

Investigating the compliance with personal safety standards by personnel and its related factors in the operating room of selected educational and medical centers of Isfahan University of Medical Sciences in 2016

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ABSTRACT

Introduction: There are special risks in the operating room that affects the health of its personnel. Since the importance of safety in this environment is high, the relevant organizations have recommended for personnel to recognize safety needs of their workplace and act to them. The objective of this study was to evaluate the compliance with individual safety points by personnel in operating room of medical centers of Isfahan University of Medical Sciences, as well as the barriers and causes related to these points.

Methods: This is an analytical descriptive study conducted by a researcher-made questionnaire containing 60 questions.

Results: The results of this study showed that the mean total score of compliance with individual safety standards by operating room personnel was 198.65 (moderate). Additionally, the reasons for not performing standards among the four subsections of the standards were: Ergonomic (lack of facilities), biological (lack of willingness), physical (lack of knowledge) and chemical (lack of knowledge). There was no significant relationship between personnel demographic characteristics and compliance with standards.

Conclusion: Considering the main reasons and causes for non-compliance and as education is main component with regard to complying with safety, the need to hold various educational methods to make personnel familiar with safety issues and also the provision of necessary equipment are recommended.

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Introduction

In health settings, there are certain chemical, biological, or ergonomic hazards that potentially affect the health of the personnel (1, 2). In this regard, operating room that includes 70% of the annual hospital admission is one of the most complex working environments recognized as the heart of any health center (3, 4). AORN has advised all operating room nurses to recognize their own safety needs in the workplace, as this organization believes that safety in the workplace and the safety of personnel should be base of all management and human resources plans (5). The goal of compliance with safety points is to reduce or eliminate workplace risks by using various control methods and equipment to meet safety needs operating room personnel, which ultimately leads to patient safety (1, 4, 5). One of the most common problems in operating room is musculoskeletal

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disorders (MSDs). Research results in the United States showed that nursing was among the top ten jobs in which musculoskeletal disorders are common. In this regard, it has been found that one third of the sick leaves of operating room personnel are due to these disorders (6, 7). Other risks for operating room personnel include pointing and contact with contaminated fluids in the patient's body. Personnel skin may contact with the patient's blood in 50% of the cases (6.4% to 50%) and pointing needle into the skin can also occur in 15% of operations (1.7% to 15%). In recent studies, it has been shown that up to 38% of patients who have undergone surgery in the operating rooms were infected to a least one contaminated pathogen (9). Exposure to chemicals such as detergents, disinfectants and anesthetics is also known as a risk for operating room personnel (10). According to the Occupational Safety and Health Administration (OSHA), approximately 250,000 hospital personnel each year are potentially exposed to anesthetic gases and complications related to it (11). Lack of sufficient manpower causes improper layout of work shifts for the operating room personnel and exposes them to burnout and high working pressure. The Association for Operating Nurses (AORN) has recommended that personnel hours should not exceed 24 hours a day for more than 12 consecutive hours, and during the week, total working hours should not exceed 60 hours, as it increases the medical risks during patient care, and risks such as needle stick, musculoskeletal injuries, and fatigue and sleep deprivation for the personnel (5, 12). As high risk workplace affects the human resources of each organization, the importance of being more safe environment becomes apparent, because human resources are one of the most important resources of the organization; so that economists believe what ultimately determines the characteristic of social and economic development process in an organization is its human resources, not the capital or other material resources (Yari, 2012). Additionally, injury to human resources causes waste of large resources for the treatment or replacement of personnel. According to the World Health Organization (WHO) in 2008, accidents and injuries created in the workplace have led to the loss and cost of around 4-5% of GDP (13). The study was conducted to determine the level of compliance with individual safety points in the operating rooms of medical centers in Isfahan University of Medical Sciences, as well as the obstacles in compliance with these points.

Project implementation method

This descriptive-analytic study was conducted on 155 operating room personnel in the educational hospitals of Isfahan University of Medical Sciences in 1396. In this study, the inclusion criteria were at least one year of work experience, participation as circular or scrub role in surgeries and having bachelor degree or associate degree in operating room. People in the study were selected using census method. Data were collected by a researcher-made questionnaire. The content validity method was used to confirm the validity of the tool and the views of ten faculty members of Isfahan University of Medical Sciences were taken on the questionnaire and they confirmed its content validity. In order to confirm the reliability, 15 questionnaires were distributed among the personnel of one of the operating rooms in a two-time interval of 6 months, and its reliability was obtained 0.833 by the software version 18 using the test re-test method (14). The questionnaire consists of two parts. In the first part, the demographic data of the research subjects such as age, gender, weight, work experience, education level, type of employment, shift, daily and weekly working hours were questioned. The second part consists of 60 questions (ergonomic standards questions (15 questions), biological (25 questions), chemical (10 questions) and physical (10 questions)). Each question includes 5 options (always (score 5), often (score 4), usually (score 3), rarely (score 3) and never (score 1), which the respondent will select an option. It should be noted that chemical injuries occur due to exposure to disinfectants and detergents, high risk drugs and anesthetic gas; biological injuries occur due to exposure to latex allergy; physical injury occur due to exposure ionized and non-ionized radiation, and cutting devices and ergonomic injuries occur due to the transmission and lifting patient and heavy tools, and static modes like long operations (1 and 2). At the beginning of the working shift, the researcher distributed questionnaire among personnel and delivered them before start of surgery. The number of questions is 60, which obtaining a score 300 means full compliance, 299 to 221 means desirable compliance, 220 to 141 means moderate compliance, 140 to 61 means incomplete compliance, and 60 means non-compliance. Additionally, to investigate the cause of lack of compliance of standards, four options of "I do not have willingness", "I do not know", "I have no facility to do it", and "I have no authority to do it" and "other cases" were designed. Regarding the limitations of this project, it can be noted that although compliance with standards can be achieved through observation, but due to the increased reactivity bias, the study was conducted in self-report way.

Results

Out of 155 samples, 45 (29%) were male and 110 (71%) were female, and 50 (32.5%) of them had associate degrees, 102 (66.2%) had bachelor degree, and 2 (1.3%) had master degree. The mean age of the personnel was 33.78 years, mean height of them was 166.42 cm, and mean weight of them was 66.33 kg. Daily shifts hours of them were 9.90 hours and weekly shifts hours of them were 47.74 hours weekly, and their work experience was 10.24 years. The mean total score for compliance with safety standards of the operating room personnel under the study was $198.65 \pm 2.30 \pm 2.8$, which it was moderate according to the ranking. Additionally, according to table 1-1, personnel working in the neurosurgical and orthopedic operating room in Kashani Hospital obtained the highest score in compliance with "ergonomic, physical and chemical standards" and Chamran operating room personnel in compliance with "biological standards". Additionally, personnel working in the Kashani 2 operating room obtained the highest score.

Among the reasons for non-compliance, the greatest reason among the standard dimensions was ergonomic (lack of facilities),

Table 1-1	Ergonomic		Biologics		Physic		Chemistry		Total	
Hospital	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
Alzahra	40.54	1.20	95.03	2.02	36.08	.96	31.19	1.32	202.84	4.64
Alzahra emergency	38.69	3.20	94.00	3.38	35.54	1.58	31.15	1.48	199.38	6.35
Alzahra 2	42.11	3.08	93.56	6.14	34.44	2.10	26.78	2.41	196.89	11.16
Isa Bin Maryam	38.89	1.67	95.22	2.36	37.17	.92	32.06	1.08	203.33	4.44
Musa Kazem	34.58	1.81	93.25	7.44	33.50	1.74	29.17	1.72	190.50	10.76
Amin	39.00	1.91	86.85	3.31	30.92	1.76	31.54	2.06	188.31	6.95
Kashani	49.73	2.36	92.73	2.49	36.33	1.50	34.47	1.33	213.27	6.74
Kashani 2	41.56	2.75	86.63	3.35	30.19	1.86	32.25	4.97	190.63	9.78
Shaid Beheshti	31.38	2.19	85.63	6.00	33.50	2.28	31.00	1.57	181.50	10.03
Chamran	37.93	1.66	99.00	2.66	34.00	1.56	31.00	1.59	201.93	5.61
Total	39.98	.72	92.84	1.13	34.53	.50	31.30	.70	198.65	2.30
P-value	0.001*		0.218		0.013*		0.804		0.201	

biological (unwillingness), physical (lack of knowledge) and chemical (lack of facilities) (Table 1-2).

Table 2.1. Mean percentage of various reasons in compliance with standards

reasons standard	Unwillingness	Lack of knowledge	Lack of facilities	Lack of authority	Other cases
Ergonomic	14.83	17.6	<u>45.81</u>	14.4	7.36
Biological	<u>49.65</u>	18.18	13.84	2.98	15.35
Physical	17.9	<u>38.47</u>	18.7	14.7	10.23
Chemical	17.71	26.42	<u>35.92</u>	4.84	15.09

There was no significant difference between demographic characteristics of personnel and compliance with standards (P-value > 0.05).

Discussion

The mean score obtained by personnel in the ergonomic and physical dimensions had significant difference among the 10 educational centers under study (P-value < 0.05). Based on the results of the post hoc test, the mean score of the physical dimensions of the personnel of Isa Bin Maryam Hospital was significantly lower than that of the Kashani hospital (P-value = 0.036 < 0.05). The mean ergonomic score was significantly less among personnel of Alzahra Hospital and Alzahra Emergency, Isa Ibn Maryam, Musa Kazem, Amin, Shahid Beheshti and Chamran compared to that in Kashani Hospital personnel (P-value < 0.05). Generally, the rate of "desirable" compliance with standards of safety standards in this study was 17.4 percent, which is less compared to study conducted by Arabi et al (2009). This may be due to subjects studied, so that only operating room personnel were studied in this research, in the study by Arabi, anesthesiologists and surgeons were also investigated, and only the safety standards related to personal protective equipment were investigated. In the current study, "lack of knowledge" had the greatest impact on non-compliance with of personnel, while in the study by Arabi, lack of facilities was the main cause of non-compliance (15). In the present study, the rate of compliance with ergonomic standards was "moderate" (64.5%), and only 5.2% of personnel complied with these standards at desirable level that given that these centers are at university level and different classes and courses are hold in them, we expected better results. This dimension of the standard is important since according to studies ergonomic problems more than other problems leads to personnel leaving the workplace (12). In the current study, on average, 41.64% of the personnel did not comply with those standards that prevent the occurrence of musculoskeletal disorders in the workplace (non-flexible working programs and the lack of proper equipment for the transmission of patients and appliances, long-term standing, improper physical modes, lifting and pushing the patient and objects). However, in most cases, there were no proper conditions for compliance with these standards. For example, 66.7% of personnel stated that there is not enough force to replace personnel during long-term surgery. Additionally, 69% and 82.8% of the personnel complained about the lack of additional monitors and arm rest during laparoscopic surgery, which according to studies, it causes considerable muscular injury to neck and arm of personnel (1). In some studies, unstable work shifts were associated with musculoskeletal problems. In the current study, shifts of 38.35% of the personnel were more than

recommended standard that the main reason was lack of authority (44.45%) and lack of sufficient personnel (27.7%). Current study statistics are roughly similar to study conducted by Rogers (2004). In that study, 40 percent of the personnel working shifts were more than 12 hours (16, 17). In the study of Sharifnaya et al. (2010), it was also found that having long working shift has a significant relationship with the occurrence of varicosity in personnel ($P < 0.001$). (21). In the present study, 70 people (45.16%) did not comply with main standard for preventing injuries of needle stick (wearing two pairs of gloves), which the main cause was the unwillingness. In a six-year study, Bi (2006) concluded that emphasizing the use of safe methods and appropriate wearing could reduce such risks (22). Therefore, the importance of this standard should be taught to personnel through training programs. Another noteworthy point is that 130 (83.87%) of personnel do not use any magnetic means to manage needles in large surgeries, which lack of facilities (87.7%) was mentioned as the main factor. The provision of such device can greatly reduce the risk of skin injury among personnel during operation. However, some cases indicating the improved compliance with the standards in the biological aspects were obtained. For example, 90.33% of the personnel used antiviral protective equipment in case of exposure to a high-risk patient (anti-virus gloves, waterproof plunger and undercoat fluids, plastic pads), 94.84% of them also did not hold the needle with hand when sewing, and 96.13% of the personnel also had information about relevant protocol during exposure to body secretions, and 89.04% of them used safe methods such as needle recapping to insert the needle cap. In this study, 49 personnel (31.61%) did not have a plan to examine the level of their hormones, that main reason was lack of knowledge of the risks and complications caused by gases and chemicals in the workplace (34.7%). Anesthetic gases caused known complications for the personnel (11). In the study of Qomishi (2013), the incidence of abortion ($P < 0.05$) and infertility ($P < 0.001$) in women working in the operating room was significantly higher than that among personnel working outside the operating room, and in the study conducted by Akhavan Akbari (2012), AST and ALT enzymes in the operating room personnel were significantly higher than those in personnel working outside of the operating room (18, 19). In the present study, 43.22% of personnel did not use anti-varicose socks that "unwillingness" was the most important factor in this regard. In the study by Sadari (1993), 18.5% of nurses did not use preventive measures (23). In the current study, 50.32% of the personnel did not perform any medical tests to determine the condition in terms of this disease. The main reason for this was lack of knowledge (55.1%) of such specialized tests. As working conditions in the operating room expose personnel to such complication (24), plans should be developed by authorities for facilitating the prevention of varicose cases. In the current study, it was found that 34.83% of their personnel did not replace their mask after each surgical procedure, which the main reason is lack of willingness of personnel (66.7%). In the study by Arabi (15), this rate was 46.4%, although lack of mask was the main reason for non-compliance of this standard. As mentioned in the standards, the mask of the personnel should be replaced after each operation (20). Addressing this issue is also important. Exposure and respiration of smoke resulting from electrocautery can also cause injury to the respiratory system of the personnel. In one study, it was found that 63.22% of personnel do not use standard equipment to evacuate this smoke, which lack of facilities and equipment was the main cause (83.7%), and other personnel used a suction device for this purpose. Although the suction can prevent in some extent to exposure this smoke, it cannot be used in all surgical procedures and the use of this equipment also has its own problems. According to what was said above, the importance of safety in the workplace is clear, and since education is one of the main and most important subjects in the field of maintaining safety, it is evident that the promotion of compliance with the standards depends on raising the awareness of the personnel as well as eliminating administrative and logistical barriers.

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