9 Nov, 2015] <<http://www.fda.gov/MedicalDevices/Safety/AlertsandNotices/ucm305757.htm>>.
29. Kasatpibal N, Whitney JD, Katechanok S, Ngamsakulrat S, Malairungsakul B, Sirikulsathean P, Nuntawinit C, Muangnart T. Prevalence and risk factors of needlestick injuries, sharps injuries, and blood and body fluid exposures among operating room nurses in Thailand. *American journal of infection control*. 2016 Jan 1;44(1):85-90.
30. Jafari F, Jafari MD, Hanna MH, Beltran KM, Borromeo-Manalo N, Carmichael JC, Mills SD, Stamos MJ, Pigazzi A. Musculoskeletal Strain in the Operating Room Personnel: A Single Institution Study. *Journal of the American College of Surgeons*. 2014 Sep 1;219(3):S110-1.
31. Workplace Injuries Cost Healthcare Industry Billions. Fierce Healthcare, 2014 FierceMarkets, a division of Questex Media Group LLC. (<http://www.fiercehealthcare.com/story/report-workplace-injuries-cost-healthcare-industry-billions/2013-11-12>); November 12, 2013 accessed April 07.03.14.
32. Goldberg DP, Gater R, Sartorius N, Ustun TB, Piccinelli M, Gureje O, et al. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med*. 1997;27(1):191-197.
33. Werneke U, Goldberg P, Yalcin I, Ustun BT. The stability of the factor structure of the General Health Questionnaire. *Psychol Med*. 2000; 3 (4):823-829
34. Banihashemian K, Bahrami Ehsan H, Moazzen M. Relation between head masters' general health and emotional intelligence and job satisfaction of teachers. *International Journal of Behavioral Sciences*. 2010;4(1):45-50.(Persian).
35. Nazifi M, Mokarami H, Akbaritabar A, Faraji Kujerdi M, Tabrizi R, Rahi A. Reliability, Validity and Factor Structure of the Persian Translation of General Health Questionnaire (GHQ-28) in Hospitals of Kerman University of Medical Sciences. *J Fasa Univ Med Sci*. 2014; 3 (4) :336-342
36. Lawshe CH. A quantitative approach to content validity. *Personnel Psych* 1975; 28: 563-75.
37. Munro BH: *Statistical Methods for Health Care Research*. Philadelphia: Lippincott Williams & Wilkins; 2004.
38. Moffat BS, Inaba K, Ives C, Zuk Z, Branco BC, Barmparas G, Swadron SP, Vogt KN, Demetriades D. Reported Blood and Body Fluid Exposures in Employees at a Level I Trauma Center. *Journal of the American College of Surgeons*. 2014 Sep 1;219(3):S110.
39. Phillips EK, Owusu-Ofori A, Jagger J. Bloodborne pathogen exposure risk among surgeons in sub-Saharan Africa. *Infect Control Hosp Epidemiol*. 2007;28:1334–1336
40. Nguyen NT, Ho HS, Smith WD, Philipps C, Lewis C, De Vera RM, Berguer R. An ergonomic evaluation of surgeons' axial skeletal and upper extremity movements during laparoscopic and open surgery. *The American journal of surgery*. 2001 Dec 31;182(6):720-4.
41. Puca FM, Perrucci S, Prudenzano MP, Savarese M, Miscio S, Perilli S, et al. Quality of life in shift work syndrome. *Funct Neurol* 1996 Sep-Oct;11(5):261-268.

42. Enns V, Currie S, Wang J. Professional autonomy and work setting as contributing factors to depression and absenteeism in Canadian nurses. *Nursing outlook*. 2015 Jun 30;63(3):269-77.)
43. Raeissi P, Raeissi N, Shokouhandeh L. The Relationship between Nurses' Mental health and Working Motivation in Ganjavian Hospital, Dezfool, Iran. *Advances In Nursing & Midwifery*. 2014;24(86):34-42.
44. Badrizadeh A, farhadi A, Tarrahi M J, Saki M, Beiranvand G. Mental health status of the nurses working in khorramabad state hospitals. *yafte*. 2013; 15 (3) :62-69
45. Maghsoodi S, Hesabi M, Emami sigaroudi A, Kazemnejad leili E, Monfared A. General health and related factors in employed nurses in Medical-Educational Centers in Rasht . *J Holist Nurs Midwifery*. 2015; 25 (1) :63-72
46. Jolivet A, Caroly S, Ehlinger V, Kelly-Irving M, Delpierre C, Balducci F, Sobaszek A, De Gaudemaris R, Lang T. Linking hospital workers' organisational work environment to depressive symptoms: a mediating effect of effort-reward imbalance? *The ORSOSA study. Social Science & Medicine*. 2010 Aug 31;71(3):534-40.
47. Letvak S, Ruhm CJ, McCoy T. Depression in hospital-employed nurses. *Clinical Nurse Specialist*. 2012;26(3):177-82
48. khaghanizade M, Siratinir M, Abdi F, Kaviani H. Assessing of mental health level of employed nurses in educational hospitals affiliated to Tehran medical sciences university. *The Quarterly Journal of Fundamentals of Mental Health*. 2006;8:141-148.
49. Sahebi L, Ayatollahi M. Mental health status of hospitals staffs in Shiraz. *Horizon Med Sci* . 2007; 12 (4):26-33
50. Asadzandi M, Sayari R, Ebadi A, Sanainasab H. Mental health status of military nurses. *Journal of Military Medicine*. 2009;11(3):135-41.
51. Shahraki Vahed A, Mardani Hamuleh M. Assessment of the relationship between mental health and job stress among nurses. *jjums*. 2010; 8(3):34-40
52. Hojjati H, Tahery N, Sharifniyai SH. Review of mental health and physical health in night working nurses in Golestan University of medical sciences in 2008-2009. *Journal of Urmia Nursing And Midwifery Faculty*. 2010;8(3):144-149.